

The productivity effect of informal employees: The Tshwane tyre-fitting industry as a case study

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Orientation: The article investigated the application of a suitable estimation model to measure the productivity spill over effects of informal employees.

Research purpose: The aim of the article was to estimate the sign and magnitude of productivity spill over effects of informal employees when employee and firm characteristics as well as external factors were considered.

Motivation for the study: The researcher thought that empirical research was appropriate because of the belief that, because of low productivity levels in the South African workplace, firms are resorting to greater numbers of informal employees in order to generate positive productivity spill over effects that would improve their levels of competitiveness.

Research design, approach and methodology: The researcher constructed real data series on the applicable variables from weekly data that he collected from firms in the sample group over the sample period. He then applied the Nelen, de Grip and Fourage estimation model to determine the sign and magnitude of the spill over effects for the different employee segments.

Main findings: The informal employee segment created greater positive productivity spill over effects. This was especially true for older informal employees with longer tenures and lower levels of absenteeism. External factors, like variations in market demand, improved the positive spill over effects that informal employees generated.

Practical/managerial implications: Firms might reconsider the composition of their workforce if the informal employee segment consistently generated higher positive productivity spill over effects.

Contribution/value-add: The researcher has introduced an estimation procedure that firms can apply to measure the productivity spill over effects of formal and informal employee segments at firm and industry level.

Introduction

Stagnant job creation in the formal sector, high levels of unemployment and a potentially economically active labour force, which is increasingly looking for informal employment, characterise the South African economy (Davies & Thurlow, 2011). There is also a belief that firms are resorting to employing greater numbers of informal employees when difficult external factors, such as low levels of economic activity, fluctuations in demand, low productivity and restrictive labour legislation, confront them. Given the perceived growth in the demand for informal employees, it has become important to study the composition, location, mobility, skill levels and productivity of informal employees.

There is no real research on the productivity of informal employees in the South African economy. This article measures the productivity of informal employees against the productivity of formal employees econometrically.

International findings about the relationship between informal workers and productivity are mixed.

One school of thought (Anderson, Grahl, Jefferys & Tasiron, 2006; Arvantis, 2005; Blundell, Brewer & Francesconi, 2005; Connolly & Gregory, 2008; Darton & Hurrell, 2005; Montgomery, 1988; Perontin & Robinson, 2000; Rosendaal, 2003) argues that there is a negative relationship between informal workers and productivity.

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The researchers give three reasons for their point of view. Firstly, they contend that employers expect informal employees to invest less in developing their human capital compared to formal employees. This results in lower productivity levels. Secondly, there is a negative relationship between working hours and self-assessed labour efficiency when one applies measures of individual performance. Thirdly, they conclude that there is a negative relationship between informal employee costs and the relative demand for informal employees. In this regard, their arguments are that:

- informal employee labour costs are high and these higher costs do not explain much of the variation in relative working hours across firms
- employers see recruitment and training costs as obstacles to hiring informal employees
- skill levels do not reflect the differences in the relative working hours of informal employees.

Another school of thought (Banes, Johnson, Kulys & Hook, 1999; Giannetti & Madic, 2007; Josten, Ng-A-Tham & Thierry, 2003; Mahmood, 2008; Nelen, de Grip & Fourage, 2011; Shepard, Clifton & Kruse, 1996) proposes a positive relationship between informal employment and productivity.

These researchers also give three reasons for their position. Firstly, they believe that firms with a high proportion of informal employees are more productive than firms with a high proportion of formal employees are. This is especially true of firms that face fluctuations in consumer demand. Secondly, they conclude that informal employees spend a large percentage of their working time on demand-related tasks compared to formal employees. Therefore, informal employees are more productive than formal employees are in the hours they work. The reason they give is that informal employees have significantly lower perceived work pressure and they call in sick less often than formal employees do. Thirdly, they argue that more flexibility in terms of informal employment could contribute to higher productivity levels.

These researchers also give reasons why informal employees are more productive than formal employees are, and why informal employment is a more efficient way to use workers. These reasons are that:

- fatigue increases as the number of working hours increases, thus reducing productivity
- there is a significant negative relationship between formal employment and self-assessed work pressure.

The same researchers also conclude that, when controlling for employee characteristics, formal employees take significantly more sick leave than informal employees do. This reduces the productivity levels of formal employees.

All the studies are saying that, when one investigates the relationship between informal employment and productivity, one must consider the characteristics of the firms and the employees as well as external factors.

De Grip and Sieber (2005), Hellerstein, Neuman and Troske (1999) and Nelen *et al.* (2011) state that, when one measures the

relationship between informal employees and productivity, one should consider:

- only heterogeneous employee segments based on the number of hours worked
- employee segment contribution to sales
- a homogeneous capital outlay amongst firms.

Nelen *et al.* (2011) state that fluctuations in consumer demand are also important considerations. Their argument is that, because of the flexibility that informal employment offers, more informal employees are expected to be employed at times when consumer demand peaks. Job content in this instance is important simply because formal employees spend less time on demand-related tasks compared to informal employees.

Research design

Research approach

The research approach comprises three distinct steps. Firstly, the researcher had to specify a suitable econometric estimation model to:

- capture all the variables that affect the productivity spill over effects of informal employees
- enable him to estimate the sign and magnitude of the productivity spill over effects correctly.

Secondly, the researcher had to decide on a suitable case study and collect relevant real data from firms. Thirdly, the researcher conducted the econometric estimation of the sign and magnitude of the productivity spill over effects of the informal employee segment.

Research method and procedure

In a study on the effect of informal employment on productivity in Dutch pharmacies (part of the services industry) in the Amsterdam metropolitan area, Nelen *et al.* (2011) used the Ilmakunnas and Maliranta (2005) model.

The researcher decided to use the Nelen *et al.* (2011) version of the Ilmakunnas and Maliranta model for two reasons. Firstly, the Nelen model entails an analysis of productivity with a new form of heterogeneity in firms' employment segments based on the number of hours worked. Secondly, it would allow the researcher to compare the results of a South African case study with the results of an international study on the link between productivity and informal employees.

The model is an estimated production function that explicitly includes heterogeneous employee segments based on the number of hours worked. The model is also based on the implicit assumption that informal and formal employees are equally productive during the hours they work. The more formal assumptions of the model are that:

- the different types of employees are perfect substitutes for each other
- the different employee segments may have different marginal productivities
- the firms have heterogeneous workforces.

It considers two employment segments:

- formal employees (FE)
- informal employees (IE).

The relative productivity of informal employees is expressed as $(\gamma_{IE} - 1)$ whilst the relative productivity of formal employees is expressed as $(\gamma_{FE} - 1)$.

The quality-adjusted labour input is expressed as:

$$L^* = L[1 + (\gamma_{IE} - 1)IE + (\gamma_{FE} - 1)FE] \quad [\text{Eqn 1}]$$

This equation is simplified by following the approximation:

$$\text{Ln}[1 + (\gamma_{IE} - 1)IE + (\gamma_{FE} - 1)FE] \approx (\gamma_{IE} - 1)IE + (\gamma_{FE} - 1)FE \quad [\text{Eqn 2}]$$

This simply means that informal and formal employee segments are directly included in a log form production function (more specifically a Cobb-Douglas production function).

By using L^* , the Cobb-Douglas production function is expressed as:

$$\gamma = aK^\alpha L^{*\beta} \quad [\text{Eqn 3}]$$

In log form (using the approximation in [2]) we have:

$$\text{Ln}(\gamma) = \theta + \alpha \text{Ln}(K) + \beta \text{Ln}(L) + \gamma_{IE}^* IE + \gamma_{FE}^* FE \quad [\text{Eqn 4}]$$

Where

$$\theta = \text{Ln}(a), \gamma_{IE}^* = \beta(\gamma_{IE} - 1) \text{ and } \gamma_{FE}^* = \beta(\gamma_{FE} - 1)$$

It is assumed in the model that the capital outlay is homogeneous across firms and that the unit sale of output (hereafter referred to as SQ) is used to measure the productivity differentials between formal and informal employees. The production function is finally transformed to:

$$\text{Ln}\left(\frac{\gamma_i}{SQ_i}\right) = \theta_1 + \delta_1 \text{Ln}(SQ_i) + \gamma_{1,IE}^* IE_i + \gamma_{1,FE}^* FE_i + \varepsilon_{1,i} \quad [\text{Eqn 5}]$$

Where

IE_i and FE_i denote the firm's informal and formal employee segments.

$\gamma_{1,IE}^* = \beta(\gamma_{1,FE} - 1)$ denotes the relative productivity of the informal employee segment compared to the formal employee segment.

Therefore:

$$\delta_1 \text{Ln}(FE_i) = (\alpha + \beta - 1) \text{Ln}(FE) \quad [\text{Eqn 6}]$$

It is clear that this equation takes into account deviations from constant returns to scale.

The researcher chose a case study from the South African services industry to ensure a sound comparison of the results of a South African case study with international results (more specifically the results of the Nelen *et al.* study of 2011). The researcher decided on the South African motor vehicle tyre-fitting industry (more specifically in the Tshwane Metropolitan area) to comply with the characteristics of the model and to ensure the availability of the data he required.

In addition, the researcher:

- used unit sales of tyres fitted per working day to measure productivity
- accepted the tyre-fitting (the primary labour function) employee segments (both formal and informal) as substitutes
- assumed that the necessary training or skill levels were the same for both formal and informal employee segments
- assumed that the firms knew how many hours both employee segments in the sample group worked.

With the data he required, it was possible for the researcher to determine the firms' informal and formal employee segments in terms of unit sales (SQ). Therefore:

$$IE_i = \frac{SQ_{i,IE}}{SQ_{i,total}} \quad \text{and} \quad FE_i = \frac{SQ_{i,FE}}{SQ_{i,total}}$$

The model is an ordinary least square (OLS) model.

Research sample

The model required four specific features of data:

- homogeneity in capital usage
- homogeneity in skill levels
- information on the working hours of all the employees in the firms
- an unambiguous physical or monetary measure of productivity.

The model accepts that employee and firm characteristics influence productivity. With regard to the characteristics of informal employees, the researcher needed to consider the average age of the employees and their tenures. With regard to the characteristics of the firms, the researcher needed to incorporate, in the model, the number of hours informal employees worked, the absentee levels of informal employees and possible excess informal labour the firms needed.

The researcher established, through interviews with franchisees, that there were 52 tyre fitment centres in the area he identified for the case study. Thirty-seven tyre fitment centres finally participated in the research project and, according to the Kaiser-Meyer-Olkin measure of sample adequacy, the researcher concluded that the sample size was statistically significant and more than adequate.

The researcher collected data on all the variables over an 18-month period (01 January 2009 – 30 June 2010). He gave the sales or operational manager of each firm an itemised list on which to record real data on the following variables every week:

- the number of formal and informal employees
- the average age per formal and informal employee segment
- the number of tyres each employee segment fitted
- the number of hours formal and informal employees worked
- the average tenure of formal and informal employees
- the percentage absenteeism for both employee categories.

Therefore, it was possible to construct a time series data set for the sample period for all these variables in order to conduct an econometric estimation.

The sales or operational managers supplied data on the average number of tyres their firms fitted or sold for the past five years. The researcher collected data on a three-year variation in the number of tyre fitment centres fitted or sold in the sample geographical area from the different franchisees.

Statistical analysis

The researcher reported the sample statistics below.

The average number of tyres fitted (SQ) was 1874 per month. The $\text{Log } SQ$ was 3.27 (SD: 0.11).

The average percentage share of unit sales the informal employees contributed was 15% (SD: 0.09) whilst the average percentage share the formal employees contributed was 65% (SD: 0.11). The average percentage share that other employees (like managers and administrators) contributed was 20% (SD: 0.11). One can ascribe the difference between the formal and informal employee segments to the fact that informal employees worked an average of 24 hours per month.

The average age of the informal employees was 25.5 years (SD: 3.12), whilst that for formal employees was 27.25 (SD: 2.89).

The average tenure of informal tyre-fitting employees was 2.2 years (SD: 1.62), whilst that for formal employees was 4.5 years (SD: 1.92).

The average number of operating hours per month was 182 hours (SD: 14.12).

The estimated average for excess informal labour during the sample period was 2.5% (SD: 5.42).

The estimated average absenteeism rate for informal employees was 3% (SD: 0.025).

There was a large estimated mean variation of 6.2 (SD: 5.42) in the number of competitors within a 10 kilometre radius.

Estimation results

The researcher conducted three estimations. He considered only the employee segments (formal and informal) in the first estimation.

The aim of the first estimation was to determine:

- whether these employee categories have positive or negative productivity spill over effects
- which of the two employee categories created the greatest productivity spill over effects (provided that the two categories showed positive productivity gains)
- whether the productivity spill over effects differ when the researcher considered the size of the informal employee segment (the estimation catered for informal employee segments smaller and greater than 15%).

Table 1 gives the results of the first estimation.

The researcher included employee and firm characteristics in the second estimation. Its aim was to determine whether age, tenure, the number of hours worked, excess informal labour and absenteeism have a positive or negative influence on the productivity spill over effects of the informal employee segment.

Table 2 gives the results of the second estimation.

The researcher included external market factors in the third estimation of the productivity spill over effects of informal employees. These were:

- variations in demand for tyres
- the amount of competition in the sample area.

Table 3 gives the results of the third estimation.

Discussion

From the results of the first estimation (Table 1), it is clear that both the formal and informal employee categories have productive inputs (positive estimated coefficients). The informal employee segment has a higher positive productivity spill over effect ($0.825 > 0.635$). With regard to the size of the informal employee segment, firms with a larger informal employee segment (more than 15%) created greater positive productivity spill over effects. This result contradicts the results of the Nelen *et al.* study (2011), where there was no significant difference in the average productivity between the different employee segments.

The results of the second estimation (Table 2) clearly indicate that, even when the researcher considered informal employee and firm characteristics, the informal employees still showed greater positive productivity spill over effects compared to the formal employees ($0.801 > 0.608$).

With regard to informal employee characteristics, it is clear from the estimation results that there is a positive relationship between the age of the informal employees and productivity (as expressed in SQ). It simply means that older informal employees are more productive than younger informal employees are. A possible explanation is that employees become more efficient in what they do because they use better and more productive ways to perform their duties.

TABLE 1: Estimation results for employee segments.

Employee segments	Estimated coefficients
Total labour input in SQ	0.825 (0.0224)*
Informal employee segment in SQ	0.825 (0.231)*
Formal employee segment in SQ	0.635 (0.156)*
Average productivity: less than 15% for the informal employee segment	4.66 (0.988)*
Average productivity: more than 15% for the informal employee segment	5.35 (0.923)*
Adjusted R^2	0.61

Source: Own estimations

SQ , the unit sale of output; R^2 , the square of the sample correlation coefficient between the outcomes and their predicted values.

*, Denotes the standard errors (in brackets) at the 95% confidence level.

TABLE 2: Estimation results including informal employee and firm characteristics.

Employee segments	Estimated coefficients
Total labour input in SQ in logs	-0.311 (0.0255)*
Informal employee segment in SQ	0.801 (0.31)*
Formal employee segment in SQ	0.608 (0.201)*
Employee characteristics:	
• average age of informal employees	0.021 (0.007)*
• tenure of informal employees	0.018 (0.003)*
Characteristics of firms:	
• number of hours informal employees worked per week	0.015 (0.003)*
• excess informal employee ratio	-0.201 (0.061)*
• absenteeism (fraction)	-0.011 (0.212)*
Adjusted R^2	0.642

Source: Own estimations

SQ , the unit sale of output; R^2 , the square of the sample correlation coefficient between the outcomes and their predicted values.

*, Denotes the standard errors (in brackets) at the 95% confidence level.

TABLE 3: Estimation results (productivity per SQ in logs as the dependent variable) including external market factors.

Employee segments	Estimated coefficients
Total labour input in SQ in logs	-0.301 (0.0212)*
Informal employee segment in SQ	0.877 (0.344)*
Formal employee segment in SQ	0.461 (0.202)*
Employee characteristics:	
• average age of informal employees	0.023 (0.009)*
• tenure of informal employees	0.013 (0.002)*
Characteristics of firms:	
• number of hours informal employees worked per week	0.027 (0.008)*
• excess informal employee ratio	-0.204 (0.064)*
• absenteeism (fraction)	-0.014 (0.201)*
External factors:	
• demand for new tyres (volume for previous five years)	0.457 (0.113)*
• amount of competition (number of firms in the sample area)	0.002 (0.003)*
Adjusted R^2	0.571

Source: Own estimations

SQ , the unit sale of output; R^2 , the square of the sample correlation coefficient between the outcomes and their predicted values.

*, Denotes the standard errors (in brackets) at the 95% confidence level.

The result contradicts those of the Nelen *et al.* (2011) study, which indicated a negative relationship between age and productivity. In their study, they argued that younger informal employees have more up-to-date knowledge that might affect the productivity of other employees positively.

Secondly, the results showed a positive relationship between informal employee tenure and productivity. The longer the tenure of the informal employees, the higher is the positive productivity spill over effects. A possible explanation is the accumulated job experience.

With regard to the characteristics of firms, it is clear from the estimation results that there is a positive relationship between the number of hours informal employees worked and productivity. The more hours the informal employees worked the more positive productivity spill over effects they generated.

This result also contradicts the Nelen *et al.* study (2011). It reported no significant relationship between the number of hours the informal employees worked and productivity.

Secondly, the estimation results showed a negative relationship between an excess informal employee ratio and productivity. It simply means that firms with an excess of informal employees generated fewer positive labour spill over effects. The Nelen *et al.* study (2011) gave a reasonable explanation. This was that too many informal employees decreases the workload per informal employee and affects average productivity.

Thirdly, the estimation results showed a negative relationship between absenteeism and productivity. The higher the level of absenteeism, the lower is the productivity.

The results of the third estimation show even greater productivity spill over effects for the informal employee segment (compared to the formal employee segment) when the researcher added external market factors to the estimation (0.877 > 0.461). A possible explanation for this is an increase in demand during peak periods. This creates a greater demand for informal employees and, in turn, results in greater positive productivity spill over effects.

It is interesting to note that the positive relationship between the amount of competition and the productivity spill over effects of informal employees is very weak. The relatively insignificant estimation result shows this. A possible explanation is that the firms in this particular industry knew about the actual and potential competition in their area and that they would have considered it when they decided on the composition of their labour force.

Conclusions and recommendations

The aim of the article was to estimate the sign and magnitude of the productivity spill over effects of informal employees in the services industry of the South African economy.

Implications for human resource management

Measuring and monitoring productivity levels should be two very important human resource (HR) management functions because productivity levels will affect the overall efficiency and profitability levels of organisations.

This has become an even more critical functional area for HR managers because of the perceived low average productivity levels in the South African economy, the perceived highly restrictive labour legislation and the proposed changes to the current labour legislation (specifically informal labourers and the proposed abolishment of labour brokers).

The results of this study clearly show that firms can employ informal employees and that they will improve average productivity levels in organisations.

The HR implications of the estimation model and the results of this particular study are twofold.

Firstly, firms can use this model (or measuring instrument) to determine how to use informal employees more productively. Secondly, the model makes it possible to determine a more optimal mix of informal and formal employee segments.

Given the current debate on informal labour and the possible abolishment of labour brokers, the study clearly shows positive implications for the continued use of informal labourers and labour brokers.

The study showed that there is a positive relationship between informal employees and productivity in the services sector of the economy. This is especially true for older informal employees with longer tenures.

Firms with larger informal employee segments created higher positive productivity spill over effects compared to firms with smaller informal employee segments.

It was also interesting to note that the more hours the informal employees worked (combined with their lower levels of absenteeism) emphasised the positive productivity spill over effects they generated. The results of the estimations clearly showed that there is a limit to the positive productivity spill over effects the informal employees generated because excess numbers of informal employees will eventually result in lower productivity spill over effects.

Including external factors (particularly demand and the amount of competition in the industry) increased the positive productivity spill over effects even further. This was especially true with variations in market demand. The results of the estimations confirmed that greater levels of market demand during certain peak times resulted in a greater demand for informal employees and, eventually, in higher positive productivity spill over effects.

Suggestions for further research

Industry and geographical differences in informal employee productivity levels were not part of this particular study.

It would be useful to conduct the same study in different industries (like the manufacturing, mining and construction industries) and different geographical regions in order to determine whether there are industry and geographically related differences in the productivity spill over effects that informal employees generate.

It would also be useful to develop a measuring instrument to determine the maximum number of informal employees for optimal productivity.

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