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RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

Productivity and Resource Misallocation: Empirical Findings from Firms in the Middle East and North Africa (MENA) Region and Turkey

Verimlilik ve Kaynakların Etkinsiz Dağılımı: Ortadoğu ve Kuzey Afrika (ODKA) Bölgesi ile Türkiye'deki Firmalardan Elde Edilen Ampirik Bulgular

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ABSTRACT

State-Business relations (SBRs) are reflected in business and investment climate indicators and may take the form of formal, regular, and informal interactions. The creation of an institutional environment in which the state provides high-quality public goods, such as infrastructure, political stability, elimination of corruption, and effective public administration, is important because it can improve productivity and lead to higher rates of growth. Resource reallocation from low to high productivity firms can generate large aggregate productivity gains with further potential benefits to economic growth. This study examines the relationship between productivity and resource misallocation in a sample of countries in the Middle East and North Africa (MENA) region, and Turkey. The analysis relies on data from the World Bank Enterprise Surveys over 2008-2016 of firms in Egypt, Turkey, and Yemen. In the analysis, we control various firm characteristics. Furthermore, we explore major state-business relations (SBRs) and their association to resource misallocation. The results are mixed, wherein in Egypt and Turkey, female ownership and international quality certification are positively associated with productivity and allocation efficiency. Moreover, obstacles in SBRs present a negative and significant correlation with the firms' performance and productivity, increasing dispersions in the resource allocation, output, and capital. We find that corruption, political instability, electricity supply, and high tax rates are the most critical obstacles in SBRs.

Keywords: Firm-Level data, Firm characteristic, Productivity, Resource misallocation, State-Business relations
Jel Code: D24, L25, O43

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ÖZ

Devlet-Özel Sektör ilişkileri iş ve yatırım ortamı göstergeleri ile ifade edilirken, resmi, düzenli ve gayri resmi ilişkiler şeklinde vücut bulabilir. Devletin yolsuzluğun ortadan kaldırılması, etkin kamu yönetimi, altyapı ve siyasi istikrar gibi yüksek kaliteli kamu malları sağladığı kurumsal bir ortamın yaratılması, verimliliği artırması ve daha yüksek büyüme oranlarına yol açması açısından önemlidir. Düşük verimli firmalardan yüksek verimli firmalara kaynakların yeniden aktarımı, önemli verimlilik kazançlarını beraberinde getirerek ekonomik büyümeye de potansiyel katkılar sunmaktadır. Bu çalışma Orta Doğu ve Kuzey Avrupa'da yer alan bazı ülkeler ile Türkiye'de verimlilik ve kaynakların etkinsiz dağılımı arasındaki ilişkiyi incelemektedir. Analizler Türkiye, Mısır ve Yemen için 2008-2016 yılları arası Dünya Bankası Girişim Anketleri'nden elde edilen veriler kullanılarak yapılmıştır. Analizlerde firma karakteristiklerini temsil eden değişkenler kontrol altına alınmıştır. İlave olarak çalışmada, devlet-özel sektör ilişkisinin kaynakların etkinsiz dağılımındaki rolü incelenmiştir. Sonuçlar ülkeler için farklılık göstermekte olup, Türkiye ve Mısır'da firmaların kadınlar tarafından işletilmesinin ve uluslararası kalite belgesine sahip olunmasının verimlilik ve kaynak dağılımındaki etkinlikle pozitif ilişkili olduğu ortaya koyulmuştur. Ayrıca devlet-özel sektör ilişkisi önündeki engeller firma performansı ve verimliliği ile negatif ilişkili olup, sermaye, çıktı ve kaynak dağılımda bozulmayı beraberinde getirmektedir. Yolsuzluk, siyasi istikrasızlık, elektrik arzı ve yüksek vergi oranları devlet-özel sektör ilişkisi önündeki en kritik engeller olarak bulunmuştur.

Anahtar Kelimeler: Firma verisi, Firma özellikleri, Verimlilik, Kaynakların etkinsiz dağılımı, Devlet-Özel sektör ilişkileri
Jel Code: D24, L25, O43

1.Introduction

The extensive economic literature documents the importance of total factor productivity (TFP) as a source and main driver of sustained economic growth and development. TFP significantly differs across countries, but large differences are presented across firms that operate within the same or very similar industries. Earlier studies try to give answers explaining those differences. One of the main explanations is that resource misallocation is a significant part of interpreting these productivity differences, which can be due to the slow diffusion of best practice and management methods, technological diffusion, and innovation generated by investment in research and development (R&D). The recent research focuses on encouraging investments in technology and innovation, upgrading learning and skills, and policies that promote access to the labor market for young and females. However, the quality of SBRs can also be a major determinant of resource reallocation from low to high productivity firms. This is also the study's main aim, to explore how the obstacles in SBRs may affect the TFP and the misallocation and reallocation of resources.

The analysis is based on the seminal work by Hsieh and Klenow (2009), who argue that the TFP of an industry depends not only on the TFP of the individual firms but also on the resource allocation across the firms. In an economy characterized by low distortion, productive firms will have access to more resources, capital, and labor explored in this study, leading to an aggregate increase in the sector's productivity and further overall economic growth. So, for the firms operating to the same or to a narrowly defined industry, to achieve the maximum allocation efficiency, they should be able to access the resources at this point where they attain the same marginal revenue products. Large dispersions in the marginal products within the same industry imply resource misallocation. Since corruption, political instability, tax rates, and access to finance are the major factors of allowing a firm to access resources, it is crucial to explore these SBRs and their relationship to productivity. This includes favors for certain firms which are large or state-owned in terms of granting additional and unnecessary subsidies for political purposes, while the young and small, but more productive firms, may face limitations in terms of capital and finance and they could be "taxed" more from the state.

Additionally, political instability and tax rates may significantly affect the firm performance. Many studies have shown how corruption and regulation distort resource allocation from their most efficient use and the most productive firms, especially in the lower-income economies, as is Egypt and Yemen explored in this study. However, as distortions may explain the resource misallocation, other factors may also play a major role, described in more detail in the following sections.

Thus, the main purpose of this study is to explore the resource misallocation that occurs, especially in distorted economies in this study where the labor and capital flow from the less productive to more productive firms is prevented. In the study by Hsieh and Klenow (2009), the potential total factor productivity (TFP) gains range between 30-50 percent in China and 40-60 percent in India if the resources were reallocated to equalize the marginal products to U.S. levels. So far, there is no study exploring the economies of the MENA region and Turkey systemically, including the role of the quality and obstacles in SBRs. The analysis will allow us to examine how much the productivity would be if the resources were allocated optimally across the firms. In particular, we will consider the marginal revenue product of capital (MRPK) and the marginal revenue product of labor (MRPL) across firms, and we will explore to what extent of the misallocation dispersion in MRPK and MRPL is owned to rigidities and distortion of the economy, such as the obstacles faced by the firms. This study adds to the previous literature as it is the first exercise exploring the potential TFP considering the obstacles in the SBRs business-state relations.

The organization of the paper is as follows. First, section 2 discusses earlier studies. Then, in section 3, we present the methodology followed in the empirical work, and in section 4, we describe the data and sample used in the analysis. Finally, in section 5, we present the empirical results, and in section 6, we discuss the main conclusions derived from the study.

2. Literature Review

Numerous studies have explored resource misallocation in advanced and developed economies and in developing economies, including Latin America, India, China, and other

Asian economies. However, there is no study exploring the resource misallocation systematically in the economies of the MENA region and Turkey and the role of additional factors, such as the quality of SBRs.

Earlier studies examining the implications of the misallocation on productivity can be split into two categories; those that adopt the direct approach and others that follow the indirect approach (Chuah, Loayza & Nguyen, 2018). Studies following the direct approach directly measure factors or explore specific regulations that cause input misallocation. The study by Hopenhayn and Rogerson (1993) shows that firing taxes distort the labor allocation across firms, resulting in a loss of TFP at about 2 percent and an output loss of 5 percent. Similarly, Lagos (2006) studied the implications of labor market regulation, including employment protection and unemployment insurance. Other studies explored the impact of reductions on trade tariffs on firm productivity and whether large changes lead to resource misallocation (Lileeva & Trefler, 2010; Epifani & Gancia, 2011; Eslava, Haltiwanger, Kugler & Kugler, 2013).

The indirect approach differs and relies on the fact that in some cases, it is rather difficult to measure a source of misallocation or there is a very specialized condition. Therefore, the indirect approach attempts to identify the extent of misallocation without identifying the underlying source of misallocation. However, even though the indirect approach sounds intuitively powerful, it relies on specific assumptions and misallocation measurements, associated with two main limitations. First, the wedges do not always necessarily reflect distortion but may result from production function misspecification. Second, since wedges are estimated using actual data may also reflect measurement errors in the data (Chuah et al., 2018).

Numerous studies explored resource misallocation around the globe following the estimation approach by Hsieh and Klenow (2009). These include the study by Busso, Madrigal, and Pagés (2013) for Latin American countries, the paper by Nguyen, Taskin, and Yilmaz (2016) for Turkey, and the study by Cirera, Jaef, and Maemir (2017) for African countries. Bartelsman, Haltiwanger, and Scarpetta (2013) use firm-level data for five industrial economies and three transition economies of Central and Eastern Europe. They developed a model of heterogeneous firms to explain the variation in misallocation across countries by adjustment distortions that in turn lead to aggregate productivity performance differences. They found a significant variation in the within-industry misallocation across countries, which allocation is measured by the covariance between size and productivity. A similar study by Asker, Collard-Wexler, and De Loecker (2014), explores the adjustment costs associated with dynamic production inputs and to what extent they lead to capital misallocation within industries and countries. They found that a considerable proportion of the variation in the dispersion of the MRPK across countries and industries is explained by the volatility in productivity. Other studies also explored the extent of misallocation, but their analysis is limited to developed countries, and there is no evidence so far from a systemic analysis in the economies of the MENA region. Furthermore, we can argue that the distortions and frictions in developing economies and the countries of the MENA region can be potentially significantly larger. For example, Restuccia and Rogerson (2008) found that misallocation can have larger effects on productivity if high-productivity producers face systematic constraints.

Several studies have also marked the importance and the role of the credit constraints in creating distortions resulting in capital misallocation across firms (Caballero, Hoshi & Kashyap, 2008; Caggese & Cunat, 2013; Brandt, Tombe & Zhu, 2013; Midrigan & Xu, 2014; Gopinath, Kalemli-Ozcan, Karabarbounis & Villegas-Sanchez, 2015).

This obstacle is a factor explored in this study, including corruption, electricity supply, tax rates, and political instability. Hsieh, Hurst, Jones, and Klenow (2013) argue that a misallocation of labor in the US since 1960 is observed from reducing race and gender discrimination. Furthermore, labor misallocation can result from policies that affect the size of firm distribution (Guner, Ventura & Xu, 2008).

If misallocation explains the TFP differences across firms and countries, then the reallocation of production is a key driver of gains in productivity. Thus, we will additionally explore the distortions driven by institutional obstacles. The analysis is also based on Oberfield's (2013) framework, which explored the Chilean crisis's impact in 1982.

3. Methodology

This section describes the quantification of the misallocation effect on *TFP*, using the accounting framework proposed by Hsieh and Klenow (2009), and hereafter, we call it the HK model. We assume that output Y is produced using a Cobb-Douglas production technology in each country.

$$Y = \prod_{s=1}^{s} Y_s^{\theta_s} \tag{1}$$

where θs is the value-added of sector s and

$$\sum_{s=1}^{s} \theta_s = 1 \tag{2}$$

The total final output in the economy Y, is a Dixit-Stiglitz aggregator of the output produced by each sector Y. The sector's output Y_s is the aggregate individual firms' output Y_{si} using the Constant Elasticity of Substitution (CES) technology as:

$$Y_s = \left(\sum_{i=1}^{M_s} Y_{si}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \tag{3}$$

where σ denotes the elasticity of substitution between varieties and Y_s is the differentiated product by firm i in sector s. We assume the standard Cobb-Douglas production function for the production of each firm

$$Y_{si} = A_{si}\, L_{si}^{1\text{-}a_s}\, K_{si}^{a_s} \quad 4)$$

A indicates the specific productivity of firm i in sector s; L and K denote the firm's labor and capital and the industry-specific capital share, respectively. We should notice that we consider firms in the same defined sector expressed by this framework's 4-digit International Standard Industrial Classification (ISIC). Following Hsieh and Klenow (2009) and other studies (León-Ledesma, 2016; Cirera et al., 2017; Chuah et al., 2018), the firm maximizes the profit as:

$$\pi_{si} = \max_{K,L} \left[(1-\tau_{Ysi}) P_{si} Y_{si} - w_{si} L_{si} - (1-\tau_{Ksi}) R K_{si} \right] \tag{5}$$

Where P_{si} Y_{si} is the firm's value-added, calculated as the firm's sales revenue minus the cost of intermediate inputs and w_{si}, and R are respectively the cost of one unit of labor and capital. We should notice that there are two distortions affecting firms. One that impacts the firm output τ_{Ysi} and the second that affects the relative factor inputs τ_{Ksi}. Since it is impossible to identify separately and disentangle the distortion effects on capital and labor, earlier studies suggest imposing the distortion on capital, which, in this case, we interpret the distortion that affects the relative price of labor and capital. As we assume that these distortions are firm-specific and, due to heterogeneity, will not affect all the firms in the same way, creating differences in the capital-labor ratios among the firms is a good approach to measure and investigate the misallocation. τ_{Ksi} denotes the firm-specific capital distortion that increases the cost of capital relative to labor, implying a large (small) value of τ_{Ksi} increases the cost of capital (labor) relative to labor (capital). Some factors potentially cause distortions, such as the labor market and trade regulations, credit and finance market imperfection, and these distortions differ across the firms, expressed by τ_{Ysi}. Following Hsieh and Klenow (2009), we differentiate for two productivity measures; the TFPQ, which captures the "physical productivity," and the TFPR, which captures the "revenue productivity".

$$TFPQ_{si} = \frac{Y_{si}}{L_{si}^{1-a} K_{si}^{a}} \tag{6}$$

$$TFPR_{si} = \frac{P_{si} Y_{si}}{L_{si}^{1-a} K_{si}^{a}} \tag{7}$$

Relations (6)-(7) show us that TFPR should not vary across firms within each sector in the absence of distortions. This means that more labor and capital should be allocated to the firms with higher TFPQ up to a point their higher output results in a lower price expressed by P_{si}, also equalizing the TFPR across the firms. Thus, any dispersions of TFPR imply distortion within the sector, and firms whose TFPR is higher than the sector averages will face the effects of distortions. On the other hand, we would expect TFPR to vary because the productivity levels vary across firms. Using the revenue data, we can re-write the $TFPQ_{si}$ as:

$$TFPQ_{si} = A_{si} = \frac{\left(P_{si} Y_{si}\right)^{\frac{\sigma}{\sigma-1}}}{\left(wL_{si}\right)^{1-a_s} K_{si}^{a_s}} \tag{8}$$

Taking the first-order condition for the profit maximization, we have:

$$MRPK_{si} = \frac{R(1+\tau_{Ksi})}{(1-\tau_{ysi})} \tag{9}$$

$$MRPL_{si} = \frac{w_{si}}{(1-\tau_{ysi})} \tag{10}$$

Substitution of (9)-(10) in the production function, we find the optimal price for each variety, a markup over marginal costs.

$$P_{si} = \frac{\sigma}{\sigma-1}\left(\frac{R}{a_s}\right)^{a_s}\left(\frac{w}{1-a_s}\right)^{1-a_s}\left(\frac{1+\tau_{Ksi}}{A_{si}(1+\tau_{ysi})}\right)^{1-a_s} \tag{11}$$

We observe that in the absence of distortions, the firm's relative shares of output and labor would be only a function of A_i; however, the pricing rule (11) shows that the output quantity produced and the labor quantity demanded are proportional to their individual TFPs and the distortions they face. The output and capital wedges that measure distortions are defined by (12) and (13).

$$1-\tau_{Ysi} = \frac{\sigma}{\sigma-1} \frac{w_{si} L_{si}}{(1-a_s) P_{si} Y_{si}} \tag{12}$$

$$1+\tau_{Ksi} = \frac{a_s}{1-a_s}\frac{w_{si}L_{si}}{RK_{si}} \tag{13}$$

Firm i's labor cost is represented by w_{si}, and $P_{si}\ Y_{si}$ represent, as before, the firm's value-added. Taking equation (13), we define the labor-capital ratio in the less distorted environment as:

$$1+\tau_{Ksi}\frac{1-a_s}{a_s} = \frac{w_{si}L_{si}}{RK_{si}} \tag{14}$$

Relation (14) tells us that if firm i's actual labor-capital ratio is higher than the less distorted labor-capital ratio, this implies that firm i is probably facing constraints in access to capital relative to hiring labor. Therefore, that firm uses less capital than the optimal one, indicated by a positive capital wedge. Following Hsieh and Klenow (2009), we assume that without distortions, $TFPR_{si}$ is proportional to the product of the marginal revenue product of capital and labor as:

$$TFPR_{si} \propto \left(MRPK_{si}\right)^{a_s}\left(MRPL_{si}\right)^{1-a_s} \tag{15}$$

We re-write (15) considering the previous relations, and we have:

$$TFPR_{si} = \frac{\sigma}{\sigma-1}\left(\frac{R}{a_s}\right)^{a_s}\left(\frac{w}{1-a_s}\right)^{1-a_s}\frac{(1+\tau_{Ksi})^{a_s}}{1-\tau_{Ysi}} \tag{16}$$

According to (16), in the absence of distortions, where the output and capital wedges are zero (τ_{Ksi}=0 and τ_{Ysi}=0), *TFPR* will be the same for all the firms within a sector. Using (16), when a firm presents a higher τ_{Ksi} and/or higher τ_{Ysi} then it will also have a higher *TFPR*.

The industry level $\overline{TFPR}$ is:

$$\overline{TFPR} = \left(\frac{\sigma}{\sigma-1}\frac{R}{a_s\sum_{i=1}^{M_s}\left(\frac{1-\tau_{Ysi}}{1+\tau_{Ksi}}\right)\left(\frac{P_{si}Y_{si}}{P_sY_s}\right)}\right)^{a_s}\left(\frac{w}{1-a_s\sum_{i=1}^{M_s}\left(1-\tau_{Ysi}\right)\left(\frac{P_{si}Y_{si}}{P_sY_s}\right)}\right)^{1-a_s}$$

(17)

In the absence of distortions, where the capital and output wedges are zero, the right hand of (17) will be equal with the left hand, which means that $TFPR_s$ is equalized for all firms i. This implies that aggregate *TFP* is maximized when there are no distortions in $TFPR_i$

and this gives us the optimal level of *TFP* in the absence of distortions. The estimation of the firms' physical productivity, defined by $TFPQ_{si}$, based on the CES technology aggregator was presented in (8): The efficient industry's productivity level, where all the marginal products are equalized, is:

$$\overline{A_s} = \left(\sum_{i=1}^{M_s} A_{si}^{\sigma-1}\right)^{\frac{1}{\sigma-1}} \tag{18}$$

From equations (8), (16)-(18), we can calculate the ratio of the actual TFP in the economy to the efficient level of TFP as:

$$\frac{Y}{Y^*} = \prod_{s=1}^{S}\left[\sum_{i=1}^{M_s}\left[\frac{A_{si}}{\overline{A_s}}\frac{\overline{TFPR_s}}{TFPR_{si}}\right]^{\sigma-1}\right]^{\frac{\theta_s}{\sigma-1}} \tag{19}$$

Where Y^* denotes the efficient output and θ_s is defined as before. One crucial parameter is the σ which denotes the elasticity of substitution across firms within the sectors, and the choice of its value is important for estimating the allocation efficiency. Following Hsieh and Klenow (2009) and other studies (Oberfield, 2013; Cirera et al., 2017), we choose the elasticity of substitution, σ=3 which is taken from US firms. The justification of using this value relies on the assumption that US firms operate in an environment of minimal distortions. Even though it may not be so realistic, we argue that in countries such as Turkey and Egypt explored in this study, obstacles in state-business relations are common, including corruption, political instability, and access to finance and credit. We should notice that we followed the approach by Cirera et al. (2017), who tested the results using a value of σ=5, as also wried with values equal at 2 and 4 and our results remain very similar, but we do not present them. Also, we should notice that the Cobb-Douglas we assume is not innocuous, if the elasticity of substitution between labor and capital is different from one, then the dispersion of the MPK and thus the gains from reallocation can substantially change (León-Ledesma, McAdam & Willman, 2010; León-Ledesma, 2016). Following Oberfield (2013) and Hsieh and Klenow (2009), we measure the total misallocation as the ratio between the output level one would observe if the production factors were efficiently allocated and the actual aggregate production.

$$M = \frac{Y^*}{Y} = \prod_{s=1}^{S} \left(\frac{Y_s^*}{Y_s} \right)^{\theta_s} \tag{20}$$

The measure (20) can be separated into two parts. The first one measures the within-industry misallocation and is derived by taking the ratio between the maximum output achieved by production factors' allocation across firms within each industry $Y^{*,w}$, and the actual production. The second measure is the between-industry misallocation and is defined as the ratio between the output Y^* and $Y^{*,w}$. The within-industry and between-industry measures of allocation efficiency are presented by (21) and (22).

$$M_W = \frac{Y}{Y^*} \tag{21}$$

$$M_B = \frac{Y^*}{Y^{**}} \tag{22}$$

where Y^* and $Y^{**}$are defined respectively as the total quantity of capital and labor within the industry and across the economy (Hsieh & Klenow, 2009; Oberfield, 2013). In (21), MW measures the contribution of the within-industry allocation efficiency to the aggregate output and is based on the study by Oberfield (2013). In particular, when this measure reaches 1, the capital and labor are optimally allocated across the firms within each industry. Relation (22) shows the additional contribution to the output of the allocation efficiency between industries between-industry similarly, so we consider the total output of firms in each industry. The general regression applied has the following form:

$$Y_{s,j,t} = \beta_0 + \beta_1 \mathbf{SBR}_{s,j,t} + \beta' \mathbf{X}_{s,j,t} + \mu_s + l_j + \theta_t + \varepsilon_{s,j,t} \tag{23}$$

Y denotes the outcomes of interest, which is the standard deviation of output and capital wedges defined respectively as $SD(\log(\tau_y))$ and $SD(\log(\tau_k))$, and the within and between industry misallocation indices expressed by (22)-(23). The regression is estimated at industry s, district-governorate j, and time t. The **SBRs** are the main variable of interest, which denotes the severity of obstacles in certain responses, such as tax rates, political instability, and access to finance. **X** is a vector of standard control variables reported in Table 1. Set μk controls for fixed-industry effects, set lj denotes the district-governorate fixed effects, and θt is the time-fixed effects.

About the SBRs, we aim to explore the most critical obstacles and not all the possible constraints. Table 2 reports the proportions of how respondents evaluate the obstacles and which ones are the biggest obstacles for the establishment's operation. A possible way of exploring the impact of SBBs would be their inclusion in one regression. Nevertheless, we avoid following this approach for the main reason of multicollinearity, which leads to biased estimates, and we will not disentangle separately their effects. Another choice would be to investigate the relationship between the outcomes of interest and the aggregate SBRs, creating an index using non-parametric analysis, such as principal components analysis.

Table 1: Variables and Descriptions

Panel A: Main outcomes and independent variables			
Variable	**Description**	**Variable**	**Description**
Misallocation efficiency measures	The outcomes refer to the variable described in the methodology section, including the standard deviation of capital and output wedge and the within-industry and between-industry misallocation efficiency measures.	Foreign ownership	A dummy taking value 1 if a firm has at least 10% foreign ownership
Log(Size)	the logarithm of a total number of full-time permanent employment in year *t*.	Exporter	A dummy taking value 1 if firm exports at least 10% of its annual sales
Log(Age)	the logarithm of the number of years that the firm has been in operation	Legal status	A categorical variable indicating the legal status of the firm 1 for a Shareholding company with shares traded; 2 for a Shareholding company with shares non-traded; 3 for Sole proprietorship; 4 for Partnership and 5 for Limited Partnership
Female ownership	A dummy taking a value of 1 if there is female participation in ownership	Region	Sampling region
Part of a Larger Firm	A dummy taking a value of 1 if the establishment is part of a larger firm?	SBRs	State-Business Relations indicating the obstacle, e.g., of access to finance and credit, electricity, corruption, political instability, tax rates, and others. It takes a value of 1 if the obstacle is major or very severe.
Quality certification	A dummy taking a value of 1 if the establishment has an internationally- recognized quality certification?	ISIC	4-digit International Standard Industrial Classification code that applies to the main operations of the firms and location
Capital	This variable is used to calculate the outcomes of the regression analysis, and this is expressed as the replacement value of assets	Labor	This variable is used to calculate the outcomes of the regression analysis and is expressed as the total labor cost, including wages and salaries.

Panel B: Instrumental Variables			
Variable	**Description**	**Variable**	**Description**
IV1	It is my perception that the responses to the questions regarding opinions and perceptions are", and the possible answers include a) Truthful; b) Somewhat Truthful and c) Not truthful	IV8	Percentage of firms not needing a loan-credit
IV2	"This questionnaire was completed in," and the possible answers include a) One visit in a face-to-face interview with one person; b) One visit in a face-to-face interview with different managers/ staff, and c) Several visits.	IV9	The proportion of working capital financed by external sources
IV3	Percentage of firms paying for security	IV10	Percentage of firms expected to give gifts to public officials (to get things done)
IV4	Percentage of firms that were visited or required to meet with tax officials	IV11	Percentage of firms identifying crime, theft, and disorder as a major constraint
IV5	Number of electrical outages in a typical month	IV12	Percentage of firms expected to give gifts in meetings with tax officials
IV6	Percentage of firms experiencing electrical outages	IV13	Percentage of firms identifying corruption as a major constraint
IV7	Percentage of banks using banks to finance working capital	IV14	Percentage of firms identifying political instability as a major constraint

However, we are interested in the individual evaluation of the most important SBRs and not the overall impact of all obstacles. Thus, establishing an aggregated index measuring the total effect without disentangling its effect is out of the current study scope. For this reason, we limit our analysis to the three major obstacles, while the regressions for the obstacles with very low responses ranging between 0.8-5 show an insignificant coefficient. Table 2 will explore the following obstacles as proxies of the SBRs in Egypt: political instability, access to finance, and electricity. In Panel B, we report the respective proportions for the Turkish firms. We observe that access to finance and political instability are two of the main obstacles similar to the Egyptian firms. However, we will explore two additional SBRs, the tax rates and practices from firms in the informal sector. In Panel C, we conclude that similarly with Egypt and Turkey, the major obstacle in SBRs and business environment is the political instability, followed by electricity and corruption aggregated almost at 68 percent of the 15 obstacles reported in the table.

Regarding the rest of the variables, the two factors that have been mainly explored in earlier studies are firm size and age. Diaz and Sanchez (2008) argue that an inverse relationship between productivity and firm size can be expected due to increased managerial complexity. On the contrary, the large firms have more access to the local, regional, and in some cases in the international market, and they use more advanced technology, so a positive association between productivity and size can also be presented (Lundvall & Battesse, 2000; Biesebroeck, 2005). Along with firm size and age, other studies use similar variables to explore the probability of a firm's exit (Lawless, 2014; Aga & Francis, 2017).

Foreign ownership is also used in previous studies to explore whether the foreign-owned present lower probabilities of risk to exit because of better access to information and market and due to possible favors in terms of the tax treatment or whether they face problems related to lack of knowledge of the local market and culture (Bernard & Sjöholm, 2003; Baldwin & Yan, 2011; Gelübcke & Wagner, 2012; Aga & Francis, 2017). While these studies explore the probabilities of a firm's exit, we still consider that they are related to our empirical analysis because they may impact a firm's performance or affect the resource misallocation due to "special" treatments. In line with this, we also include a dummy indicating the following: exporter, which is defined as if at least 10 percent of the annual sales are exported and whether the firm is accredited with international quality certification. Furthermore, we assume that firms that export are more likely to have access to a piece of broader information at the international markets and other advantageous positions that affect their performance.

Another variable of interest is gender ownership and whether at least one of the owners is female. We include this information into our regression analysis, following earlier studies, suggesting that women show a lower risk preference for investing in activities associated with lower risk than their male counterparts (Croson & Gneezy, 2009; Faccio, Marchica, & Mura, 2016). Since the previous literature refers to the risk and a firm's exiting rates, we argue that this variable is also related to productivity and resource misallocation. We also include, as another control variable in our analysis, the legal status of the firm, indicating whether the firm is classified as a partnership, limited partnership and whether it is a shareholding company with shares traded, among others. This can be related to our topic, as the firm's legal status is a possible confounder of SBRs and resource misallocation. For instance, workplaces classified as firms with limited liability present higher growth than firms with different legal structures (Harhoff, Stahl & Woywode, 1998).

Another control variable is the sampling region or the firm's location, defined as district-governorate in Egypt and as a Nomenclature of Territorial Units for Statistics (NUTS) at level 1-region in Turkey. Also, we control for the firm's sector, which is defined as manufacturing or services. These controls intend to capture unobserved heterogeneity and time-invariant conditions at the sector and area-level affecting particular firms. Also, these allow us to capture location characteristics, the quality and skills of the workers available in a certain area, and preferences for the firms' products and services that may affect their performance and productivity.

While the variables included in the regression analysis have been justified, they still can be endogenous. For instance, firm size may affect productivity, but more productive firms may also expand the firm's size. Also, more productive firms may apply for an international quality control certification or increase their sales to exports. First, however, we aim to explore some of the most important factors of productivity and misallocation, which are available in the ES data and have not been examined so far.

In particular, we recognize three primary sources of endogeneity of SBRs, including the self-statement and perception about the obstacles, the omitted variables bias, and reverse causality (Beck, Demirguc-Kunt & Maksimovic, 2005; Carlin, Schaffer, & Seabright, 2006). The major issue is the possible degree of the reverse causality, where the direction of the effect can go from SBRs to productivity or resource misallocation, while on the other hand, firms with higher productivity rates may also over-report the effectiveness of SBRs. Furthermore, the direction and the sign of the bias depending on particular firms, especially large ones that can bribe and have "special" treatment from the government. For this reason, and because we find it difficult to use proper and suitable instruments that can be convincing, we interpret the regression results as plain correlations. Apart from the "subjective" SBRs explored in the study, we could make use of "objective" indicators as to whether the firm has provided a "gift: or an informal payment; however, due to a large proportion of missing values, we obtain a very small sample, and we argue that this could probably lead to a selection bias. The World Bank ES and the Global Methodology surveys provide a rich pool of possible candidate instruments for the SBRs.

4. Data

The analysis relies on data derived from the Enterprise Survey provided by the World Bank[1]. The period examined differs between the countries and ranges between 2008-2016. Enterprise surveys cover more than 130,000 firms in 125 countries; however, we aim to explore resource misallocation and employment growth in a selected sample of countries in the MENA region. These surveys cover various topics and include many characteristics of the firm, and they also focus on information that shapes the business environment, including factors that may accommodate constraining firms, and they can play an important role in whether the country will grow and prosper. The World Bank ES allows us to compare firms, sectors, countries, and years. The surveys contain information on subjective and objective

[1] Enterprise Surveys (http://www.enterprisesurveys.org), The World Bank.

factors and characteristics of the business environment. More specifically, the subjective questions we employ here refer to evaluations about the severity of obstacles in the SBRs. The respondents are asked to rank from a list of 15 components about their impact on the business environment, measured on a scale between 1 and 5, where 5 indicates a severe obstacle and value 1 shows no obstacle. Overall, Enterprise Surveys are very useful because they also provide a rich set of variables and other firm characteristics.

We limit our analysis to the global surveys conducted by World Bank to use representative samples. In particular, we use the 2008 and 2013 cross-section surveys in Turkey and the respective surveys in Egypt for 2013 and 2016, while for Yemen, we use the panel survey in the years 2010 and 2013. While for Yemen we have full-panel data, for Turkey and Egypt, following the strategy of previous studies, we use the full cross-section surveys, including panel and non-panel components. This approach allows us to compare the trends across the economies explored (Aga, Francis & Meza, 2015; Aga and & Francis, 2017). Furthermore, we account for sampling weight in both descriptive statistics and regression analysis following these studies. The strata for the ES is based on the firm size, business sector and geographical location-region within a country. We consider the replacement costs of machinery and equipment, which corresponds to the market value of the capital. To prevent the effects of extreme values in the capital, we trimmed the upper and lower 1 percent of the sample.

Table 3 reports the summary statistics using sampling weights for the main control variables. The main purpose of table 3 is to highlight the similarities and differences across the firms between the three economies explored. For example, regarding firm size and age, we observe that the averages are very close to all economies, where the average number of employees is 115, and the average age is 21 in Egypt, 138 employees and 24 years in Turkey, while the respective value in Yemen are 17 and 19. Thus, while the average age is similar across countries, Yemen's average firm size is significantly lower.

There are significant differences among the countries explored rearding the rest of the variables. In particular, while female ownership in Egypt and Yemen is only 6.8 percent, the percentage in Turkey reaches 30 percent. This shows that female entrepreneurship is more common in Turkey, while women in Egypt and Yemen have fewer opportunities to establish or participate in business activities. Thus, it would be helpful to explore whether female ownership has a significant relationship with resource misallocation, besides its possible endogeneity, as it may shed helpful insights about the labor force and ownership structure and the potential gender role in economic growth. Furthermore, the 6 and 4.3 percent of the Egyptian and Turkish firms in our sample are classified as foreign ownership, according to the definition of table 1, while the respective percentage in Yemen is only 1.3. Regarding the international quality certification, only 4.4 and 10 per cent of the sample has been accredited with a relevant certification respectively in Yemen and Egypt compared with the 31.5 per cent in Turkey. Also, significant differences are observed in the firms defined as exporters, consisting only of 4.9 in Yemen and 7.6 percent in Egypt compared to 20 percent in Turkey. These statistics illustrate the openness of the firms which is significantly higher in Turkey. Thus, exploring the relationship among those variables and the outcomes used in the empirical work is worthwhile beyond their possible endogeneity.

Table 3: Descriptive Statistics for the Control Variables

	Panel A: Egypt						
Variable	**Average**	**Linearized Standard Error**	**No. Observations**	**Variable**	**Average**	**Standard Deviation**	**No. Observations**
Log of Firm Size	2.740	0.0356		Quality certification	0.104	0.0115	
Log of Firm Age	2.503	0.0358		Foreign ownership	6.098	0.6567	
Female ownership	0.068	0.0107		Exporter	7.600	1.0171	
Part of Larger Firm	0.190	0.0149					
	Panel B: Turkey						
Variable	**Average**	**Linearized Standard Error**		**Variable**	**Average**	**Standard Deviation**	
Log of Firm Size	2.859	0.0545		Quality certification	0.316	0.0330	
Log of Firm Age	2.551	0.0485		Foreign ownership (%)	4.365	0.4913	
Female ownership	0.301	0.0327		Exporter (%)	20.337	2.2640	
Part of Larger Firm	0.087	0.0115					
	Panel C: Yemen						
Variable	**Average**	**Linearized Standard Error**		**Variable**	**Average**	**Linearized Standard Error**	
Log of Firm Size	2.190	0.0471		Quality certification	0.0440	0.0096	
Log of Firm Age	2.424	0.0500		Foreign ownership (%)	1.2677	0.4809	

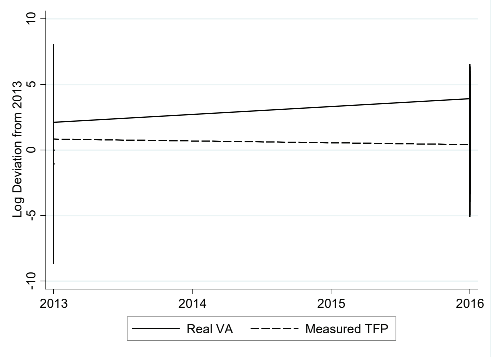
Female ownership	0.0667	0.0141	Exporter (%)	4.8923	2.8286
Part of Larger Firm	0.3580	0.0402			

5. Empirical Results

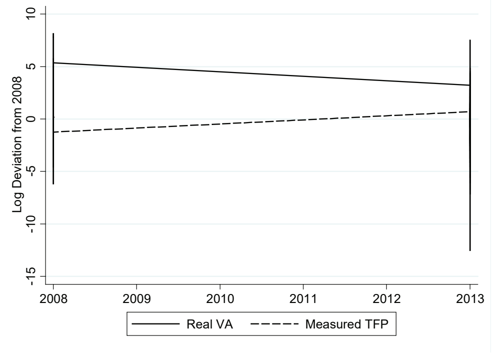
In figure 1, we present the log deviation of the aggregate production value-added and the TFP in the three countries we explore. The deviation is based on the first year of the sample period for each country which varies; for Egypt is 2013, for Turkey is 2008, and for Yemen is 2010. In figure 2, we present the log deviation of capital and labor from the base year of every country as in figure 1. The value-added is defined as before, while the measured TFP is based on the Cobb-Douglas estimates using the Levinsohn -Petrin (LP) method. The common characteristic among the economies explored is that the real value-added is higher than the measured TFP, except for Yemen, but both measures present a significant reduction between 2010-2013. On the contrary, the value-added was slightly increased in Egypt, while the measured TFP remained stable. In Turkey, we observe an inverse situation wherein the value-added decreases and the measured TFP increases.

A similar situation is observed in figure 2, where we show the log deviations of the capital and labor, which reflects the movements in figure 1. In particular, in Egypt, both employment and capital presented a slight increase, while in Yemen, a significant drop in both factors of production is recorded. On the contrary, an increase in capital is observed in Turkish firms, while the employment remained stable similar to the case of Egypt.

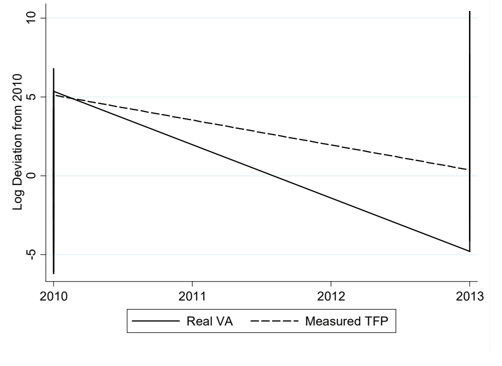
Figure 1. Aggregate Production Value-Added TFP and capital-labor



(a) Egypt

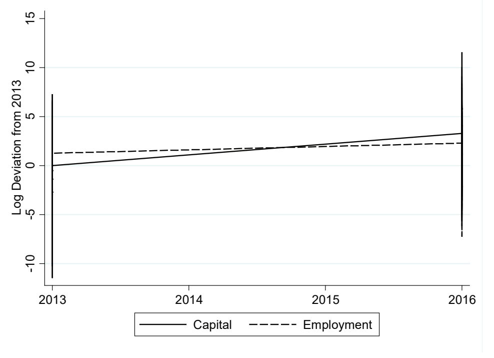


(b) Turkey

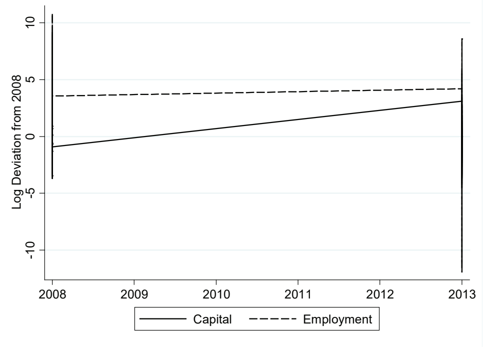


(c) Yemen

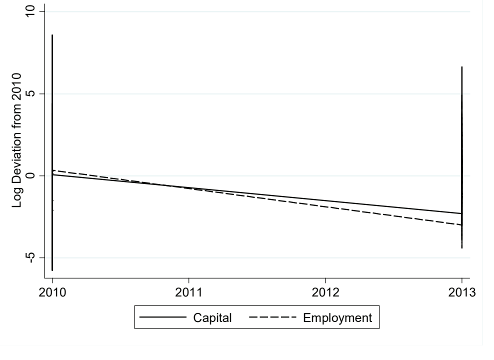
Figure 2. Aggregate Production Capital and Labor



(a) Egypt



(b) Turkey



(c) Yemen

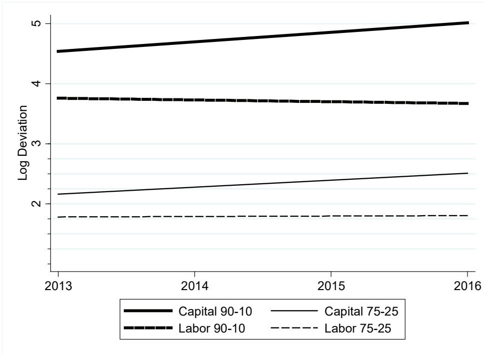
Following the methodology by Hsieh and Klenow (2009) and Oberfield (2013), we then estimate and present the dispersion of labor and capital wedges, the scale wedges, and within-industry and between-industry allocation efficiency. Even though Oberfield's study aims to explore the impact of the Chilean crisis in 1982, we aim to show the resource misallocation since the starting point of the surveys. Figure 3 shows that a measure of the dispersion of capital and labor for each year is expressed by the log deviations between the 90th and 10th percentiles and between the 75th and 25th percentiles of the respective distribution among the firms. According to the methodology described in the previous section, the capital and labor wedges for firm *i* are defined respectively as:

$$CW = \frac{P_i Y_i / K_i}{P_i^* Y_i^* / K_i^*} \tag{24}$$

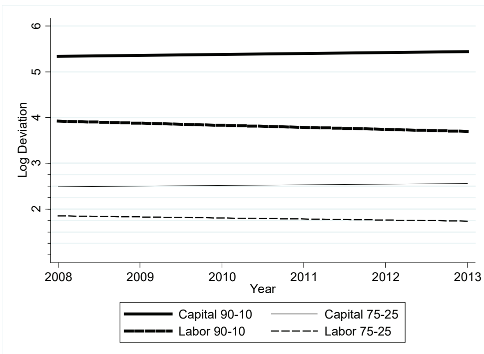
$$CL = \frac{P_i Y_i / L_i}{P_i^* Y_i^* / L_i^*} \tag{25}$$

where the asterisk in (24)-(25), denotes the labor, capital and value-added in the efficient allocation. The solid lines show the capital wedges and the dash lines represent the labor wedges.

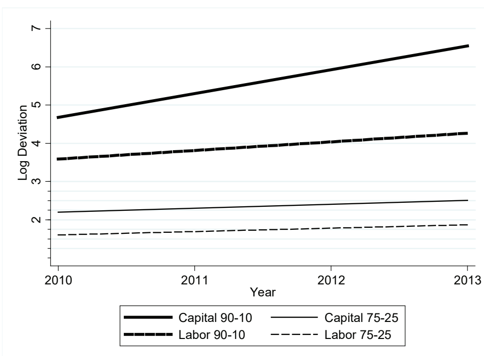
Figure 3. Dispersion of capital and labor wedges



(a) Egypt



(b) Turkey



(c) Yemen

In Egypt, we observe a small increase in both capital dispersion measures and stability in the labor wedges across the time explored. In Yemen, we observe a similar situation, but a significantly larger increase in capital and labor with a 90-10 ratio is illustrated. In Turkey, the situation is slightly different, as both capital and labor wedges ratios remained rather stable across the period 2008-2013, except from labor wedge and the ratio 90-10 which marked a slight decrease in 2013. Overall, we see that the allocation efficiency is not improved, as in some cases there were slight increases in the wedges.

In figure 4 we present the scale wedges for different years in each country depending on the data and year the surveys were conducted and we show how these scale wedges vary with firm size and how this is changed across time. In all cases, the graphs are based on the quantiles of the first year presented on the graph. The scale wedge for firm *i* and considering again the efficient allocation of $\boldsymbol{K}^*$, $\boldsymbol{L}^*$ and $\boldsymbol{Y}^*$ it will be:

$$SW = \frac{P_i Y_i / (K_i^{a_i} L_i^{1-a_i})}{P_i^* Y^*_i / K^{*a_i}_i L^{*1-a_i}_i} \tag{26}$$

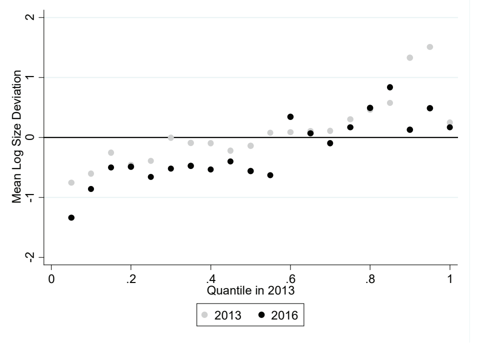
In Panel (a) of figure 4, we present the scale wedge for Egypt in 2013 and 2016, in panel (b), we show the case of Turkey for the years 2008 and 2013, and in panel (c), we illustrate the scale wedges for Yemen in period 2010-2013. We have divided the firms into groups of 20. In all cases, we observe that larger firms, on average,, have higher scale wedges indicating that firm size is negatively associated with the allocation efficiency. Furthermore, small firms also present a high mean log of the standard deviation of scale wedges in the sample of the firms in Egypt and Turkey, while in Yemen small firms seem to present higher allocation efficiency up to a quantile of 0.6. Also, we observe that the medium-sized firms in Turkey and Egypt also present lower-scale wedges between the 0.4-0.6 quantiles. Thus, we conclude that the efficiency is maximized up to some level of size, and then it drops. So, another argument for considering the quadratic terms of firm size in the regressions analysis is to capture the behavior illustrated in figure 4. The same also applies to firm age, where we will test a quadratic relationship with efficiency.

Even though the findings so far provide a minor role of the within-industry misallocation in specific periods and especially after 2007, which may be associated with the global economic recession of 2007-2008, we turn our analysis to the structural decomposition. In figure 5, we present the allocation efficiency, specifically the efficiency within and between industries, and consider both within and between industries. There are three lines in each graph and country; the solid line shows the between-industry efficiency, the dashed line shows the within-industry efficiency, and the dotted line shows both within and between-industry. The within-industry is the actual output divided by the output that could be attained if the resources within each industry were optimally allocated. Similarly, the between-industry line shows the output ratio that could be attained if the resources were optimally allocated within each industry and across all the plants, respectively. Finally, the third line (both within and between-industry) shows the actual output divided by the output that could be achieved if the resources were optimally allocated across the firms.

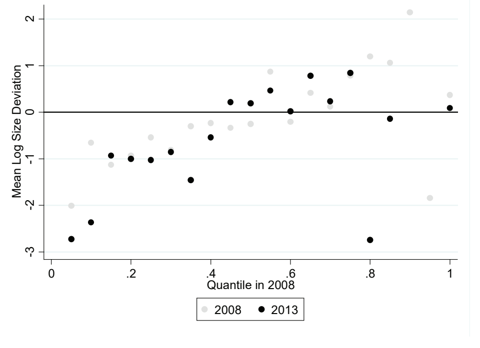
In all cases, the output is away from the efficient optimum. Remarkably, the allocation efficiency based on all three measures is higher in Egypt, where the average value of *MW* and *MB* is respectively 0.3033 and 0.5095, over the period we examine, while the respective values in Turkey are 0.1694 and 0.3579 according to table 4. However, we should notice two factors that show the Turkish economy presented a higher growth of allocation efficiency. First, the *MW* value remained almost stable in Egypt between 2013 and 2016, while the respective value in Turkey was almost doubled. The same applies to the between-industry measure *MB*, while the allocation efficiency within and between industries increased significantly from 0.0037 to 0.1351. These results, along with the illustrations in figure 5, show that the allocation efficiency was relatively higher in Turkish firms than in Egyptian workplaces. Second and equally important is the period we examine. While in Turkey, we use the period 2008 and 2013, according to the data available, the period we employ in the case of Egypt is 2013 and 2016. More specifically, we use 2008 as the first year of our analysis in Turkish firms, which was precisely the year of the great recession, and this had a massive impact on the economies around the globe, including Turkey.

Furthermore, as we have also shown in the descriptive statistics, the Turkish firms are more "open" as they are more likely to be a part of another firm, to export more and more likely to have foreign ownership. This indicates that the Turkish firms could be more exposed to the effects of the great recession of 2007-2008, and it took at least a couple of years for the countries to recover from the economic shocks. Also, we do not include in our analysis the year 2016, as we do in Egypt, which does not allow for a robust comparative analysis. However, we observe that all the measures remained stable during this period, and there was no significant change. The within-industry allocation efficiency presented a slight increase, while the between-industry was slightly decreased.

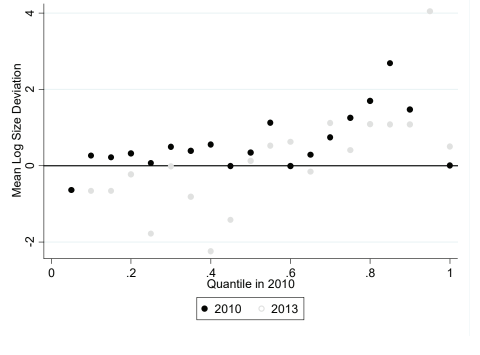
Figure 4. Scale wedges



(a) Egypt



(b) Turkey

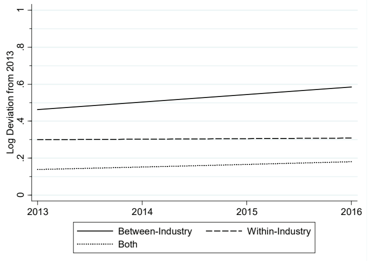


(c) Yemen

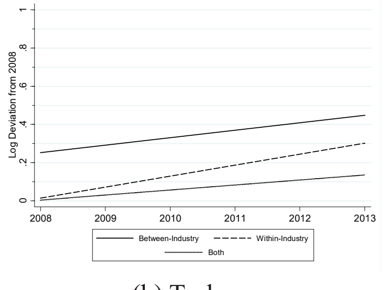
Table 4: Average Values of Within-Industry and Between-Industry Allocation Efficiency Measures

	MW	MB	Mboth
Egypt 2013-2016	0.3033	0.5095	0.1548
Egypt 2013	0.3000	0.4623	0.1387
Egypt 2016	0.3087	0.5848	0.1805
Turkey 2008-2013	0.1694	0.4397	0.0745
Turkey 2008	0.0148	0.2513	0.0037
Turkey 2013	0.3018	0.4447	0.1351
Yemen 2010-2013	0.2048	0.0751	0.0154
Yemen 2010	0.1973	0.0932	0.0184
Yemen 2013	0.2149	0.0535	0.0115

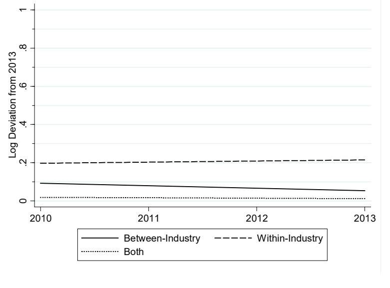
Figure 5. Allocation Efficiency Within-Industry and Between-Industry



(a) Egypt



(b) Turkey



(c) Yemen

Tables 5-7 report the regression results in the economies we explore. As we mentioned earlier, we examine only the significant constraints in SBRs, presented in table 2. In table 5, we report the results for Egypt considering the obstacles in access to finance, political instability, and electricity, where the main factor of interest takes the value 1 if the obstacle in a certain SBR characteristic is severe or major. In the first two columns, the dependent variables of main interest include the dispersion on output and capital, measured as the standard deviation of their logarithmic values. In contrast, in columns (3)-(4), we estimate the regressions for the within-industry (MW) and the between-industry (MB) allocation efficiency measures.

Table 5: Resource Misallocation Regressions in Egypt

Panel A: SBR Access to Finance	**OLS**				**2SLS**			
Coefficients	**DV: SD(log (τy))**	**DV: SD(log (τk))**	**DV: MW**	**DV: MB**	**DV: SD(log (τy))**	**DV: SD(log (τk))**	**DV: MW**	**DV:MB**
Access to Finance	0.0122 (0.0091)	0.0103* (0.0057)	-0.0007*** (0.0002)	-0.0097*** (0.0029)	0.0276 (0.0223)	0.0215* (0.0121)	-0.0010** (0.0004)	-0.0115** (0.0051)
Log of Firm Size	-0.0113 (0.0085)	0.0011 (0.0044)	-0.0010*** (0.0002)	-0.0143*** (0.0037)	-0.0104 (0.0092)	0.0018 (0.0042)	-0.0010*** (0.0002)	-0.0142*** (0.0034)
Log of Firm Size Square			1.4e-0.4*** (3.5e-0.5)	0.0020*** (0.0005)			1.4e-0.4*** (3.2e-0.5)	0.0020*** (0.00046)
Log of Firm Age	0.0130* (0.0076)	0.0140 (0.0123)	0.0016*** (4.6e-0.4)	0.0225*** (0.0065)	0.0144** (0.0068)	0.0127 (0.0115)	0.0018*** (4.2e-0.4)	0.0253*** (0.0060)
Log of Firm Age Square			-2.4e-0.4*** (9.0e-0.5)	-0.0034*** (0.0012)			-2.8e-0.4*** (8.2e-0.5)	-0.0039*** (0.0011)
Female ownership (Yes)	-0.0055 (0.0160)	-0.0528* (0.0277)	0.0006** (0.0003)	0.0084** (0.0040)	-0.0058 (0.0168)	-0.0461** (0.0220)	0.0005** (0.00024)	0.0082** (0.0040)
Part of a Larger Firm (Yes)	0.0173 (0.0316)	-0.0225 (0.0496)	-4.4e-0.4* (2.3e-0.4)	-0.0061 (0.0041)	0.0152 (0.0337)	-0.0221 (0.0267)	-4.8e-0.4* (2.6e-0.4)	-0.0068* (0.0037)
International Certification of Quality (Yes)	-0.0428* (0.0235)	-0.0383 (0.0633)	4.6e-0.4 (3.0e-0.4)	0.0084** (0.0041)	-0.0397* (0.0226)	-0.0409 (0.0577)	4.2e-0.4 (2.7e-0.4)	0.0081** (0.0039)
Foreign ownership	-0.0008** (0.0003)	-0.0004 (0.0003)	3.58e-06 (3.46e-06)	4.5e-05 (5.3e-05)	-0.0009*** (0.0003)	-0.0001 (0.0003)	2.78e-06 (3.46e-06)	3.9e-05 (4.8e-05)
Exporter	3.51e-04 (2.5e-04)	7.0e-04* (3.7e-04)	-1.0e-05*** (3.51e-06)	-1.5e-0.4*** (5e-0.5)	3.7e-04 (2.4e-04)	7.3e-04* (3.7e-04)	-9.75e-06*** (3.42e-06)	-1.3e-0.4*** (4.8e-0.5)
No. observations	2,712	2,720	2,770	2,770	2,558	2,558	2,763	2,763

R-Squared	0.7667	0.8034	0.6965	0.6965	0.4175	0.4487	0.5658	0.5753
Weak Instrument test					10.205 [0.0008]	17.692 [0.000]	72.881 [0.000]	72.173 [0.000]
Hansen Endogeneity Test					12.701 [0.1170]	9.312 [0.2734]	4.095 [0.7688]	5.585 [0.5889]
Panel B: SBR Political Instability								
Political Instability	0.0155 (0.0116)	0.0071* (0.0036)	-5.2e-04** (2.1e-04)	-0.0011* (0.0006)	0.0211 (0.0146)	0.0092* (0.053)	-6.9e-04** (2.8e-04)	-0.0019** (0.0008)
No. observations	2, 714	2,725	2,775	2,775	2,564	2,564	2,761	2,761
R-Squared	0.6941	0.7898	0.6914	0.6914	0.4185	0.3662	0.5594	0.5594
Weak Instrument test					22.216 [0.000]	22.203 [0.000]	28.051 [0.000]	28.331 [0.000]
Hansen Endogeneity Test					12.378 [0.1277]	12.837 [0.1128]	4.125 [0.2483]	2.948 [0.8761]
Panel C: SBR Electricity								
Electricity	0.0398** (0.0192)	0.0306 (0.0196)	-0.0017*** (0.0002)	-0.0176*** (0.0033)	0.0518** (0.0252)	0.0442 (0.0302)	-0.0038*** (0.0009)	-0.0406*** (0.0096)
No. observations	2,754	2,762	2,783	2,783	2,570	2,570	2,782	2,782
R-Squared	0.6975	0.7875	0.7048	0.7048	0.5214	0.4734	0.4869	0.4869
Weak Instrument test					15.127 [0.000]	15.248 [0.000]	38.013 [0.000]	38.013 [0.000]
Hansen Endogeneity Test					12.507 [0.1187]	12.181 [0.1345]	3.047 [0.3844]	3.047 [0.3844]

Standard errors within brackets, p-values within square brackets, ***, ** and * indicate significance at 1%, 5% and 10% level.

Remarkably, political instability presents the lowest adverse effects on allocation efficiency, and the quality of electricity seems to be the major constraint on SBRs. These results may provide public authorities and policymakers valuable insights that frequent and long electrical outages may create significant problems in productivity. Furthermore, large firms may be better equipped and thus better protected against those outages and the poor quality of electricity supply. Even though we saw that increases in firm size are associated with better levels of allocation efficiency, this does not necessarily imply that small firms are not efficient. In particular, large firms can also have better access to finance and public authorities, where small firms may reduce their efficiency because they have no access for various reasons and no support from the government regarding the electricity supply.

Similarly, in Turkey, we observe that the two main obstacles in SBRs are access to finance and political instability, as we have seen in the case of Egypt, while the tax rates are the third major obstacle to the business environment, as we have illustrated in table 2. In particular, obstacles related to access to finance increase the dispersion of output while significantly reducing the allocation efficiency. On the other hand, the effect of the political instability is higher, but the 2SLS estimates are lower, showing that OLS estimates may overestimate the impact of the political instability. The last obstacle explored is the tax rates that reduce *MW* and *MB* allocation efficiency and increase the dispersions on output. In Yemen, we observe that political instability and electricity are also major obstacles to SBRs, with corruption being the third major constraint. We conclude that poor quality on the specific SBRs significantly reduces the allocation efficiency and increases the dispersions on output and capital, except for electricity, whose effect is insignificant. Overall, the adverse effect of corruption on allocation efficiency is the highest, followed by electricity and political instability.

The findings so far are consistent with earlier studies that explored the impact of electricity, financial markets, and political instability on firm performance, such as sales and employment growth, but not on allocation efficiency, as this study attempts to examine. These studies suggest that unreliable supply of electricity, expressed by numerous, frequent and long electrical outages has a significant negative effect on firm growth. For instance, a report published by World Bank in 2008 (World Bank, 2008) shows that unreliable, expensive, and in some cases, unavailable electricity constitutes a major barrier for Kenyan firms. Similarly, the study by Lea and Hanmer (2009) finds that electricity and unreliable power supply is one of the significant constraints in the business environment in Malawi and one of the main barriers to investments in industries with high demand for power. Lemma, Massa, Scott, and te Velde (2016), using a survey of 813 firms in Tanzania, found that unreliable and poor quality of electricity is a major obstacle to firm operations costing firms around 15 percent of their annual sales.

Earlier studies have also highlighted the importance of access to finance and credit to firm growth, where small-medium firms have less access to formal external finance sources than large firms. This is explained by the poor structure of the capital markets, characterizing these economies, but also is due to corruption that commonly large and privileged firms are the favored isolating the small firms that are in more need of financing their operations (Beck & Demirguc-Kunt, 2006). As expected, these obstacles significantly reduce the capability of small-medium firms to have access to finance and capital. The issue becomes even more crucial, especially when these constraints isolate those firms that are more in need, such as the start-ups, which can be productive and become even more productive shortly, but poor SBRs may limit or even stop their potential promising operations.

Political instability is another major constraint on SBRs and thus on allocation efficiency, especially on exporting firms that could be more affected, especially during periods of political turmoil, including the countries we explore in this study (Collier & Duponchel, 2013). Also, smaller firms may tend to perceive political instability as a bigger obstacle to their operations and the business environment than large firms because they have less access to finance and capital markets and fewer resources to survive during periods of turmoil. Furthermore, as we have shown, firm size is related to lower allocation efficiency, but these firms have significantly larger bargaining power relative to small firms to influence policymakers and obtain preferential treatments (Schiffer & Weder, 2001).

Tax rates can also be important to allocation efficiency and a major obstacle to the business environment, especially to small firms having low access to capital and financial markets, and due to these higher rates will be unable to hire high-skilled employees and high-technology capital, reducing this way their productivity. Tax rates can be a critical factor of the firm performance, as tax-related compliance costs will add significantly to the tax burden that firms face, and these can be particularly high for the small-medium enterprises and the young firms (Venkatesh & Slemrod, 2002; Evans, Lignier & Tran-Nam, 2013; Coolidge, 2012). A high tax corporate rate implies a high compliance burden diverting resources from productive activities, such as investments in physical capital and productivity-enhancing innovations, increasing the costs of input factors without creating additional output, or creating a low-quality output and thus, firm productivity and allocation efficiency decline.

Table 6: Resource Misallocation Regressions in Turkey

Panel A: SBR Access to Finance	**OLS**				**2SLS**			
Coefficients	**DV: SD(log (τy))**	**DV: SD(log (τk))**	**DV: MW**	**DV: MB**	**DV: SD(log (τy))**	**DV: SD(log (τk))**	**DV: MW**	**DV: MB**
Access to Finance	0.0078*	0.0067	-0.0195**	-0.0132**	0.0106*	0.0091**	-0.0402**	-0.0337**
	(0.0041)	(0.0049)	(0.0088)	(0.0059)	(0.0059)	(0.0045)	(0.0193)	(0.0154)
Log of Firm Size	0.1949	0.3562*	-0.0010	-0.0007	0.1572	0.3170	-0.0015	-0.0014
	(0.1518)	(0.1869)	(0.0031)	(0.0021)	(0.1291)	(0.2803)	(0.0033)	(0.0022)
Log of Firm Age	0.3163*	0.4015	-0.0118***	-0.008***	-0.2863*	0.3686	-0.0130***	-0.008***
	(0.1729)	(0.3266)	(0.0036)	(0.0024)	(0.1508)	(0.2954)	(0.0043)	(0.0029)

Female ownership (Yes)	-0.4690 (0.4149)	-0.4693 (0.3858)	0.0119** (0.0057)	0.0081** (0.0038)	-0.5002 (0.4414)	-0.5779 (0.5198)	0.0102* (0.0059)	0.0070* (0.0040)
Part of a Larger Firm (Yes)	0.1112 (0.6238)	0.4826 (0.5836)	0.0111 (0.0082)	0.0075 (0.0056)	0.1919 (0.5448)	0.3433 (0.8438)	0.0118 (0.0080)	0.0080 (0.0054)
International Certification of Quality (Yes)	-0.2548* (0.1398)	-0.4204 (0.2695)	0.0021 (0.0058)	0.0014 (0.0039)	-0.2648** (0.1250)	-0.4244 (0.2849)	0.0020 (0.0058)	0.0013 (0.0039)
Foreign ownership	-0.0225** (0.0106)	-0.0468** (0.0215)	1.2e-05 (1.4e-05	8.76e-05 (7.5e-05)	-0.0218** (0.0091)	-0.0503*** (0.0181)	1.6e-05 (1.9e-05	7.91e-05 (7.7e-05)
Exporter	0.0037 (0.0043)	0.0028 (0.0059)	6.2e-05 (5.7e-05)	4.3e-05 (4.3e-05)	0.0033 (0.0047)	0.0032 (0.0075)	6.5e-05 (5.7e-05)	6.4e-05 (4.4e-05)
No. observations	1,513	1,530	2,143	2,143	1,372	1,393	2,095	2,095
R-Squared	0.8785	0.8344	0.7931	0.7931	0.3725	0.3725	0.6079	0.6079
Weak Instrument test					14.456 [0.000]	14.798 [0.000]	10.639 [0.0089]	10.425 [0.0102]
Hansen Endogeneity Test					20.102 [0.0840]	16.060 [0.1389]	14.775 [0.1931]	14.632 [0.1953]
Panel B: SBR Political Instability								
Political Instability	0.0481** (0.0217)	0.0624 (0.0611)	-0.0401*** (0.0078)	-0.0271*** (0.0053)	0.0595** (0.0259)	0.0701 (0.0516)	-0.0365*** (0.0129)	-0.0247*** (0.0097)
No. observations	1,501	1,527	2,138	2,138	1,362	1,387	2,089	2,089
R-Squared	0.8780	0.8320	0.8052	0.8052	0.3661	0.3661	0.6515	0.6515
Weak Instrument test					24.821 [0.000]	27.072 [0.000]	42.819 [0.000]	42.819 [0.000]
Hansen Endogeneity Test					16.701 [0.1752]	15.727 [0.1516]	9.818 [0.5468]	9.818 [0.5468]
Panel C: SBR Tax Rates								
Tax Rates	0.0046* (0.0025)	0.0057 (0.0049)	-0.0197*** (0.0069)	-0.0133*** (0.0046)	0.0069* (0.0037)	0.0081 (0.0075)	-0.0237** (0.0102)	-0.0160** (0.0075)
No. observations	1,495	1,522	2,154	2,154	1,382	1,398	2,133	2,133
R-Squared	0.8783	0.8342	0.7942	0.7942	0.3536	0.3536	0.6328	0.6328
Weak Instrument test					26.266 [0.000]	25.284 [0.000]	11.166 [0.0007]	11.762 [0.0006]
Hansen Endogeneity Test					15.422 [0.1925]	16.631 [0.1393]	8.506 [0.1305]	8.464 [0.2724]

Standard errors within brackets, p-values within square brackets, ***, **, and * indicate significance at 1%, 5%, and 10% levels.

According to the weak instrument test, we fail to accept the null hypothesis in all cases, indicating that the instruments proposed in the analysis are correlated with the main endogenous SBRs variables we explore here. Also, based on the Hansen J test, we accept the null hypothesis of no endogeneity. The exception is the regressions using the obstacles in access to finance as the main SBRs in Turkey, where the null hypothesis is accepted only at the 10 percent significance level.

We report the estimated coefficients using only one SBR obstacle for the remaining factors of resource misallocation because the results remain almost identical when we include the remained obstacles in SBRs. Thus, we decided not to report them as these do not add any extra information. We also included a quadratic term for the firm age and size to capture possible non-linearities, as increases in the firm size may have an inverse effect on the outcome. In other words, it may take the time or a firm needs to reach a certain level of size to improve productivity. On the contrary, it can be the case that older and larger firms become less productive or due to other factors, such as the SBRs are "subsidized" more, while it would not be in the absence of those obstacles, allocating in this way resources from the highly productive firms to the low productive ones. We should notice that in cases where the quadratic term is missing is due to statistical insignificance.

Regarding Egypt, we observe that the firm age is positively correlated to the dispersion on output, while firms with female and foreign ownership, and those with international qualification of quality and those classified as foreign present a negative coefficient. In the second column, we show that female ownership is again positively associated with the dispersion of capital, while the coefficient on the exporting firms becomes significant and positive. Firm size and age present a quadratic relationship with *MW* and *MB*, specifically a U-curve and an inverse U-curve, respectively. In other words, the allocation efficiency is reduced with increases in firm size up to some point, and this turning point is estimated at 36 full-time permanent employees for both *MB* and *MW* measure. Thus, firms with several workers less than 36 are less efficient.

On the contrary, age presents an inverse relationship, where at some point, the efficiency is positive and then is declining at 27 years of operation. Thus, firms operating less than 27 years are more efficient. As before, firms with female owners perform better, but being part of another firm and exporting reduces efficiency.

In Turkey, we observe that firm size is insignificant, while firm age harms allocation efficiency. Firms with at least one female employer present higher allocation efficiency levels, and those with foreign ownership and accredited with an international certification of quality assurance present lower levels of dispersion on capital and output.

In table 7 and the case of Yemen, we observe a linear relationship between firm size and the outcomes of interest, while a quadratic association between firm age and the resource misallocation efficiency measures is noted. In particular, firm size increases the dispersion on output and capital, while age initially reduces the dispersions, but after 22-25 years of operation, the dispersions are increased. Being part of another firm increases the allocation efficiency in terms of the *WM* and *MW* measures and is negatively related to the dispersion of capital. While female ownership was positively contributing to the allocation efficiency in the sample of the Egyptian and Turkish firms, this does not hold in Yemen, at least in our sample, where female ownership is positively correlated with dispersions on capital. However, as we noticed earlier, these variables can be endogenous, and also constraints on female entrepreneurship can be highly likely, as we have seen in table 3. Thus, the more productive firms consisting of female owners can also be highly "taxed" by poor SBRs, increasing allocation efficiency. This will not be further explored because it is out of the current study's main aim, but we suggest future research, especially in the MENA region countries.

However, there are major drawbacks to our analysis. First, the sample of the firms is quite small. Second, the period examined, specifically two waves, are very short. We will investigate the dynamics across firms, industries, and time using a more extended period and a larger sample of firms. Third, another constraint is the non-panel structure of our sample, as we have considered both panel and non-panel components. While the advantage of this approach is that we include the full sample, allowing us to examine broader the resource misallocation across firms and industries using a larger sample, the drawback comes from the fact that we do not follow the same firm across time. We suggest future research investigating the relationship between allocation efficiency and the determinants explored in this study for separate industries, such as construction, manufacturing, transport, health, and education services. Another point of criticism is the production function and the input factors. In particular, we suggest a more flexible function, instead of the Cobb-Douglas, and the inclusion of additional inputs, such as the land and materials. Another point of interest would be to investigate an alternative form of production function and specifically explore the Lucas "span-of-control," which refers to decreasing returns to scale. However, this could be more relevant to the farming business and agriculture industry, while our analysis does not include this sector.

Table 7: Resource Misallocation Regressions in Yemen

Panel A: SBR Corruption	**OLS**				**2SLS**			
Coefficients	**DV: SD(log (τy))**	**DV: SD(log (τk))**	**DV: MW**	**DV: MB**	**DV: SD(log (τy))**	**DV: SD(log (τk))**	**DV: MW**	**DV: MB**
Corruption	0.5777***	0.2364**	-0.0186***	-0.0040***	0.6893***	0.4297***	-0.0280***	-0.0063***
	(0.1802)	(0.0902)	(0.0009)	(0.0006)	(0.1936)	(0.1923)	(0.0034)	(0.0016)
Log of Firm Size	0.6334***	0.3970***	0.0038	0.0002	0.6136**	0.4100**	0.0034	0.0003
	(0.1798)	(0.0939)	(0.0025)	(0.0004)	(0.2869)	(0.1660)	(0.0036)	(0.0004)

Log of Firm Age	-1.9548** (0.9091)	-1.145*** (0.3822)	-0.0369*** (0.0066)	-0.0026*** (0.0004)	-1.9527** (0.9246)	1.336*** (0.3963)	-0.032*** (0.0065)	-0.0025*** (0.0007)
Log of Firm Age Square	0.3131* (0.1887)	0.1810** (0.0696)			0.3145* (0.1657)	0.2254** (0.0893)		
Female ownership (Yes)	0.9795 (0.4442)	0.4216** (0.2185)	0.0058 (0.0174)	0.0040 (0.0121)	0.9742 (0.6444)	0.4222* (0.2337)	0.0174 (0.0134)	0.0039 (0.0044)
Part of a Larger Firm (Yes)	-0.2021 (0.2653)	-0.2453** (0.1197)	0.0624*** (0.0101)	0.0043*** (0.0007)	-0.1935 (0.2289)	-0.3375** (0.1533)	0.0510*** (0.0072	0.0042*** (0.0008)
International Certification of Quality (Yes)	-0.1845 (0.3955)	-0.1030 (0.1589)	0.0050 (0.0179)	-0.0004 (0.0127)	-0.1669 (0.3650)	-0.1496 (0.1852)	0.0096 (0.0155)	-0.0008 (0.0120)
Foreign ownership	-0.0051 (0.0069)	-0.0010 (0.0028)	1.7e-04 (2.0e-04)	1.2e-05 (1.1e-05)	-0.0061 (0.00103)	-0.0082 (0.0035)	1.9e-04 (1.6e-04)	1.8e-05 (1.4e-05)
Exporter	0.0004 (0.0003)	0.0023 (0.0018)	2.8e-05 (2.1e-05)	1.94e-06 (1.4e-05)	0.0006 (0.0005)	0.0029 (0.0021)	2.6e-05 (7.3e-05)	1.89e-06 (8.14e-06)
No. observations	602	628	758	758	612	627	758	758
R-Squared	0.7948	0.8256	0.7798	0.7798	0.6191	0.6203	0.6816	0.6816
Weak Instrument test					5.820 [0.0149]	11.364 [0.0001]	13.011 [0.000]	13.011 [0.000]
Hansen Endogeneity Test					7.083 [0.6420]	10.413 [0.3002]	6.307 [0.6204]	6.307 [0.6204]
Panel B: SBR Political Instability								
Political Instability	0.7714*** (0.1659)	0.2667** (0.1110)	-0.0124** (0.0060)	-0.0029** (0.0011)	0.8774** (0.4261)	0.3384** (0.1351)	-0.0207** (0.0084)	-0.0043** (0.0019)
No. observations	600	624	753	753	587	615	753	753
R-Squared	0.7895	0.8262	0.4564	0.4564	0.6255	0.6528	0.8170	0.8170
Weak Instrument test					12.184 [0.0002]	14.251 [0.000]	13.761 [0.000]	13.761 [0.000]
Hansen Endogeneity Test					6.751 [0.4697]	6.355 [0.4922]	11.901 [0.2917	11.901 [0.2917]
Panel C: SBR Electricity								
Electricity	0.2721 (0.2259)	0.1576 (0.0984)	-0.0135** (0.0062)	-0.0020** (0.0008)	0.3116 (0.2292)	0.2988 [0.2081)	-0.0260** (0.0121)	-0.0073** (0.0015)
No. observations	608	632	766	766	595	617	764	764
R-Squared	0.7816	0.8306	0.4461	0.4461	0.6836	0.7274	0.5642	0.5642
Weak Instrument test					10.182 [0.0045]	15.438 [0.000]	13.899 [0.000]	13.899 [0.000]
Hansen Endogeneity Test					6.294 [0.4957]	7.100 [0.4509]	11.382 [0.3237]	11.382 [0.3237]

Standard errors within brackets, p-values within square brackets, ***, **, and * indicate significance at 1%, 5%, and 10% levels.

6. Conclusions

This study tried to measure the resource misallocation in Egypt, Turkey, and Yemen and evaluate the impact of SBRs on allocation efficiency and other factors. The study is the first to explore the impact of SBRs on allocation efficiency, especially in a sample of MENA region countries and Turkey. Our results have shown that severe and significant obstacles related to specific SBRs expressed by the access to finance, political instability, electricity, corruption, and tax rates are essential to allocation efficiency and resource misallocation. The main findings have policy implications, and they offer useful insights, as policymakers should provide a reliable infrastructure of electricity and give incentives in terms of lower tax rates or favorable tax credits to firms that can be highly productive, such as firms with high-skilled employees and technology, and those using energy-efficient sources. Also, policymakers should first and foremost shield the economy against corruption and destabilizing political events. For example, following the Arab Spring revolution and the latest political events in Turkey, policymakers should reduce political instability and corruption in regions that were the most affected, reducing inequalities in unemployment and wealth, and encourage female entrepreneurship and target to support small-medium and exporting firms.

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