EYD

Ekonomik Yaklaşım Derneği / Association

***Ekonomik Yaklaşım* 2023, 34(129): 331-362**

www.ekonomikyaklasim.org
doi: 10.5455/ey.29001

Informality and Productivity: The Sources of Productivity Differentials between Formal and Informal Firms

Erol TAYMAZ[1]

18 Aralık 2023'de alındı; 30 Aralık 2023'de kabul edildi.
31 Aralık 2023'den beri erişime açıktır.

Received 18 December 2023; accepted 30 December 2023.
Available online since 31 December 2023.

Araştırma Makalesi/Original Article

Abstract

The informal sector constitutes a large share of employment and output in all developing countries. Although the informal sector is regarded by many researchers and policy makers as a source of employment developing countries desperately need, there is ample evidence that documents that informal firms are less productive, employ unskilled labor, and pay lower wages. This study analyzes the sources of productivity difference between informal and formal firms in Turkey. We estimate and compare productivity levels of informal and formal firms by taking into account the endogeneity of the choice between formal and informal operation. Our findings indicate that there is a significant productivity gap between informal and formal firms. More educated and experienced entrepreneurs move to the formal sector, and this process of self-selection contributes to widen the productivity gap between informal and formal firms. Life-cycle and learning theories are also supported by our findings. Even after controlling for all these factors (self-selection, differences in endowments, and learning), the productivity gap does not disappear. The findings

[1] *Middle East Technical University, Department of Economics, Ankara, Turkiye. Email: etaymaz@metu.edu.tr*
http://orcid.org/0000-0001-7525-6674

suggest that there is a substantial untapped potential to increase productivity through formality. However, a large number of informal firms would not survive if they are forced to operate formally.

Keywords: *Informality, informal employment, productivity, self-selection, public policy.*
JEL Codes: *E26, O17, J24, J38.*

Özet

Kayıtdışılık ve Üretkenlik: Kayıtlı ve Kayıt Dışı Firmalar Arasındaki Üretkenlik Farklılıklarının Nedenleri

Kayıt dışı sektör, tüm gelişmekte olan ülkelerde istihdam ve üretimin büyük bir bölümünü oluşturmaktadır. Kayıt dışı sektör araştırmacılar ve politika yapıcılar tarafından gelişmekte olan ülkelerin ihtiyaç duyduğu önemli bir istihdam kaynağı olarak görülse de, kayıt dışı firmaların daha az üretken olduğu, niteliksiz işgücü istihdam ettiği ve düşük ücret ödediği bilinmektedir. Bu çalışmada, Türkiye'deki kayıt dışı ve kayıtlı firmalar arasındaki üretkenlik farkının kaynakları incelenmiştir. Kayıtlı ve kayıt dışı çalışma arasındaki tercihin içselliğini dikkate alarak kayıt dışı ve kayıtlı firmaların üretkenlik düzeylerini belirleyen etkenler tahmin edilmiştir. Bulgularımız, kayıt dışı ve kayıtlı firmalar arasında önemli bir üretkenlik farkı olduğunu göstermektedir. Daha eğitimli ve deneyimli girişimciler kayıtlı sektöre geçmekte ve bu (kendi kendini seçme) süreci kayıt dışı ve kayıtlı firmalar arasındaki üretkenlik farkına yol açmaktadır. Yaşam döngüsü ve öğrenme teorileri de bulgularımız tarafından desteklenmektedir. Bu etkenlerin tamamı (kendi kendini seçme, donanım farklılıkları ve öğrenme) kontrol edildikten sonra bile üretkenlik farkı ortadan kalkmamaktadır. Bulgular, yasal düzenlemeler yoluyle üretkenliğin artırılabileceğini, fakat kayıtlı olarak çalışmak zorunda kalmaları halinde kayıt dışı firmaların önemli bir kısmının hayatta kalamayacağını göstermektedir.

Anahtar Kelimeler: *Kayıtdışılık, kayıtdışı istihdam, verimlilik, kendi kendini seçme, kamu politikası.*
JEL Kodları: *E26, O17, J24, J38.*

Bu makalenin adını ve doi numarasını içeren aşağıdaki metni kolayca kopyalamak için soldaki QR kodunu taratınız.
Scan the QR code to the left to quickly copy the following text containing the title and doi number of this article.

Informality and Productivity: The Sources of Productivity Differentials between Formal and Informal Firms
https://doi.org/10.5455/ey.29001

1. Introduction

The informal sector constitutes a large share of employment and output in all developing countries. Although the informal sector is regarded by many researchers and policy makers as a source of employment developing countries desperately need, there is ample evidence that documents that informal firms are less productive, employ unskilled labor, and pay lower wages. Therefore, there are calls to adopt

policies to reduce the size of the informal economy so as to increase productivity and to achieve sustainable growth. Since the informal economy is a source of substantial employment, the benefits and costs of reducing informality should be carefully analyzed.

This study analyzes the sources of productivity differences between informal and formal firms in Turkey. We use a unique dataset collected through a specific survey on formal and informal firms, and estimate and compare productivity levels of informal and formal firms by using switching regression method to take into account the endogeneity of the choice between formal and informal operation. We assume that entrepreneurs observe their ability and potential costs and benefits of (in)formality, and make a decision based on their observations. Therefore, the outcome (productivity) is not independent of the entry decision, and a comparison between formal and informal firms that does not consider the endogeneity of the entry decision would be erroneous.

The paper is organized as follows. In the second section, we define the concept of "informality", and discuss the (likely) sources of productivity differentials between informal and formal firms. In the third section, we present the data, model, and estimation results. The fourth section presents the findings of a simulation analysis on the effects of enforcing formality. The last section summarizes the main findings of our analyses.

2. Conceptual Framework

2.1. Definition of "informality"

There are a large number of terms and definitions offered for informal-type economic activities. The terms "informal", "shadow", "underground", "uncovered" and "unrecorded" are usually used synonymously. Although these terms refer to different

conceptualizations (for a discussion, see Perry et al., 2007, Chapter 1), they can be categorized in two groups, which are also precisely defined by the International Labor Organization (ILO). The first category emphasizes the dualistic and segmented nature of the labor market, and defines "informality" in terms of the characteristics of enterprises and working conditions. The second category refers to the legal status of the economic activity. An economic activity is defined as "informal" if it is legal but not legally recorded/registered.

In the case of employment, the first category is defined by ILO as "employment in the informal sector" and the second one as "informal employment". "Employment in the informal sector" covers all jobs in informal sector enterprises which are defined as "private unincorporated enterprises (excluding quasi-corporations), i.e. enterprises owned by individuals or households that are not constituted as separate legal entities independently of their owners, and for which no complete accounts are available that would permit a financial separation of the production activities of the enterprise from the other activities of its owner(s)" (for details, see Hussmanns, 2004).

In this study, we prefer to use the term "informal employment" to refer to those employees (wage workers, self-employed and entrepreneurs) who are not registered in any social security organization. The "informal firm" is defined accordingly, as a firm that employs informal employees, and the "informal sector" as the set of informal firms. There are three reasons to choose the restricted definition. First, as Henley et al. (2006) show, definitions of informality based on occupation and firm size seem be "arbitrary in practice even if conceptually well-founded". Second, the availability of data on social security status makes the empirical study feasible. Third, as a comprehensive study on Turkey shows, this is the most widespread form of evading regulatory obligations in Turkey, because "most of the business [in Turkey] are registered, but they partially report business revenue and employment" due to low cost of registering and strong enforcement (see McKinsey Global Institute, 2003: 50).

Finally, as Khamis (2012) shows, legal measures of informality (including social security coverage) are significantly correlated, and, this is also the case in Turkey.

2.2. Informality and the determinants of productivity

There is a substantial number of theoretical and empirical studies that analyze and document the characteristics of informal employment and informal firms. The literature shows almost unequivocally that costly and burdensome labor and product regulations, administrative complexity of taxation, and legal quality are important determinants of informality.[2] In other words, informal firms could avoid a number of costs involved in operating formally (avoiding taxes and social security payments, benefiting from flexible employment and production relations, etc.), but they face with a number of disadvantages and costs as well. The most obvious cost of informality is the (potential) cost of punishment if the firm is detected, and the probability of detection is likely to increase by firm size so that this fact explains why large firms are more likely to operate formally. Moreover, there are additional disadvantages of informality, like the lack of, or the restricted access to, public services (training, fairs, etc.), infrastructure, and public support schemes, limited access to formal credit, lack of legal protection, high transaction costs, etc. These factors may have a detrimental effect on informal firms' performance.

One of the most cited stylized facts associated with informality is the productivity differential between informal and formal firms. Informal firms are less productive than formal firms (see, for example, Dabla-Norris, Gradstein and Inchauste 2008; Allen, Nataraj and Schipper 2018). A comprehensive study on informality shows that the difference in labor productivity between those firms that operate informally and formally is about 30 percent on average for seven Latin American and Caribbean

2 Dabla-Norris, Gradstein and Inchauste (2008) suggest that "the elasticity of informality with respect to the regulation burden is smaller, the better the quality of the legal system is". Therefore the effect of regulatory burden in encouraging informal activity will be weaker in countries with a strong rule of law.

countries (Perry et al., 2007: 173), whereas a recent study finds that the labor productivity of informal firms is about only one-fourth of formal firms (Amin and Okou, 2020)[3]. A study on Turkey finds a similar productivity gap between formal and informal businesses, around 30-40 percent (McKinsey Global Institute, 2003: 65).

Low productivity of informal firms is a policy concern for governments who are frequently advised to reduce the size of the informal economy to sustain economic growth. For example, an OECD study suggests that "overcoming the duality between the formal and informal sectors should be the central point" of any strategy in Turkey, and the government should encourage small and medium-sized firms, by reducing regulatory burden, to move into the formal sector, and to raise productivity through economies of scale (Gönenç et al., 2007: 20; see also Gönenç et al., 2014).

Any policy towards informal sector that aims to raise productivity should be based on a careful analysis on the determinants of productivity among informal and formal firms,[4] because the outcome of the policy is not independent of the factors that generate productivity differential. For example, Amaral and Quintin (2006) suggest that when labor markets are segmented, policies aimed at increasing the share of the formal sector can raise productivity because the value of the marginal product of formal workers is higher than that of informal workers. Thus, subsidizing formal employment can increase national income. However, in the case of competitive labor markets, workers in the informal sector are less productive because they have less education. In such a case, policies that aim at reducing the size of the informal sector are "a poor substitute for investments in education, or investments in the quality of formal institutions (e.g. improving enforcement)". In other words, the policy should

3 Amin and Okuo (2020) find that the labor productivity of formal firms is also declined by 20–24 percent as a result of competition from informal firms. Similarly, Distinguin, Rugemintwari and Tacneng (2016) show that that formal micro and small firms facing competition from informal firms are more likely to be credit constrained.

4 A government could aim at reducing the extent of informality because of tax considerations (to enlarge the tax base), to eliminate the cost disadvantages of formal firms, and to improve working conditions. Although these issues are also very important, we focus our attention on the effects of informality on productivity.

attempt to solve the binding constraint that lowers productivity of informal firms. Otherwise, the policy would be ineffective, or even be counterproductive. The literature on the effects of public policies towards informality is extensive. But, unfortunately, there is no consensus on the best policy options, partly because of the fact that the effects of policies are highly context-dependent.[5] Thus, there is a need to identify the reasons behind the productivity differentials to design policies for reducing informality and alleviating urban poverty.

One of the main factors that may lead to productivity gap between formal and informal firms is the lack of access to markets and services by informal firms (Djankov et al., 2003; Straub, 2005; Perry et al., 2007: 157-158). Informal firms may not benefit from key public goods, and enforcement of property rights and contracts. This could increase their transaction costs due to inefficient contractual relations, i.e., a part of informal firms' resources will be wasted due to inefficient institutional mechanisms in which informal firms are forced to operate. Moreover, they will not be able to benefit from various public support schemes (training of employees and managers, technology diffusion services, etc.) that may improve productivity. Chatterjee, Lebesmuehlbacher and Narayanan (2021) find in the case of India that informal firms are even not able to benefit from public investment, but the output elasticity of public capital is between 0.12 and 0.16 for formal sector firms, because

5 There are a large number of theoretical and empirical studies on the effects of public policies towards informality. For example, strict law enforcement may reduce informal employment, but, it may also decrease average wages, productivity and investment by reducing the firm's access to unregulated labor (Almeida and Carneiro, 2012); an increase in labor tax rate may reduce the share of the informal sector (El Badaoui et al., 2010), or there could be inverted U-type relationship between tax rates and informality (Mitra, 2017); an increase in the labor tax may reduce job creation in the informal sector, but may increase the average quality of the workforce in the formal sector with a positive effect on job creation (Boeri and Garibaldi, 2005); reducing the cost of formalization may increase the size of the informal sector (Dessy and Pallage, 2003); policies improving the education of the labor force may decrease incentives to formalize (Masatlioglu and Rigolini, 2008); a randomized experiment in Benin found that formalization does not increase sales and profits, but the cost of formalization exceeds the tax revenue to be received in 10 years (Benhassine et al., 2018); enforcement is effective in reducing informality but it also reduces welfare, whereas reducing entry costs for formality is not as effective as enforcement, but improves welfare, and leads to higher wages (Ulyssea 2018).

large firms crowd out the output of small (and informal) firms thanks to the complementarities generated by public investment.

The lack of access to credit provided by state-owned or private banks may have a detrimental impact on productivity because of two reasons. First, capital constrained informal firms will scale down their capacity, and operate below the efficient scale of production. Second, high cost of capital or limited outside financing will force informal firms to substitute (low-skill) labor for physical capital (Amaral and Quintin, 2006; Paula and Scheinkman 2011; Raj and Sen 2015). Hence, informal firms are likely to have lower capital intensity and lower labor productivity.[6]

A usual suspect for productivity differentials is the existence of economies of scale. The negative correlation between the extent of informality and firm size is one of the robust stylized facts on informality: informal firms are usually small firms. If economies of scale are relevant, at least among very small firms, then a productivity gap will arise between average informal and formal firms (Perry et al, 1007: 157). In such a case, if informal firms shy away from growth because of fears of detection, eliminating regulatory burden will make it easier for informal small and medium-sized firms to grow, and the average productivity will raise through economies of scale (Gönenç et al., 2007:20). Although the economies of scale argument is frequently adopted by policy makers, there is no robust empirical evidence on the degree of economies of scale. Moreover, even if the production function exhibits economies of scale, any productivity difference between informal and formal firms would disappear once it is conditioned on firm size.

6 If informal firms substitute labor for capital due to relatively higher cost of capital, they would have lower labor productivity than the formal firms do, but the same level of total factor productivity if they operate on the same production function. Our estimation methodology does not assume same technology for formal and informal firms so that the capital constraint could reduce total factor productivity of informal firms.

The discussion on the role of economies of scale implicitly assumes that informal and formal firms adopt the same technology and operate on the same production function. However, because of the differences in the knowledge set available to informal and formal entrepreneurs, and the restrictions they face with, informal and formal firms may indeed use different technologies, i.e., the production function for informal and formal firms could be different, and the differences in underlying production technologies may lead to differences in observed productivity levels.

New firms in developing countries tend to start their life as informal, and if they perform well, they tend to grow and become formal (Levenson and Maloney, 1998). In this framework, that resembles Jovanovic's (1982) model of learning, firms, if they survive, should move from informal to formal as part of their natural evolution. Since young firms at the early stages of their life-cycle have lower productivity on average, there would be a productivity difference between informal and formal firms. However, this difference will disappear if the life-cycle of firm size is controlled for.

Productivity differentials could arise not because of intrinsic characteristics of informal and formal firms, but because of self-selection of more productive (more educated) workers and entrepreneurs into the formal sector. There are a large number of theoretical studies, mainly based on heterogeneous workers and/or firms and matching models, that show that more productive workers go to formal sector jobs, whereas less productive workers select into the informal sector (see, for example, Boeri and Garibaldi, 2005; Albrecht, Navarro and Vroman, 2009; Galiani and Weinschelbaum, 2012; Meghir, Narita and Robin 2015; Herrera-Idarraga et al., 2015).[7] Moreover, García and Badillo (2018) provide evidence on formal job rationing in the labor market created by structural constraints in the Colombian economy. As a result of rationing of formal jobs, there are two types of informal workers: those who do not (or could not) consider any formal employment, and those

7 Herrera-Idarraga et al., (2015) show that informal workers have a lower return to their education, and they also "suffer a second penalty associated with educational mismatches".

who accept informal employment to accumulate human capital until they move to formal employment.

The most talented managers self-select into the formal sector, and that formal managers operate with more physical capital than informal managers in the model developed by Amaral and Quintin (2006). In most of these models, there is a (probabilistic) penalty of detection for informal firms operating informally. The model by Rogers and Swinnerton (2004) is different than others in its assumption on voluntary compliance, i.e., there is no cost for informality. In this model, firms differ in productivity, and more productive firms tend to voluntarily comply with the costly "labor standards" because doing so relieves the labor shortage they face. Once firms have been identified as formal firms, workers will look for jobs with them first. This will increase the average productivity of the workforce, as a greater number of workers will go to the more productive firms. Note that in all those models, there is a productivity differential between informal and formal firms, but it arises because of self-selection of more productive/more educated/more talented workers and/or entrepreneurs into the formal sector.

There is some empirical support for the underlying assumptions of these models. Dimova et al. (2008), and Galiani and Weinschelbaum (2012) find that workers with high levels of education allocate to the formal sector and receive high compensation for their education and experience, whereas less educated workers allocate to the informal sector. The study by McKenzie and Sakho (2010) reveals that "owners of large firms who have managed to stay informal are of higher entrepreneurial ability than formal firm owners, in contrast to the standard view (correct among smaller firms) that informal firm owners are low ability". Paula ve Scheinkman (2011) find evidence in Brazil that support the hypothesis that informal firms are smaller, established by "less able" entrepreneurs, and employ more labor intensive technologies.

The discussion (and the papers analyzed) so far assumes that endowments, and most importantly, educational level as a proxy for human capital is fixed or given. However, the agents (firms and workers) will respond to incentives in investing in human capital, and the extent of informality may have a significant impact on incentives. Perry et al. (2007: 161, 171) suggest that, because of working conditions, informal firms may not attract educated workers, and have less incentive to invest in training and innovation. Thus, the returns to education will be lower in an economy dominated by the informal sector. In a similar framework, Masatlioglu and Rigolini (2008) present a model in which educated and unskilled workers are employed in the formal and informal sectors, respectively. They "show that high costs of education make labor migration and firm's profits in the formal sector an increasing function of its size. Therefore, incentives to reduce informal economic activity increase with the size of the formal economy, and unless the formal sector has reached a 'critical mass' countries remain in a highly informal equilibrium". The model by Amaral and Quintin (2006) assumes endogenous education decision by workers, and the model generates well the stylized facts that formally employed workers tend to be older, have more education, and earn more than informal workers, and employers that comply with regulations tend to be much larger than informal employers.

The literature on skill traps caused by skill-investment or skill-R&D complementarities (see, for example, Snower, 1996; Redding, 1996; Acemoglu, 2001; Burdett and Smith, 2002) emphasizes the importance of high skill-good jobs that pay high wages for economic performance. This literature can be extended to analyze informality where (high skill-high wage) "good jobs" are created by the formal sector, and (low skill-low wage) "bad jobs" by the informal sector.

To summarize, our review suggests that there are four factors that may lead to a productivity gap between informal and formal firms: 1) the lack of access to public services and markets by informal firms, 2) choice of technology and economies of scale, 3) self-selection of more educated/more productive workers/entrepreneurs to

the formal sector, and 4) learning and life-cycle effects. In the subsequent sections, we will analyze the role of these factors in explaining productivity differentials by using firm-level and individual-level data.

3. Informality and Productivity: Firm-Level Evidence for Small Firms

3.1. The data

The lack of data is the main obstacle in comparing productivity differentials between informal and formal firms, because, almost by definition, informal firms do not keep official accounts, and are not willing to provide information on their activities. There is an exceptional study made on Turkey by Şemsa Özar of Bogazici University (2006; OAMDI, 2013). As a part of the Economic Research Forum (ERF) project on "Promoting Competitiveness in Micro and Small Enterprises", Dr. Özar and her team conducted an extensive study on small and medium-sized firms in Turkey, by collecting the data from about 5000 firms employing less than 50 people through field survey.

The study used a national, stratified, multi-stage systematic sampling method to identify firms. In the first stage, 19 provinces were selected from 5 strata defined in terms of socio-economic level. The selection of provinces from each stratum was carried out by weighted probability regarding the number of enterprises in each province. In the second stage, 432 Primary Sampling Units (PSUs) with a minimum of 45 enterprises in urban areas were selected.[8] The PSUs were defined on the basis of the *2000 Census of Buildings* conducted by Turkstat.

The research team identified 9,280 eligible firms for the survey in selected PSUs, and 7,335 of these firms were selected randomly with respect to the proportions by sub-categories of gender, size and location. A total of 5,000 interviews were carried out.

8 During this stage, 100 villages in rural areas were also selected, but the rural enterprises from the sample were excluded before the weighting and extrapolating process.

The study was conducted from June to September 2001 (for details, see Özar, 2006; Özar, Özartan and İrfanoğlu, 2008, OAMDI, 2013).

A very detailed questionnaire with 322 questions was applied in the survey, and information about the entrepreneur, legal status of the enterprise, types of informality, production, employment, financing, etc. were collected. There are three questions about different types of informality: i) if the enterprise registered with the industry or commerce register ("business register"), ii) if the enterprise registered with the tax department (acquired a tax card or a card number), and iii) if the enterprise joined any social insurance scheme.[9] The data show that most of small firms in Turkey are registered. The proportion of registered firms (both business register and tax office) is slightly lower in manufacturing than in services (89 percent vs 96-97 percent).[10] There is not much difference in terms of registering employees with a social security scheme: about one fifth of small firms in the dataset did not register any employee.

Figure 1 shows the Venn diagram for the number of informal firms by three types of informality to visualize overlaps between different types of informality. It is seen that most of the firms who do not register at the business register do not register with the tax office and social security as well. This is an expected outcome, because registering the firm with the commerce register is the first step in establishing a business in Turkey. Firms apply to the tax office, and social security scheme after registration. However, a great majority of firms who did not cover their employees with a social security scheme are registered with the business register *and* the tax department (626 firm in the sample, 112 in manufacturing and 514 in services). These findings show that almost all firms, even very small ones, do register with the business register and the tax office, and uncovered employment is most common type

9 The specific questions are Q84 ("Enterprise registered (industrial or commercial)?"), Q90 ("Registered with tax department (acquired a tax card or a card number)"), and Q93 ("Joined social insurance scheme?). If the response to Q93 is "yes", then a follow-up question is asked (Q96, "Who was covered? (1) entrepreneur, (2) entrepreneur + some workers, (3) entrepreneur + all workers ").
10 Unless otherwise stated, all data presented in this section are derived from the ERF database.

of informality. This is why we prefer to define “informality” and “informal sector” in terms of “informal employment” in our case.

The information on the factors behind informality indicates that those firms that did not register with the business register or the tax office did so because they consider registration as “useless”, but the majority of firms that did not join social security schemes did so because they consider it “expensive” (see Table 1). This finding supports the anecdotal evidence presented in McKinsey Global Institute (2003: 50) that the cost of registering the business in Turkey is low, but small firms do not report their employees to avoid social security payments and taxes.

Figure 2 depicts the kernel density (frequency) functions for informal and formal firms by size. As expected, informal firms have a higher concentration in small size in both manufacturing and services, whereas the distribution of formal firms is skewed with a fat tail towards larger size. The observed size differences between informal and formal firms can be explained by the probability of enforcement (large firms are more likely to be identified and inspected by the authorities), and productivity differentials because small firms are, on average, less productivity and thus has a stronger incentive to operate informality to reduce the cost of compliance.

There is also a strong correlation between entrepreneur’s educational level and the extent of informality. More educated entrepreneurs are more likely to operate formally, due to cultural factors, types of activities conducted, returns to education, etc. (see Table 2). The share of formality is especially very low among those entrepreneurs without any diploma. There are significant differences between informal and formal firms in terms of entrepreneurs’ ages. Young entrepreneurs are more likely to operate informally. Entrepreneur’s gender seems to matter as well. Female entrepreneurs, especially those in manufacturing, tend to have much higher proportion of informality.

3.2. The model

A simple comparison between informal and formal firms in Turkey shows that the stylized facts are valid for the Turkish case. Table 2 presents the data on the mean values of a number of variables for informal and formal firms operating in manufacturing and services. Even if our sample includes only small firms employing less than 50 people, formal firms produce more, achieve higher labor productivity (as measured by value added per employee), and use more capital intensive techniques. Moreover, formal firms employ fewer young people (they have longer tenure), and more permanent workers, especially in manufacturing. Entrepreneurs of formal firms are more educated, older, and have more experience.

Although most of these differences are statistically significant at the 5 percent level, a simple comparison between a group of informal and formal firms would not provide any information why these differences emerge. If, for example, the factors that influence the choice of entry into formal/informal sectors and the characteristics under investigation are correlated, then the observed differences would simply reflect the effect of self-selection process. In order to mitigate the effects of self-selection and to test if there is a productivity gap between informal and formal firms, we use the method of endogenous switching regression.

An endogenous switching regression model for production function is estimated to check if informal and formal firms use the same technology, to test if there are productivity differences, and to understand the factors behind productivity differences, including the role of economies of scale, if any.

The model is defined as

(1) $I_i = 1$ if $\gamma Z_i + u_i \geq 0$

$I_i = 0$ if $\gamma Z_i + u_i < 0$

Formal: $q_{1i} = \beta_1 X_{1i} + \varepsilon_{1i}$ if $I_i = 1$

Informal: $q_{0i} = \beta_0 X_{0i} + \varepsilon_{0i}$ if $I_i = 0$

where I_i denotes the informality status of the i^{th} firm (1 for formal, 0 for informal), Z a vector of variables that determine the choice of formality, q_{ji} (log) output of firm i under j (informal/formal), and X a vector of inputs (capital, labor, materials, all in log form, and other relevant variables). β_1, β_0, and γ are vectors of parameters to be estimated. It is assumed that u_i, ε_{1i} and ε_{0i} have a trivariate normal distribution with mean vector zero and covariance matrix

$$\Omega = \begin{bmatrix} \sigma_u^2 & \sigma_{1u} & \sigma_{0u} \\ \sigma_{1u} & \sigma_1^2 & . \\ \sigma_{0u} & . & \sigma_0^2 \end{bmatrix}$$

The covariance between ε_{1i} and ε_{0i} is not defined, because q_{1i} and q_{0i} are never observed simultaneously. Further, it is assumed that $\sigma_u = 1$ (γ is estimable only up to a scalar factor). The model is identified by non-linearities because the latent variable in the selection equation is a continuous variable but the selection is a discrete event. Moreover, to improve identification, the selection model may include some exogenous variables that do not have any impact on output (for details, see Di Falco et al., 2011).

The switching regression model assumes that an entrepreneur, given a set of individual characteristics represented by Z, makes a decision to enter into informal or formal sectors. The entrepreneur adopts a specific production technology to produce output due to the differences in operating conditions in the informal and formal sectors. The parameters of the production function will provide information about the sources of productivity differences.

We assume a Cobb-Douglas production function:

(2) $q_{ji} = \beta_{j0} + \beta_{j1} k_i + \beta_{j2} l_i + \beta_{j3} m_i + \varepsilon_{ji}$

where subscripts *j* and *i* denote informality status (1/0), and the firm, respectively. *q*, *k*, *l*, and *m* are (log) value of output, value of fixed capital, number of employees, and value of inputs (raw materials, energy, and others). The production function exhibits economies of scale if $\beta_{j1} + \beta_{j2} + \beta_{j3} > 1$. The intercept term, β_{j0} is the productivity parameter, and it measures the level of total factor productivity. If $\beta_{10} > \beta_{00}$, then we will conclude that formal firms have higher total factor productivity.

The productivity of the firm is likely to be determined by a number of variables, such as the composition of the workforce, educational level of the entrepreneur, etc. In other words,

(3) $\beta_{j0} = \alpha_j X_i^*$

where X^* is a vector of variables that determine productivity. By substituting Equation 6 into Equation 5, an augmented production function can be estimated to shed light on the sources of productivity differences.

3.3. Determinants of informality

In the selection equation, the dependent variable is a binary variable that takes the value 0 if the firm is informal (no employee registered with social security), and 1 otherwise. The following explanatory variables are included in the model:[11]

It is well documented in the literature that there is a negative correlation between firm size and the probability of informality because large firms can easily be identified by the public officials if they do not register their employees. We use the log number of employees as an explanatory variable in the model. This is the only firm-specific variable that also appears as an input in the production function because we would like to avoid possible simultaneity of firm-specific variables in the informality

11 As shown by Lehmann and Zaiceva (2015), "persons who are more risk loving tend to have a higher propensity to select themselves into informal employment", and this type of behavior could be relevant for entrepreneurs as well. Unfortunately, the data does not include any variable about risk attitude.

selection model. We estimated the same model by omitting the size variable, but the results did not change qualitatively.

The model includes a rich set of variables about the characteristics of the entrepreneur: first, we include the gender variable (1 for female, 0 for male) to test if entrepreneur's gender influences his/her decision to operate informally. As also observed in the descriptive analysis, female entrepreneurs could be more likely to enter into the informal sector.

The model includes age and its square to allow for non-linear relationship between entrepreneur's age and the tendency to operate informally. We expect an inverted U-type relationship between formality and age, because young entrepreneurs could be more likely to start with informal activities, then to switch to the formal sector. After controlling for the experience of the entrepreneur, we may expect that older entrepreneurs are also more likely to work informally, because the business they are involved in is likely to be their secondary activity. A variable about the experience of the entrepreneur (the log value of experience of the entrepreneur in the last job) is also added to test if experience helps to move to formal activities. We expect a positive coefficient for the experience variable because more experience entrepreneurs are more likely to operate in the formal sector.

The theories of self-selection emphasized the importance of education (human capital). We use a set of dummy variable for the educational level: no diploma, primary school, secondary school, high school, and university.[12] Since the proportion of people with no diploma was very low in our (formal) sample, we merged "no diploma" and "primary school", and the merged category (less than secondary school) is used as the base category (the omitted dummy variable). We expect that the probability of formality will increase by the level of schooling. Although the questionnaire does not differentiate between different types of schooling (for

12 The questionnaire includes a question about the year of schooling. We generated the educational level dummies by assuming "normal" time for schooling. Therefore, strictly speaking, educ0-educ4 refer less than 5, 5-7, 8-10, 11-14, 15 and more years of schooling, respectively.

example, high school vs vocational high school), there is a specific question on the vocational training the entrepreneur has ever received. Thus, we include a dummy variable to control for the effects of vocational training on informality.

The region where the entrepreneur was born could be a factor in informality decision because the businesses are established in the urban areas, and those who were born in rural areas may have limited access to social networks in urban areas. We use a dummy variable, *rural origin*, that takes the value 1 if the entrepreneur was born in rural areas, and 0 otherwise. We expect a negative coefficient for the rural variable: those entrepreneurs with rural background are less likely to operate in the formal sector.

The firm can produce either for only local market, or regional, national or international markets. Since the probability of detection could be lower in local markets, we added a dummy variable for producing for local market.

The questionnaire has a specific question about the entrepreneur's main aim in establishing the business, and the options are "suits qualifications", "has experience in business", "capital requirements reasonable", "family business", "desire to set up new enterprise", "to improve living conditions", and "only option available". The last option refers to the fact that the entrepreneur has established the business because of desperation, and these entrepreneurs are more likely to face with credit and other constraints, and, thus, are forced to operate informally. To test if this is the case, we generated a dummy variable, "No other option", that takes the value 1 if the entrepreneur established the business if this was his/her "only option available", and 0 otherwise.[13]

Entrepreneurs could establish more than one business or could be involved in many economic activities. We use a dummy variable, "Sole economic activity", to check if there is a difference in the tendency towards informality between those entrepreneurs

13 We experimented with a number of dummy variables for other options as well, but they did not have a statistically significant coefficient.

who are involved in only one economic activity, and those who are involved in more activities. De Vries (2010) shows in the case of retail sector in Brazil that informal entrepreneurs are more likely to have a second job, and those who have a second job are less efficient.

The location of the firm could be an important factor for informality. If the firm is located in a business cluster in which there are neighboring enterprises engaged in related activities, the firm may tend to operate formally. Hence, we expect a positive coefficient for the cluster variable.

The estimation results for the formality decision in manufacturing and services are presented in Table 3.[14] The results provide a strong empirical evidence to the hypothesis that production functions differ between formal and informal firms. Estimation based on pooling the data for formal and informal firms may lead to biased results.

The findings are consistent with our *a priori* expectations. Large firms are more likely to operate formally, and more educated entrepreneurs tend to move into the formal sector. Vocational training has a strong negative impact on informality. Those entrepreneurs who have received vocational training are more likely to operate in the formal sector. There is a U-type relationship between informality and entrepreneur's age. The probability to operate informally reaches its minimum level around the late-40s in both sector (45 in manufacturing, 50 in services).

Rural background has a significant impact on informality decision. Entrepreneurs with rural background are more likely to prefer informal activities.

The entrepreneur who has established the business because there were no other option is more likely to be in the informal sector. If the business is the entrepreneur's only

14 The R package *endoSwitch* is used to estimate the endogenous switching regression model by full information maximum likelihood (FIML) (see Chen et al., 2020).

economic activity, then the probability of informality declines. Apparently, secondary activities are more likely to be performed informally.

There is a support for life-cycle theories: the tendency to operate informally diminishes by entrepreneur's experience. Moreover, clustering has a positive impact on the extent of formality only in services. Those entrepreneurs who produce for local markets tend to be informal, but this effect is not statistically significant for services.

Our findings on the determinants of informality suggest that self-selection of more educated entrepreneurs into the formal sector, life-cycle and learning theories, and the detection and punishment factors (proxied by the firm size) are all supported by the data. Note that all these factors are also likely to increase the productivity of formal firms (more human capital, more experience, and larger size).

3.4. Productivity differences between small informal and formal firms

We estimate production functions for informal and formal firms by using the endogenous switching regression method to identify the determinants of productivity differences (Equations 4 and 5). The first model estimated includes only input variables (capital, labor and raw materials), and variables about the composition of labor and economic activity as explanatory variables. Then the variables about entrepreneurial characteristics (educational level, vocational training, gender and partnership) are included.

Estimation results are presented in Table 4. The coefficients of production functions for informal and formal firms are significantly different, i.e., there is no homogeneous technology used by both informal and formal firms. Moreover, contrary to our *a priori* expectations, there are decreasing returns to scale for informal firms whereas constant returns to scale seem to prevail for formal firms. Labor elasticity of output is much higher for formal firms than informal firms, and elasticities of capital and raw materials are quite similar across formal and informal firms. These results may

indicate that informal firms are not able to use labor effectively (for a similar results for Peruvian firms, see Carpio and Patrick, 2021). The intercept term shows that, after controlling for employee and entrepreneur characteristics, formal firms are 100-150 percent more productive than informal firms.

Permanency of economic activity and production for institutional customers have positive effects on productivity. If a firm's activity is permanent (not temporary or seasonal), it becomes more productive. On the other hand, firms serving institutional customers (the government, public enterprises, foreign firms, or private firms employing 10 or more people) are more productive than those who sell their products mostly to households and micro firms (that employ less than 10 people). These two variables reveal the importance of access to markets and services by informal firms, and of long-term relations for productivity that make long term investment feasible.

The variables about the composition of labor (the shares of permanent employees, apprentices, and young employees) are all significant, especially in formal firms. The share of permanent employees has a positive impact on productivity possible because of the accumulation of firm-specific knowledge and on-the-job training, whereas the share of apprentices and young employees have negative coefficients because of similar reasons. Interestingly, the share of permanent employees does not have any strong effect in the case of informal service activities, i.e., even permanent employees could not accumulate skills in informal service firms.

Estimation findings show that entrepreneur's educational level matters for productivity. More educated entrepreneurs' firms are more productive both in the informal and formal sectors. Interestingly, conditional on working informally, returns to education is higher in the informal sector in manufacturing.

Entrepreneur's gender does not have a clear-cut effect: although female entrepreneurs are more likely to enter into the informal manufacturing, conditional on the sector,

female entrepreneurs are more productive in formal manufacturing, and less productive in informal services.

Vocational training has an unexpected negative impact on productivity in informal manufacturing and formal services. It seems that partnership stimulates productivity in services but not in manufacturing.

The correlations between the "error" terms of selection and productivity equations give information about the effects of unobserved factors on selection and productivity. In both manufacturing and services in the full model with entrepreneurial characteristics (Model 2 in Table 4), the value of correlation coefficient (rho) is negative between informality decision and productivity, and positive between formality decision and productivity. In other words, those unobservable factors (like unobserved ability of entrepreneurs) that make entrepreneurs more likely to choose formal sector make them more (less) productive in the formal (informal) sector, because the entrepreneurs are aware of those factors and select themselves to the sector where they could be more productive.

Our analyses suggest that four factors that are identified as the cause of productivity differences between informal and formal firms are identified in the Turkish data as well: informal firms are less productive because of 1) the lack of access to public services and markets, 2) choice of technology, 3) self-selection of more educated/more productive workers/entrepreneurs to the formal sector, and 4) learning and life-cycle effects. However, we could not find any evidence on economies of scale. On the contrary, there are diseconomies of scale in both manufacturing and services. If an informal firm grows, the costs of informality increase because of diseconomies of scale, and this factor could also explain why large firms tend to operate formally.

Diseconomies of scale in informal firms are driven by low output elasticity of labor in informal firms. Elasticity of labor of formal firms is 37 percent higher than that of

informal firms in manufacturing, and 56 percent higher in services. (Model 2 in Table 4). For example, if labor input increases by 10 percent, output an informal manufacturing firm increases by 4.9 percent, while the increase in output is 6.7 percent in a formal manufacturing firm. Although our analysis does not silent about the factors behind differences in elasticities of labor, we may speculate that it is due to the lack of accumulation of firm-specific skills and managerial/entrepreneurial capabilities in informal firms. Apparently, informal entrepreneurs are not able to manage and coordinate large number of workers.

4. Enforcing Formality: A Simulation Analysis

We have seen that there are substantial productivity differences between informal and formal firms: there is a substantial untapped resource for productivity improvements. However, our analysis also indicates that some entrepreneurs prefer to establish informal firms because it is more profitable to do so given their characteristics that cannot be changed easily. If those entrepreneurs who would prefer to work informally are forced to operate formally through strict enforcement, they could not achieve the productivity level of the formal firms. We need to take into account the fact that entrepreneurs' characteristics (like gender and educational level) will not change at least in the short- and medium-term after enforcing formality.

In order to assess the productivity effect of enforcing formality, we need to calculate the conditional output level for informal firms. We assume that all informal firms start to operate formally due to strict enforcement, and they switch to the production function of formal firms without any change in their inputs (same amounts of capital, material inputs, and labor), and firms' and entrepreneurs' characteristics.

The conditional expected output of an informal firm can be calculated as follows:

(4a) $E(q_{0i} \mid I_i = 0, X_{0i}) = \beta_0 X_{0i} - \sigma_0 \rho_0 f(\gamma Z_i)/(1-F(\gamma Z_i))$

(4b) $E(q_{1i} \mid I_i = 0, X_{0i}) = \beta_1 X_{0i} - \sigma_0 \rho_0 f(\gamma Z_i)/(1-F(\gamma Z_i))$

where f(.) and F(.) are probability density and cumulative distribution functions, respectively, and σ_0 the standard deviation of ε_{0i}, ρ_0 the correlation coefficient between u_i and ε_{0i} (see Equation 1). Equation 4a defines the expected *actual* output level of an informal firm, *i*, conditional on operating informally, and Equation 4b defines the *counterfactual*, the expected output level for the same firm conditional on operating formally. Note that the equations take into account the differences in production functions (the β parameters), and the effects of the selection process. The conditional expected output of a formal firm can be calculated similarly:

(5a) $E(q_{1i} \mid I_i = 1, X_{1i}) = \beta_1 X_{1i} + \sigma_1 \rho_1 f(\gamma Z_i)/F(\gamma Z_i)$

(5b) $E(q_{0i} \mid I_i = 1, X_{1i}) = \beta_0 X_{1i} + \sigma_1 \rho_1 f(\gamma Z_i)/(F(\gamma Z_i)$

The average (log) expected conditional output levels for informal and formal firms are presented in Table 5. The expected average (log) output of informal manufacturing firms operating informally in our sample is 12.69 (see Table 5). The log output of these firms would be 12.81 had they operated formally, i.e., formality would increase their output by 12 percent.[15] The expected increase in output of informal manufacturing firms is not negligible, but it is much lower than the productivity differentials obtained through simple comparisons. The output (and productivity) effect of formality on existing informal firms would be even slightly negative in services: -2 percent. In other words, informal service firms would lose, on average, by moving into formal operations. Since their costs would also increase due to social security payments and tax payments, most of the informal service firms are likely to exit from the market if they are forced to operate formally.

A comparison between actual and counterfactual cases for formal firms reveals that they benefit substantially from operating formally. Formal manufacturing (service) firms produce much more than their counterfactual (i.e., informal) case: 107 percent in manufacturing and 52 percent in services.

15 Since we assume constant input levels, the increase in output means productivity growth.

Finally, the substantial difference between the actual average output of formal firms and the counterfactual average output of informal firms (the output they are expected to produce had they operated formally) shows that a large part of the productivity difference between formal and informal firms is due to their characteristics that make informality a better option for these firms. For example, formal firms in the dataset produce 154 percent more than informal firms in manufacturing. 12 percentage points difference is due to the conditions of informality, and 142 percentage points difference is due characteristics of formal and informal firms. In services, formal firms produce 69 percent more than informal firms, and almost all of it is explained by firm characteristics.[16]

Figures 3 and 4 depict the kernel density function of (log) output for informal and formal firms in manufacturing and services, respectively. The blue line represents the actual output whereas the red line is expected output for the counterfactual case. As seen in the figures, the counterfactual curve moves to the left (lower output) for formal manufacturing and services, i.e., in terms of output, these firms made a "rational" choice to operate formally.

It seems that formality would have a positive effect on small informal manufacturing firms, but the distribution of output of large informal manufacturing firms would not change much if they operate formally. In other words, the average output in informal manufacturing is expected to increase to some extent because small firms would increase their output. In the case of services, the distributions of actual and counterfactual output for informal firms are almost identical. However, changes in output distributions hide heterogeneity in firm-level changes. To check how informal firms would react, we plot the distribution of change in log output for manufacturing and services in Figure 5. It seems that almost half of informal manufacturing firms

16 Báez-Morales (2015), by using Oaxaca-Blinder decomposition, found that formal firms produced about 120 percent more than informal firms, and about 85-90 percentage points of the difference is explained by "endowments", and "30-35 percentage points by "returns" in Mexico in 2008-2012. Echevin and Murtin, (2009) found a smaller output gap between formal and informal firms in Senegal, and about two thirds of the gap is explained by "endowments".

and 43 percent of informal service firms would increase their output if they operate formally. If the cost of formality is around 15 percent of output[17], 45 percent of manufacturing and 24 percent of service firms could survive under formal operations (firms located beyond the red line in Figure 5).

Our simulations on hypothetical changes in enforcement reveal that transition from informality to formality would be beneficial in raising productivity, output, and, of course, social security revenue. However, such a transition involves a serious and painful adjustment. First, a large number of informal firms are likely to exit from the market because the existing informal entrepreneurs would not be able to achieve a sizeable productivity increase when they operate formally. Second, even if formal firms fill in the vacuum created by the exit of informal firms and generate a compensating growth, the composition of employment would change radically. Disadvantaged groups (less educated, young, and woman) would experience a decline in the demand for their labor, whereas more educated, and mid-aged would have a much better employment prospects. Therefore, the public policy towards eliminating the informal sector should be complemented by policies supporting the disadvantaged groups during the transition process, and a comprehensive training and education policy to satisfy increasing demand for more educated labor. Moreover, in order to reduce the burden of transition, the government could provide temporary reductions in social security payments and income taxes for informal firms and workers.

Our data does not allow us to analyze interactions between formal and informal firms. There are some theoretical and empirical studies that show that formal firms can benefit from formality, for example, through subcontracting and other relations, or the "unfair" competition from informal firms may reduce productivity of (small) formal firms. Policy towards the informal sector should take into all these interactions.

17 The share of wages in informal firms is around 25 percent of output. We assume labor cost would increase 40 percent due to social security and income tax, and other costs of formality would be equal to 5 of output.

5. Conclusions

Our main findings can be summarized as follows:

1. There is a significant productivity gap between informal and formal firms. The findings are robust with respect to sectors (manufacturing and services), and firm size.

2. The hypothesis that more educated entrepreneurs move to the formal sector is supported by the data. This process of self-selection contributes to widen the productivity gap between informal and formal firms.

3. The theories of life-cycle and learning are also supported by our findings. The relationship between informality and age is U-shaped for entrepreneurs. They tend to move to the formal sector over time, but after a certain age (the late 40s-early 50s), they could have informal businesses possible as their secondary activities. Moreover, when entrepreneurs get more experience, they are likely to move into formal production.

4. The hypothesis on the importance of economies of scale for productivity growth is not supported by the data. Informal and formal firms are likely to operate on different production functions, and decreasing returns to scale prevail for informal firms, whereas there are constant returns to scale for formal firms.

5. Even after controlling for all these factors (self-selection, differences in endowments, and learning), the productivity difference does not disappear. The remaining gap is due to access to public services and infrastructure, access to markets, composition of labor, entrepreneurs' characteristics, and unobserved factors.

6. The findings suggest that there is a substantial but untapped potential to increase productivity in Turkey. The analysis on the sources of productivity differentials suggests that policies towards reducing the size of the informal economy would be beneficial in increasing productivity and boosting growth, and both "stick" (enforcement) and "carrot" (training, clustering, market access, etc) policies should be

adopted to reduce informality. If informal firms are forced to operate formally only through strict enforcement, many informal firms in manufacturing are likely to exit from the market because they could not increase their productivity sufficiently when they operate formally.

7. The transition to formality would be a painful process especially for disadvantaged groups (less educated, young, and woman). Therefore, policies aimed at reducing informality should be complemented by social policies that help the disadvantaged groups during transition, and education policies that help to provide skills needed by formal firms.

Data availability

The data that support the findings of this study are available from Economic Research Forum (ERF) web site at http://www.erfdataportal.com/index.php/catalog/37. The dataset is licensed and is available only for scholarly, research, or educational purposes (OAMDI, 2013).

References

Acemoglu, D. (2001). "Good Jobs versus Bad Jobs", *Journal of Labor Economics* (19): 1-21.

Albrecht, J., Navarro, L., and Vroman, S., (2009). "The Effects of Labour Market Policies in an Economy with an Informal Sector", *Economic Journal,* 119(539):1105–1129.

Allen, J., Nataraj, S., and Schipper, T. C., (2018). "Strict Duality and Overlapping Productivity Distributions between Formal and Informal Firms", *Journal of Development Economics*, (135): 534–554.

Almeida, R., and Carneiro, P. (2012). "Enforcement of Labor Regulation and Informality", *American Economic Journal: Applied Economics*, 4(3): 64–89.

Amaral, P.S. and Quintin, E. (2006). "A competitive model of the informal sector", *Journal of Monetary Economics* (53): 1541-1553.

Amin, M., and Okou, C. (2020). "Casting a Shadow: Productivity of Formal Firms and Informality", *Review of Development Economics*, 24(4): 1610–1630.

Báez-Morales, A. (2015). *Differences in Efficiency between Formal and Informal Micro Firms in Mexico,* AQR Working Papers No 10, Barcelona: Research Institute of Applied Economics.

Benhassine, N., McKenzie, D., Pouliquen, V., and Santini, M. (2018). "Does Inducing Informal Firms to Formalize Make Sense? Experimental Evidence from Benin", *Journal of Public Economics*, (157): 1–14.

Boeri, T. and Garibaldi, P. (2005). *Shadow Sorting*, paper presented at the NBER Macroeconomic Conference, Budapest, June 2005.

Burdett, K. and Smith, E. (2002). "The Low Skill Trap", *European Economic Review* (46): 1439- 1451.

Carpio, M. B. D., and Patrick, C. (2021). "Agglomeration and Informality: Evidence from Peruvian Establishments", *Journal of Regional Science* (forthcoming) https://doi.org/10.1111/jors.12515

Chatterjee, S., Lebesmuehlbacher, T., and Narayanan, A. (2021). "How Productive is Public Investment? Evidence from Formal and Informal Production in India", *Journal of Development Economics*, 151: 102625. https://doi.org/10.1016/j.jdeveco.2021.102625

Chen, B., Yun, S. and Gramig, B. (2020). *Package "endoSwitch": Endogenous Switching Regression Models*, version 1.1.0. https://github.com/cbw1243/endoSwitch

Dabla-Norris, E., Gradstein, M., and Inchauste, G. (2008). "What Causes Firms to Hide Output? The Determinants of Informality", *Journal of Development Economics*, 85(1-2): 1–27.

Dessy, S. and Pallage, S. (2003). "Taxes, Inequality and the Size of the Informal Sector", *Journal of Development Economics* (70): 225-233.

De Vries, G. J. (2010). "Small Retailers in Brazil: Are Formal Firms Really More Productive?", *Journal of Development Studies*, 46(8), 1345–1366.

Di Falco, S., Veronesi, M. and Yesuf, M. (2011). "Does Adaptation to Climate Change Provide Food Security? A Micro-Perspective from Ethiopia", *American Journal Agricultural Economics,* 93(3): 829-846.

Dimova, R., Nordman, C.J. and Roubaud, F. (2008). *Allocation of Labour in Urban West Africa: Implication for Development Policies*, IZA Discussion Paper No. 3558, IZA, Bonn.

Distinguin, I., Rugemintwari, C., and Tacneng, R. (2016). "Can Informal Firms Hurt Registered SMEs' Access to Credit?", *World Development*, (84):18–40.

Djankov, S., Lieberman, I., Mukherjee, J. and Nenova, T. (2003). "Going Informal: Benefits and Costs", in B. Belev (ed.). *The Informal Economy in the EU Accession Countries: Size, Scope, Trends and Challenges to the Process of EU Enlargement*, Sofia: CSD, 63-80.

Echevin, D., & Murtin, F. (2009). "What Determines Productivity in Senegal? Sectoral Disparities and the Dual Labour Market", *Journal of Development Studies*, 45(10), 1707–1730.

El Badaoui, E., Strobl, E., and Walsh, F. (2010). "The Formal Sector Wage Premium and Firm Size", *Journal of Development Economics*, 91(1): 37–47.

Galiani, S., and Weinschelbaum, F. (2012). "Modeling Informality Formally: Households and Firms", *Economic Inquiry*, 50(3): 821–838.

García, G.A. and Badillo, E.R. (2018). "Rationing of Formal Sector Jobs and Informality: The Colombian Case", *Journal of International Development*, 30, 760–789.

Gönenç, R., Leibfritz, W. and Yilmaz, G. (2007). *Enhancing Turkey's Growth Prospects by Improving Formal Sector Business Conditions*, Economics Department Working Papers No. 542, Paris: OECD.

Gönenç, R., Röhn, O., Koen, V., and Öğünç, F. (2014). *Fostering Inclusive Growth in Turkey by Promoting Structural Change in the Business Sector,* Economics Department Working Papers No. 1161, Paris: OECD.

Henley, A., Arabsheibani, G.R. and Carneiro, F.G. (2006). *On Defining and Measuring the Informal Sector*, IZA Discussion Paper No. 2473, IZA, Bonn.

Herrera-Idarraga, P., Lopez-Bazo, E., and Motellon, E. (2015). "Double Penalty in Returns to Education: Informality and Educational Mismatch in the Colombian Labour Market", *Journal of Development Studies*, 51(12), 1683–1701.

Hussmanns, R. (2004). *Measuring the Informal Economy: From employment in the Informal Sector to Informal Employment*, ILO Working Paper No. 53, ILO, Geneva.

Jovanovic, B. (1982). "Selection and The Evolution of Industry", *Econometrica*, (50): 649-670.

Khamis, M (2012). "A Note on Informality in the Labour Market", *Journal of International Development*, 24, 894–908.

Lehmann, H. and Zaiceva, A. (2015). "Redefining Informality and Measuring its Determinants: Evidence from the Russian Labour Market", *Journal of International Development,* 27, 464–488.

Levenson, A.R. and Maloney, W.F. (1998). *The Informal Sector, Firm Dynamics, and Institutional Participation*, Policy Research Working Paper Series 1988, Washington DC: World Bank.

Masatlioglu, Y., and Rigolini, J. (2008). "Informality Traps", *The BE Journal of Economic Analysis and Policy*, 8(1): Article 51.

McKenzie, D., and Sakho, Y. S. (2010). "Does It Pay Firms to Register for Taxes? The Impact of Formality on Firm Profitability", *Journal of Development Economics*, 91(1): 15-24.

McKinsey Global Institute (2003). *Turkey: Making the Productivity and Growth Breakthrough*, New York: McKinsey.

Mitra, S. (2017). "To Tax or not to Tax? When does It Matter for Informality?", *Economic Modelling*, (64): 117–127.

OAMDI (2013), *Micro and Small Enterprises Survey (MSEs),* Version 1.0 of Licensed Data Files; Turkey MSEs 2001. Egypt: Economic Research Forum (ERF). http://www.erfdataportal.com/index.php/catalog/37.

Özar, Ş. (2006). *Micro and Small Enterprises in Turkey: Uneasy Development*, Project on "Promoting Competitiveness in Micro and Small Enterprises in the MENA Region", ERF Research Report Series No 0420, Cairo.

Özar, Ş., Özartan, G. and İrfanoğlu, Z.B. (2008). "Micro and Small Enterprise Growth in Turkey: Under the Shadow of Financial Crisis", *Developing Economies,* 46(4): 331-362.

Paula, Á. D., and Scheinkman, J. A. (2011). "The Informal Sector: An Equilibrium Model and Some Empirical Evidence from Brazil", *Review of Income and Wealth*, 57(s1): S8–S26.

Perry, G.E., Maloney, W.F., Arias, O.S., Fajnzylber, R., Mason, A.D. and Saavedra-Chanduvi, J. (2007). *Informality: Exit and Exclusion*, Washington, DC: World Bank.

Redding, S. (1996). "The Low-Skill, Low-Quality Trap: Strategic Complementarities between Human Capital and R&D", *Economic Journal,* (106): 458-470.

Rogers, C.A. and Swinnerton, K.A. (2004). *A Model of Informal Sector Labor Markets*, unpublished paper.

Snower, D.J. (1996). "The Low-Skill, Bad-Job Trap", in *Acquiring Skills: Market Failures, Their Symptoms and Policy Responses* (eds. A. Booth and D.J. Snower), Cambridge: Cambridge University Press, 109-124.

Straub, S. (2005). "Informal Sector: The Credit Market Channel", *Journal of Development Economics,* (78): 299-321.

Ulyssea, G. (2018). "Firms, Informality, and Development: Theory and Evidence from Brazil", *American Economic Review*, 108(8): 2015–2047.

Declaration of Conflicting Interests
The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The authors received no financial support for the research, authorship, and/or publication of this article.

Author Contributions
Authors contributed equally to this work.

Approval of Ethics Committee
Ethics Committee approval is not required for this article.

Ethical Standards
In all processes of the article, it was acted in accordance with the principles of research and publication ethics.