INFORMAL EMPLOYEE CONTRIBUTION TO LABOR PRODUCTIVITY: THE SOUTH AFRICAN TSHWANE METROPOLITAN TYRE-FITTING INDUSTRY AS A CASE STUDY

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ABSTRACT

Orientation: The paper dealt with the application of a suitable estimation model to measure the labor productivity spillover effects of informal employment.

Research purpose: The aim of the study was to estimate the sign and magnitude of labor productivity spillover effects of informal employment when employee characteristics, firm characteristics and external factors were taken into consideration. The South African Tshwane Metropolitan tyre-fitting service industry was used as a case study.

Motivation for the study: The empirical research was deemed necessary given the perceived notion that due to general low labor productivity levels in the South African workplace (especially against the background of restrictive labor legislation) firms are resorting to higher levels of informal employment in order to generate positive productivity spillover effects that would enhance their level of competitiveness. International studies have been conducted on this particular topic but no empirical research has been published regarding the South African situation.

Main findings: The informal employee segment created greater positive labor productivity spillover effects when compared to the formal employee segment. This was especially true for older informal employees with a longer tenure record and a lower level of absenteeism. Excess levels of informal employment do eventually result in a decrease of positive labor productivity spillover effects. External factors such as variation in market demand enhanced the positive spillover effects generated by informal employees.

Practical/managerial implications: It is recommended that firms might reconsider the composition of their workforce if the informal employee segment consistently generates higher positive labor productivity spillover effects in the sense that it would enhance their level of competitiveness.

INTRODUCTION

The South African economy is characterized by stagnant job creation in the formal economy. The result is high levels of unemployment with more and more potential economic active labor seeking informal employment. There is also the general notion that firms are resorting to the employment of more informal employees when they are confronted with difficult external factors such as low economic activity, fluctuations in demand conditions, low formal labor productivity levels and restrictive labor legislation. Given the perceived growth in the demand for informal labor it has become important to research aspects such as the composition, location, mobility, skill levels and productivity aspects of informal labor. This particular paper investigated the productivity contribution of informal employees when measured against the labor productivity levels of formal employees.

Reasonable international research on the relationship between informal employment and labor productivity has been conducted but no real research has been conducted on the labor productivity dimension of informal employment in the South African economy. Research results on labor productivity in the South African working environment are generally focused on the productivity aspects of formal employment (such as measuring instruments, human resource composition, skill levels, the impact of technology and employment flexibility etc).

International research results on the relationship between informal labor and productivity are mixed. One school of thought argues for a negative relationship between informal labor and productivity. Connolly (2008) and Arvantis (2005) indicated that informal employees are expected to invest less in their human capital compared to formal employees which obviously do result in lower labor productivity levels. Rosendaal (2003) and Perotin & Robinson (2000) are of the opinion there is a negative relation between working hours and self-assessed labour efficiency when measures of individual performance are applied. Montgomery (1988) concluded that there exists a negative relationship between informal employee costs and the relative demand for informal employees. The basic arguments are that i) higher informal employee labor costs would increase and that this higher costs do not explain much of the variation in relative working hours across firms ii) the recruitment and training costs are viewed as an impediment for the hiring of informal employees and iii) skill levels were found not to reflect differences in relative working hours of informal employees.

The other school of thought proposes a positive relationship between informal employment and labor productivity. Nelen, de Grip & Fourage (2009) are of the opinion that firms with a high share of informal employees are more productive than firms with a high share of formal employees. This is especially true for firms which face fluctuations in consumer demand. In the same study it was also concluded that informal employees spend a large percentage of their working time on demand-related tasks compared to formal employees. In this sense it was concluded that informal employees were more productive than formal employees in the hours that they have worked. The reason given was that informal employees have significant lower perceived work pressure and that they call sick less often than formal employees. Shepard, Clifton & Kruse (1996)

analyzed the effects of informal employment flexibility on labor productivity. The conclusion of their study was that more flexibility in terms of informal employment can contribute to higher labor productivity levels. Owen (1978) concluded that informal employment does create higher levels of labor productivity especially when there are fluctuations in demand. Josten, Ng-A-Thom & Thierry (2003) provided a few reasons why informal employees are more productive than formal employees or why informal employment is a more efficient way to allocate labor in firms. These reasons are i) that fatigue increases as the number of working hours increases, thus reducing labor productivity and ii) a significant negative relationship between formal employment and self-assessed work pressure. This particular study also concluded that when controlling for employee characteristics, formal employees reported significantly more working days in which they were absent due to sickness compared to informal employees. The productivity levels of formal employees were thus reduced.

Whatever the outcome of the relationship between informal employment and labor productivity, all these studies are expressing the point of view that when this relationship is investigated firm characteristics, employee characteristics and external factors need to be taken into consideration. De Grip and Sieber (2005), Hellerstein, Neuman & Troske (1999) and Nelen, de Grip & Fourage (2009) are of the opinion that i) only heterogeneous employee shares based on working hours ii) employee segment contribution to sales and iii) a homogeneous capital outlay among firms must be considered when the relationship between informal employees and labor productivity is measured. Nelen, de Grip & Fourage (2009) indicated that fluctuations in consumer demand are also important to consider. Their argument is that because of the flexibility that informal employment offer, informal employees are expected to be deployed at times when consumer demand is expected to peak. Job content in this instance is important simply because formal employees spend less time on demand-related tasks compared to informal employees.

THE MODEL

In a study on the impact of informal employment on labor productivity in Dutch pharmacies in the Amsterdam metropolitan area Nelen, de Grip & Fourage (2009) used the Ilmakunnas & Maliranta (2008) model. The major contribution of the Nelen, de Grip & Fourage (2009) version of the Ilmakunnas & Maliranta (2008) model is the analysis of labor productivity with a new form of heterogeneity in firm's employment shares based on employee working hours. In order to enable a comparison with international results the methodology of the Nelen, de Grip & Fourage (2009) model was employed in this particular study.

The model is an estimated production function in which heterogeneous employee shares based on employee's working hours are explicitly included. The model is also based on the implicit assumption that informal and formal employees are equally productive during the hours that they work. The more formal assumptions of the model are i) that the different types of employees are perfect substitutes ii) that the different employee segments may have different marginal productivities and iii) that the focus is on firms with a heterogeneous workforce.

Three employment shares are considered namely i) formal employees (*FE*) ii) informal employees (*IE*) and iii) other employee categories (*OE*). The relative productivity of informal employees is expressed as $(\gamma_{IE} - 1)$ while the relative productivity of formal employees is expressed as $(\gamma_{FE} - 1)$. The quality-adjusted labor input is expressed as:

$$\text{L*} = \text{L}[1+ (\gamma_{IE} - 1)\text{IE} + (\gamma_{FE} - 1)\text{FE}]….(1)$$

This equation is simplified by following the approximation:

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

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

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

$$\gamma = a\text{K}^{\alpha}\text{L*}^{\beta}…..(3)$$

In log-format (using the approximation in (2)) we have:

$$\text{Ln}(\gamma) = \theta + \alpha\text{Ln}(\text{K}) + \beta\text{Ln}(\text{L}) + \gamma_{IE}\text{*IE} + \gamma_{FE}\text{*FE}…..(4)$$
$$\text{(where } \theta = \text{Ln}(a), \gamma_{IE}\text{*} = \beta(\gamma_{IE} - 1) \text{ and } \gamma_{IE}\text{*} = \beta(\gamma_{FE} - 1))$$

It is assumed that the capital outlay is regarded as homogeneous across firms. 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 as:

$$\text{Ln}(\frac{\gamma_i}{SQ_i}) = \theta_1 + \delta_1\text{Ln}(\text{SQ}_i)+ \gamma_{1,IE}\text{*IE}_i + \gamma_{1,FE}\text{*FE}_i + \varepsilon_{1,i}……(5)$$

(where IE_i and FE_i denote the firm's informal and formal employee segments)

The relative productivity of the informal employee segment compared to the formal employee segment is denoted by $\gamma_{1,IE}\text{*} = \beta(\gamma_{1,FE} \text{ -1})$. Thus:

$$\delta_1\text{Ln}(\text{FE}_i) = (\alpha + \beta \text{ -1})\text{Ln}(\text{FE})…….(6)$$

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

In order to facilitate a sound comparison of the results of a South African case study with international results (more specifically the results of the Nelen, de Grip & Fouarage (2009) study) it was deemed necessary also to choose a case study from the services industry. In order to i) comply with the characteristics of the model and ii) ensure the availability of the required data the South African motor vehicle tyre-fitting service industry was chosen (more specifically the Tshwane metropolitan area) . There were three important aspects that needed to be taken into consideration namely i) in order to measure labor productivity the unit sales of motor vehicle tyres fitted per working day

was used ii) the motor vehicle tyre-fitting (primary labor function) employee segments (formal and informal) were accepted as substitutes iii) the required training/skill levels were the same for both employee segments (formal and informal) and iv) the number of working hours was known for both employee segments in the sample group.

With the required data (see next section on data) it was possible to determine the firm's informal and formal employee shares in terms of unit sales (*SQ*). Thus:

$$\textbf{IE}_\textbf{i} = SQ_{i,IE} \Big/ SQ_{i,total} \quad \textbf{and FE}_\textbf{i} = SQ_{i,FE} \Big/ SQ_{i,total} \quad .$$

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

DATA

The model required four specific features of data namely i) homogeneity in terms of capital usage ii) homogeneity in terms of skill levels iii) information on the working hours of all employees within firms and iv) the unambiguous physical or monetary measure of labor productivity.

The sample size based on statistical validation was 52 tyre-fitting businesses and a response rate of 37 businesses was realized. Data on all the required variables was collected for an 18-month period (1 January 2009 – 30 June 2010). The exception was for demand factors and the degree of competition where data for a three-year period was collected.

A unique matched employer-employee dataset on the tyre-fitting businesses in the Tshwane Metropolitan area was compiled. It was accepted in the model that labor productivity might be influenced by employee and firm characteristics. In terms of informal employee characteristics i) the average age of employees and ii) the tenure of employees needed to be taken into consideration. In terms of firm characteristics i) the number of informal employee working hours ii) informal employee absenteeism levels and iii) possible excess informal labor were incorporated in the model. Real data was collected on all these variables.

A further two external factors that could affect productivity levels namely, demand factors and the degree of competition in the sample area were taken into consideration. In terms of demand factors the volume of tyres fitted for the past three years (more specifically variation in sales) were taken into consideration while for the degree of competition among firms within the sample area over the last three years was used.

In terms of sample statistics the following are reported.
- The average number of new tyres fitted (*SQ*) was 1874 per month. Log SQ was 3.27 (SD:0.11).
- The average percentage share of informal employees in terms of unit sales was 15% (SD: 0.09), the average percentage share of formal employees in terms of unit sales was 65% (SD: 0.11) and the average percentage share of other

employees (management, administrative etc) was 20% (SD: 0.11). The large difference between the formal and informal employee shares can be ascribed to the fact that the average monthly working hours per informal employee was 24 hours.

- Average age of informal employees was 25.5 years (SD: 3.12) and for formal employees it was 27.25 years (SD:2.89).
- Average firm tenure for informal tyre-fitting employees was 2.2 years (SD:1.62) and for formal employees it was 4.5 years (SD: 1.92).
- The average number of operating hours per month was 182 hours (SD:14.12).
- An average of 2.5% (SD:5.42) excess informal labor during the sample period was estimated while an average absenteeism ratio of 3% (SD:0.025) for informal employees was estimated.
- A large estimated mean variation of 6.2 (SD:5.42) in the number of competitors in a 10 kilometer radius was reported.

RESULTS

Three estimations were performed. In the first estimation only the employee shares (formal and informal) were considered. The aims of the first estimation were i) to determine whether these employee categories have positive or negative productivity spillover effects ii) to determine which of the two employee categories created the greatest productivity spillover effects (provided that the two categories exhibit positive productivity gains) and iii) to determine whether the productivity spillover effects differ when the size of the informal employee share is taken into consideration (the estimation catered for informal employee shares smaller and greater than 15%) The estimated results of the first estimation are listed in Table 1.

Table 1: Estimation results when only the employee shares are considered

	Estimated coefficients
Total labor input in SQ's	0.332 (0.0224)*
Informal employee share in SQ	0.825 (0.231)*
Formal employee share in SQ	0.635 (0.156)*
Average productivity: less than 15% informal employee share	4.66 (0.988)*
Average productivity: more than 15% informal employee share	5.35 (0.923)*
Adjusted R^2 * SE in parentheses at 95% confidence level	0.61

 Source: Own estimations

From the results it is clear that both formal and informal employee categories are both productive inputs (positive estimated coefficients). The informal employee segment has a higher positive productivity spillover effect (0.825 > 0.635). In terms of the size of the informal employee share firms with a greater informal employee share (greater than 15%) created greater positive labor productivity spillover effects. This result is in contrast with

the result of the Nelen *et al* (2009) study in which there was no substantial difference in the average productivity between the different informal employee shares.

In the second estimation employee and firm characteristics were included. The aim of this estimation was to determine whether age, tenure, the number of working hours, excess informal labor and absenteeism have any positive or negative impacts on the productivity spillover effects of the informal employee share.

Table 2: Estimation results when informal employee characteristics and firm characteristics are included

	Estimated coefficients
Total labor input in SQ's in logs	0.311 (0.0255)*
Informal employee share in SQ	0.801 (0.310)*
Formal employee share in SQ	0.608 (0.201)*
Employee characteristics Informal employee average age	0.021 (0.007)*
Informal employee tenure	0.018 (0.003)
Firm characteristics Number of informal employee working hours per week	0.015 (0.003)*
Excess informal employee ratio	-0.201 (0.061)
Absenteeism (fraction)	-0.011 (0.212)
Adjusted R^2 * SE in parentheses at 95% confidence level	0.642

 Source: Own estimations

The estimation results on the informal employee share in *SQ* versus the formal employee share in *SQ* (in Table 2) clearly indicates that even with a second estimation in which informal employee characteristics and firm characteristics are taken into consideration, informal employees were still generating greater positive labor productivity spillover effects when compared to formal employees ($0.801 > 0.608$).

In terms of informal employee characteristics it is firstly clear from the estimation results that there is a positive relation between the age of the informal employee and labor productivity (as expressed in *SQ's*). It simply means that older informal employees are more productive than younger informal employees. A plausible reason might be that older informal employees have already gained the necessary skill levels. This is in contrast with the result of the Nelen *et al* (2009) study which indicated a negative relationship between age and labor productivity. In their study the argument was made than younger informal employees have more up-to-date knowledge which might impact positively on the productivity of other employees. Secondly, the results also indicated a

positive relationship between informal employee tenure and labor productivity. Longer informal employee tenure created higher positive productivity spillover effects. A plausible reason might be the accumulation of a greater level of job experience.

In terms of firm characteristics it is firstly clear from the estimation results that there is a positive relationship between the number of working hours of informal employees and labor productivity. More working hours for informal employees generated greater positive productivity spillover effects. This result is also in contrast with the Nelen *et al* (2009) study in which no significant relationship between the number of informal employee working hours and labor productivity was reported. Secondly, the estimation results indicated a negative relationship between excess informal employee ratio and labor productivity. It simply means that firms with an excess of informal employees generated less positive labor spillover effects. The Nelen *et al* (2009) study gave a plausible reason namely that an excess of informal employees decreases the workload per informal employee and thereby affects average firm productivity. Thirdly, the estimation results clearly indicate an expected negative relationship between absenteeism and labor productivity. The higher the level of absenteeism the lower labor productivity would be.

Table 3: Estimation results (productivity per SQ in logs as the dependent variable) when external market factors are included

	Estimated coefficients
Total labor input in SQ's in logs	0.301 (0.0212)*
Informal employee share in SQ	0.877 (0.344)*
Formal employee share in SQ	0.461 (0.202)*
Employee characteristics	
Informal employee average age	0.023 (0.009)*
Informal employee tenure	0.013 (0.002)
Firm characteristics	
Number of informal employee working hours per week	0.027 (0.008)*
Excess informal employee ratio	-0.204 (0.064)
Absenteeism (fraction)	-0.014 (0.201)
External factors	
Demand for fitting new tyres (volume of past three years)	0.457 (0.113)
Degree of competition (number of firms within the geographical sample area)	0.002 (0.003)
Adjusted R^2	0.571
* SE in parentheses at 95% confidence level	

Source: Own estimations

The third estimation on the productivity spillover effects of informal employees specifically included external market factors namely i) the variation in the demand for the fitting of tyres and ii) the degree of competition in the geographical sample area. The results of the third estimation are reported in Table 3.

The estimation results on the informal employee share in *SQ* versus the formal employee share in *SQ* (in Table 3) clearly indicates even greater labor productivity spillover effects for the informal employee segment (compared to the formal employee segment) when external market factors were added to the estimation ($0.877 > 0.461$). A plausible explanation for this particular result can be attributed to the fact that an increase in demand (during certain peak periods) creates a greater demand for informal employees and in return resulting in greater positive productivity spillover effects. It is interesting to note that the positive relationship between the degree of competition in the geographical area and the productivity spillover effects of informal employees is very weak (as indicated by the relative insignificant estimation result). A plausible explanation is that the firms in this particular industry are most probably well informed on actual and potential competition in their geographical area and that they would have taken it into account when deciding on the composition of their labor force.

DISCUSSION AND CONCLUSIONS

The aim of the study was to estimate the sign and magnitude of the labor productivity spillover effects of informal employment in the services industry of the South African economy.

Given the average low labor productivity levels in the South African economy combined with highly restrictive labor legislation, the results of this particular study might have implications for the employment policies (specifically the composition of the workforce) for firms (especially in the services sector). The results of the study confirmed the existence of a positive relationship between informal employment and labor productivity in the services sector of the economy. This is especially true for older informal employees with a longer tenure record. In the sample group, firms with a greater level of informal employees created higher positive labor productivity spillover effects (compared to firms with a smaller informal employee segment). It was also interesting to note that for the sample group a greater number of informal working hours (combined with lower levels of informal employee absenteeism) also underpinned the positive labor productivity spillover effects generated by informal employees. The estimation results clearly indicated a limit to the positive labor productivity spillover effects generated by informal employees in the sense that excess levels of informal employees will eventually result in lower productivity spillover effects.

The inclusion of external factors (in particular market demand conditions and the degree of competition in the industry) enhanced the positive productivity spillover effects even further. It was especially true in the case of variations in market demand. The estimation results clearly 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 spillover effects.

Further possible extensions of this study are twofold. Firstly, it would be worthwhile conducting the same study for different industries (such as manufacturing, mining and construction industries) in order to determine whether there are industry-related differences in the productivity spillover effects generated by informal employment. Secondly, it would be valuable to develop a measuring instrument that would determine the labor productivity maximization cap of informal employment.

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