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Evaluating the effectiveness of a gainsharing programme for labour productivity improvement

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Orientation: Companies are faced with the challenge of promoting innovation for productivity improvement among employees. They create a work environment that promotes worker participation for productivity improvement. This sentiment underpins the concept of gainsharing.

Purpose: This study evaluated the effectiveness of a gainsharing programme for productivity improvement in automotive parts manufacturing companies in South Africa (SA).

Motivation for the study: SA's labour productivity, in the manufacturing sector, is low when compared with Korea, the United States of America, Taiwan, Japan, France and the United Kingdom. Hence, this study focused on gainsharing, given the low labour productivity levels in the South African manufacturing industries.

Research design, approach and method: The two automotive parts manufacturing companies that have adopted a gainsharing strategy participated in the study. A third automotive parts manufacturing company that has adopted the 360-degree performance appraisal system was included for comparative purposes. These companies operated in the eThekwini District Municipality in KwaZulu-Natal. Study objectives were achieved by collecting pre- and post-quarterly data for spoilage, absenteeism, capital investment and labour productivity.

Main findings: Results established that gainsharing improves productivity and reduces spoilage and absenteeism rates.

Managerial implication: The South African companies are encouraged to revise their reward philosophies and develop strategies, policies and practices that help achieve productivity goals and support organisational change.

Contribution: Gainsharing is a desirable alternative as it contributes to raising the competence levels and productivity improvement of an organisation. As a comparison, the 360-degree performance appraisal does not have an impact on labour productivity.

Introduction

Despite the contraction of economic activity in 2009, the tepid recovery in 2010 and the overall soft labour market conditions, the real wage continued to increase rapidly in SA, outpacing the growth of labour productivity (Klein 2012). Consequently, companies are turning to their employees for creative suggestions and ideas on better ways of doing things. This initiative promotes innovation in productivity improvement among employees. As a result, companies are encouraged to revise their reward philosophies and develop reward strategies, policies and practices that help achieve new business goals and support organisational and cultural change. Fourie (2008) states that the organisational effectiveness depends on appropriate reward systems and that, in order to maximise performance, a comprehensive performance policy must be developed that aligns pay (or other incentives) to performance. Gainsharing is an incentive strategy that meets these requirements (Armstrong 2010). It is about improving productivity and attracting and retaining high achievers as well as creating a working environment that encourages worker participation (Rondeau 2007). It also provides the opportunity for linking improved performance to improved compensation and is a means of creating the kind of workplace that attracts motivated risk takers and work teams. Gainsharing is a tool to increase productivity as out-of-pocket expenses are generally low, because any payouts accrued by workers are linked to future unit performance, and any realised gains are distributed between employees and the company (Rondeau 2007). An effective gainsharing programme involves a diverse set of factors. For instance, profitability, labour costs, material savings and, most importantly, employee participation and involvement (Ritson 2008). Hence, this study evaluates whether gainsharing is responsible for the improvement of labour productivity in the automotive parts manufacturing sector. In comparison with the 360-degree performance appraisal system, it determines if gainsharing is a suitable tool for labour productivity improvement.

Literature review

This section discusses the overview of a gainsharing programme. It elaborates how gainsharing improves performance.

Brief overview of gainsharing programme

This section commences by defining a gainsharing programme. Its framework for employee participation is explained, and the experiences of US-based companies using a gainsharing programme conclude it.

According to Armstrong (2010), gainsharing is a formula based company wide programme that offers employees a share in the financial gains of a company as a result of its improved performance. Employee involvement is a cornerstone in the success of the gainsharing programme. The involvement is systematic as employees are involved at all the stages of implementation including the design and periodic evaluation (Armstrong 2010). For gainsharing to be successful, Masternak (2009) concurs that it must link two of the most important areas in organisational behaviour, namely employee participation and positive employee involvement. Under gainsharing schemes, knowledge sharing is formalised through an employee suggestion system. Workers are encouraged to participate in various ways. For instance, they write down their cost-saving ideas and submit them to a committee, generally made up of employee and management representatives, who determine the viability of the suggestion (Masternak 2009). The monetary savings from implemented suggestions are calculated using a formula based on historical cost data. These savings become part of a pool of money that is distributed to all participating employees in the form of a gainsharing bonus or reward (Henemen & Von Hippel 2005). Although the financial element is a key feature of gainsharing, its strength as a process for improving performance lies in other important features such as ownership, involvement and communication (Armstrong 2010).

The participation structure of gainsharing varies by organisation and tends to grow and evolve over time (Masternak 2009). Initially, involvement may be as small as conducting regular communication meetings or as major as forming self-directed work teams (Armstrong & Stephens 2005). However, Rondeau (2007) notes that team-based suggestion systems are common gainsharing participation structures. Basically, employee involvement teams are formed to solicit and review performance improvement suggestions from other members of the workforce. The groups are permanent and meet on a regular basis to approve and implement ideas within their spending authority. Suggestions that are approved by teams, but are beyond its spending authority, are advanced to a higher level review or steering teams.

Roman (2009) investigated how making changes to a team-based incentive programme affected productivity, product quality and absenteeism in three large manufacturing plants in Texas (in the USA). Results indicated that there were significant improvements in all of these areas. Furthermore, the investigation noted that changes in organisations must be linked to changes in incentive schemes if they are to be continuously successful. Irrespective of the employee involvement system the organisation chooses, it is critical that all the problems or challenges are addressed, questions are answered and employee ideas are given proper consideration. Hietpas (2008), in a study of gainsharing in the building industry in the USA, identified employee involvement at all stages of programme implementation as vital. Hietpas (2008) noted that meetings between middle- and upper management and employees must take place frequently so that discussions about important issues do not get ignored. The aforementioned are key issues in separating gainsharing successes from gainsharing failures.

Gainsharing as a tool for performance improvement

Gainsharing in various sectors of economic activity is increasing (Weiss 2006). It is regarded as a compensation system that includes employees in plans to improve performance so that they (and management) share any gains. Bowey (2003) contends that companies without clearly stated objectives generally have unsuccessful compensation plans. Successful companies, in contrast operate their plans as part of a holistic approach, involving senior management support and a wide range of team-building, performance management and communication initiatives. As a result, gainsharing should be viewed as a complex organisational development intervention and not simply as an incentive system (Matthew & Sanjiy 2005). As such, gainsharing programmes are not quick fixes to inherent problems but are devices that take advantage of a focused organisational strategy that combines employee participation and an incentive system. Fundamentally, gainsharing rewards motivate employees and save the company money (Gardner 2011). Hence, if high productivity is required over a short period, incentives offered are better than the normal pay.

Employees under gainsharing reward structures are expected to engage in more cooperative behaviours, including sharing their ideas for saving costs and improving production, more so than employees under more competitive, individual-based compensation systems (Tjosvold 2004). Gainsharing offsets one of the downsides of flatter structures, namely fewer promotion opportunities. It raises the level of both intrinsic and extrinsic rewards, particularly for that portion of the workforce that is predisposed to making an extra effort. It helps motivated employees take a keener interest in organisations that do not offer promotion as an incentive (Tsui 2003). Therefore, gainsharing enables the organisation to recognise its employees' creativity and intelligence in ways other than by increasing their rank or formal status. The organisational perspective of gainsharing is linked to organisational behaviour that plays a pivotal role in understanding employee behaviour (Wellbourne & Gomez-Mejia 2011). In this regard, employees must perceive that gainsharing is properly set up and that procedures are fair and objective. Snee and Hoerl (2003) suggest the factors that must be addressed when creating an effective framework for unbiased gainsharing programmes. This includes the utilisation of an easy-to-understand formula that tracks those variables that directly affect an organisation's strategic performance and a regular programme evaluation (at least annually). This involves developing metrics to assess programme performance, creating procedures for revising the bonus formula and using a process for communicating the programme's changes. It must clarify employee involvement during design, implementation and periodic evaluation. Organisations that solicit employee input regarding programme design tend to have programmes that outperform designed systems (Gardner 2011). Gainsharing is a base reward system that pays at a current market level. It is not a substitute for salaries below the market level (Wellbourne & Gomez-Mejia 2011). It is designed for and works best when augmenting a base salary system that reflects market conditions. The success of a system relies partly on the subject matter expected to guide the design process. In addition, the product or service line must be stable. Organisations that have relatively stable product or service lines, or an ability to develop a stable formula, tend to have the highest success rate.

In the USA, Brazil and parts of Europe, gainsharing creates a working environment that encourages worker participation and provides opportunity for linking improved performance to better compensation (Wellbourne & Gomez-Mejia 2011). According to Leitman et al. (2010) in the private health sector in the USA, a pay-for performance programme introduced at a large private hospital between July 2006 and June 2009 resulted in a $25 million reduction in costs. The gainsharing programme proved an incentive for medical staff to reduce hospital costs while maintaining quality care. At Ford Motor Company (in the USA), employees at dealerships are given purchasing incentives (Sachin & Roble 2008). If they can buy the part below the normal purchase price, they get a share of the overall savings that are made. The aforesaid findings bring important perspectives to the effectiveness of gainsharing in a global context.

Hypothesis

The study is based on the following assumption:

H1: The implementation of a gainsharing programme leads to labour productivity improvement in the automotive parts manufacturing companies.

Ho: The implementation of a gainsharing programme does not lead to labour productivity improvement in the automotive parts manufacturing companies.

Having presented the main hypothesis for this study, Table 1 lists the study sub-hypothesis.

TABLE 1: The sub-hypotheses for the study.

Sub-hypothesis	Code	Description
1	H2	An increase in the spoilage rate increases labour productivity in the automotive parts manufacturing companies
	Ho	An increase in the spoilage rate decreases labour productivity in the automotive parts manufacturing companies
2	H3	An increase in the absenteeism rate increases labour productivity in the automotive parts manufacturing companies
	Ho	An increase in the absenteeism rate decreases labour productivity in the automotive parts manufacturing companies
3	H4	An increase in the allocation of workers in production increases labour productivity in the automotive parts manufacturing companies
	Ho	An increase in the allocation of workers in production decreases labour productivity in the automotive parts manufacturing companies
4	H5	The accumulation of past capital investments increases labour productivity in the automotive parts manufacturing companies
	Ho	The accumulation of past capital investment decreases labour productivity in the automotive parts manufacturing companies

Source: Author's own work

Methodology

The method for this research will be discussed under the following headings, namely research design and approach, companies that participated in the study, data collection, measurement of data and data analysis.

Research design and approach

This study was quantitative in nature. Bryman and Bell (2007) explain that the quantitative approach involves the use of statistical procedures to analyse the data collected. Consequently, after the measurement of the relevant variables, the scores were transformed using statistical methods. The study was also conclusive in design. Conclusive studies are meant to provide information that is useful in reaching decision-making (Yin 2008).

Companies that participated in the study

The study is comparative in nature using quantitative research tools. A convenience sample utilising three large companies that are in the automotive parts industry situated within the eThekwini District Municipality in the Province of KwaZulu-Natal in SA was used. The two companies that adopted gainsharing as an incentive strategy agreed to participate in the study. They are identified as companies A and B. The third company, which adopted a 360-degree performance appraisal system, is identified as company C and is included in the study for comparative purposes. Company A had 1005 employees, whereas company B had 1300 employees, and both operate a three-shift system. Company C uses a 360-degree performance appraisal system and also operates a three-shift system. It is situated in the same municipal area and has 1400 employees.

Data collection

The collection of data from two automotive parts manufacturing companies (A and B) was carried out in two phases. The first phase involved the collection of pre- and post-gainsharing results for spoilage, absenteeism, capital investment and labour productivity. The pre-gainsharing results were quarterly data reflecting each company's performance over the 3 years prior to gainsharing implementation. This includes data from the first quarter of 2005 to the final quarter of 2007 (2005Q1–2007Q4). The post-gainsharing data reflect the company's performance for the period of 3 years after the implementation of gainsharing. This involves data from 2008Q1 to 2010Q4. In the period between the 2011 and 2016, both companies A and B were involved in labour restructuring. This emanated from the strategic changes that took place in the motor assembly plant of the company they are supplying. Hence, the data from the restructuring period were excluded from the study. The next part of the study involved collecting pre- and post-quarterly data for spoilage, absenteeism, capital investment and labour productivity from the other automotive parts manufacturing company (C) that uses a 360-degree performance appraisal system. Company C's data set ranges from 2004Q1 to 2009Q4. However, they adopted the 360-degree performance appraisal system in 2007Q1. The reason for including company C in the study was to compare gainsharing results with a different incentive system.

Time series data and analysis

The company's quarterly time series data on labour productivity, spoilage, absenteeism, number of workers involved in production and investment were used. Although companies A and B are relatively similar in nature, the researcher pooled the data from the two companies for an optimum sample size so that statistically valid results could be obtained. The measurements were based on 22 observations (after adjustments) per company. Therefore, the results are based on the total of 44 observations. Similarly, company C's quarterly time series data on absenteeism, labour productivity and spoilage rates were used. The measurements were based on the total of 24 observations.

Additionally, a dummy variable that assumed the value of 0 and 1 to represent the pre- and post-gainsharing periods, respectively, was introduced into the ordinary least squares (OLS) model. The aim was to isolate the pre- and post-labour productivity effects. Consequently, if gainsharing proved to be a useful strategy in raising labour productivity levels, this would result in a statistically significant coefficient on the dummy variable.

Hence, the favourable findings regarding the co-integrating tests enabled the study to engage in quantitative analysis involving OLS in order to quantify the magnitude of the effectiveness that the implementation of gainsharing has had on labour productivity. Co-integration provides evidence of a long-run relationship between variables (Juselius 2006).

The OLS model used was as follows:

Labour productivity = Bo + B1 Spoilage + B2 Absenteeism + B3 Number of workers involved in production + B4 Investment + B5 Pre/Post-dummy

The above model assumes that labour productivity is a function of spoilage rate, absenteeism rate, the number of workers involved in production, investment and gainsharing strategy. The investment variable is the labour productivity lagged by 1 period (i.e. 1 quarter). This variable aims to capture previous machinery input (i.e. past capital investment).

For the study to achieve its objective, stationarity tests (as shown in Table 2) were conducted in order to determine the status of the variables.

The results for both companies' (A and B) pooled data indicate that the variables exhibit mixed orders of integration. If one ran the OLS models that had non-co-integration level

TABLE 2: Augmented Dickey Fuller stationarity test results.

Variables	Company	Level	First difference	Critical values with percentage significant levels	Conclusion
Labour productivity	A	-0.929	-3.952	-3.831 (1%)	Stationary after 1st differencing
	B	0.603	-4.258	-3.809 (1%)	Stationary after 1st differencing
	C	-4.345	-	-3.739 (1%)	Stationary in levels
	AB	-1.559	-5.780	-3.597 (1%)	Stationary after 1st differencing
Spoilage rate	A	-3.628	-6.685	-3.809 (1%)	Stationary after 1st differencing
	B	-2.844	-6.817	-3.809 (1%)	Stationary after 1st differencing
	C	-3.295	-3.752	-3.674 (5%)	Stationary after 1st differencing
	AB	-5.470	-	-4.186 (1%)	Stationary in levels
Absenteeism	A	-4.731	-	-3.788 (1%)	Stationary in levels
	B	-4.853	-	-3.809 (1%)	Stationary in levels
	C	-5.392	-	-3.738 (1%)	Stationary in levels
	AB	-6.573	-	-4.186 (1%)	Stationary in levels
Number of workers	A	-0.875	-5.387	-3.809 (1%)	Stationary after 1st differencing
	B	-0.982	-5.194	-3.809 (1%)	Stationary after 1st differencing
	C	-1.719	-4.837	-3.752 (1%)	Stationary after 1st differencing
	AB	-1.663	-6.325	-3.597 (1%)	Stationary after 1st differencing

Source: Calculated from research data

The data set spanned 2005Q1 to 2010Q4 for companies A and B. Data set for company C spanned from 2004Q1 to 2009Q4.

The stationarity tests for all (except spoilage rate for companies C and AB) were conducted on the assumption of intercept and no trend was used.

Company AB represents the pooled data for companies A and B.

All the critical values are based at the 1% significance level, except for spoilage rate of company C which was based at the 5% significance level.

A battery of other unit root tests (not reported) confirmed the above Augmented Dickey Fuller (ADF) test results.

variables, this could have resulted in spurious regressions. As a result, the tests in Table 3 were carried out on the assumption that the co-integrating vector comprises the labour productivity, spoilage rate, absenteeism, number of workers and the exogenous policy dummy variables.

The above tests show that the variables of companies A and B have a co-integrating relationship. This reflects that there is more than one co-integrating relationship in the pooled data of companies A and B (also shown as AB) in Table 3. This indicates that the results in Tables 4 and 5 consist of statistically valid relationships that could represent long-run relationships. However, results for company C show that there are no co-integrating relationships between the variables under consideration. This implies that the related OLS regressions for company C in Tables 4 and 5 contain variables that do not have long-run relationships.

Study results

Labour productivity results for companies A, B and C

Table 4 presents the comparative results of labour productivity as a dependent variable to absenteeism and spoilage rates, the number of workers involved in production, as well as dummy variables (for gainsharing and 360-degree performance appraisal).

Labour productivity as a dependent variable to spoilage rate

Results for companies A and B in Table 4 show that spoilage rate has no relationship to labour productivity. This is determined by the *t*-values of -1.33 for company A and 0.09 for company B. Both results are below the critical *t*-value of 2.08, thus rejecting the assumption of a significant relationship between the two variables. However, the results for company C show that spoilage rate has a relationship and is statistically significant to labour productivity as shown by its *t*-value of 3.61, which is above the critical *t*-value of 2.06 at the 5% level of significance. The positive relationship indicates that any

TABLE 4: Labour productivity data for spoilage and absenteeism rates, number of workers in production and dummy variables.

Regression	Coefficient	*t*-statistic	Probability
Model 1: Company A regression			
Constant (Bo)	-8.682901	-3.763349	0.001500
Spoilage rate	-0.055950	-1.326403	0.202300
Absenteeism rate	0.001439	0.044748	0.964800
Number of workers	1.934386	5.700135	0.000000
Gainsharing dummy	0.178659	4.006333	0.000900
R-squared	0.940099	F-statistics	66.70077
Adjusted R^2	0.926005	Prob (F-statistic)	0.000000
S.E. of regression	0.061079	Mean dependent var.	4.528331
S.D. dependent var.	0.224537	Durbin–Watson stat.	1.196897
Model 2: Company B regression			
Constant (Bo)	13.63182	3.444978	0.003100
Spoilage rate	0.092150	0.850904	0.406600
Absenteeism rate	0.107928	1.681369	0.111000
Number of workers	-1.369704	-2.415123	0.027300
Gainsharing dummy	0.616282	6.579194	0.000000
R-squared	0.8256680	F-statistics	20.13048
Adjusted R^2	0.784664	Prob (F-statistic)	0.000003
S.E. of regression	0.100087	Mean dependent var.	4.597399
S.D. dependent var.	0.215684	Durbin–Watson stat.	1.945990
Model 3: Company C regression			
Constant (Bo)	-43.89323	-1.566675	0.132100
Spoilage rate	0.561978	3.61252	0.001600
Absenteeism rate	0.206197	1.25233	0.224200
Number of workers	6.749395	1.733268	0.097700
360˚ dummy	-0.00692	-0.029883	0.976400
R-squared	0.453045	F-statistics	4.348594
Adjusted R^2	0.348863	Prob (F-statistic)	0.010202
S.E. of regression	0.301106	Mean dependent var.	5.748966
S.D. dependent var.	0.373150	Durbin–Watson stat.	1.320818

Source: Calculated from research data

Model 1, Company A regression notes: The OLS estimation is based on the equation: Productivity = Bo + B1 Past capital investment + B2 Spoilage + B3 Absenteeism + B4 Number of workers + B5 Gainsharing dummy. Regression data: 2005Q1–2010Q4. 22 observations after adjustment.

Model 2, Company B regression notes: The OLS estimation is based on the equation: Productivity = Bo + B1 Past capital investment + B2 Spoilage + B3 Absenteeism + B4 Number of workers + B5 Gainsharing dummy. Regression data: 2005Q1–2010Q4. 22 observations after adjustment.

Model 3, Company C regression: Productivity = Bo + B1 Past capital investment + B2 Spoilage + B3 Absenteeism + B4 Number of workers + B5 Post-360° dummy. Regression data: 2004Q1–2009Q4. 24 observations.

OLS, ordinary least squares, S.E., standard error, S.D., standard deviation, Prob, probability, stat., statistics, var., variable.

TABLE 3: Johansen trace and maximum eigenvalue statistics for co-integrating vector.

Company	Trace test			Maximum Eigenvalue test		
	No. of hypothesised co-integrating equations	Trace statistic	5% critical value	No. of hypothesised co-integrating equations	Maxi-Eigen statistic	5% critical value
A	Ho: r = 0, H1: r ≥1	63.78**	47.86	Ho: r = 0, H1: r =1	34.78**	27.58
	Ho: r ≤1, H1: r ≥2	29.00	29.80	Ho: r ≤ 1, H1: r = 2	13.58	21.13
B	Ho: r = 0, H1: r ≥1	53.28**	47.86	Ho: r = 0, H1: r =1	30.57**	27.58
	Ho: r ≤ 1, H1: r ≥2	22.70	29.80	Ho: r ≤ 1, H1: r = 2	14.47	21.13
C	Ho: r = 0, H1: r ≥1	58.96	63.87	Ho: r = 0, H1: r = 1	26.57	32.12
	Ho: r ≤ 1, H1: r ≥2	32.39	42.92	Ho: r ≤ 1, H1: r = 2	18.05	21.13
AB	Ho: r = 0, H1: r ≥1	84.96*	47.86	Ho: r = 0, H1: r = 1	40.76*	27.58
	Ho: r ≤ 1, H1: r ≥2	44.20*	29.80	Ho: r ≤ 1, H1: r = 2	27.21*	21.13
	Ho: r ≤ 2, H1: r ≥3	16.98**	15.50	Ho: r ≤ 2, H1: r = 3	16.57**	14.26
	Ho: r ≤ 3, H1: r ≥4	0.412	3.841	Ho: r ≤ 3, H1: r = 4	0.412	3.841

Source: Calculated from research data

An unrestricted vector autoregression (VAR) of lag order two (that is, p = 2,) was used; hence, the differenced vector error correction model had a lag order of 1. The selection of the lag order was based on discretion because of small data size.

Companies AB represent pooled data of companies A and B.

Models of companies A and B were based on the assumption that the level of data and co-integrating equations have linear trends.

Models for company C as well as company AB were based on the assumption that the level of data has co-integrating equations and linear trends.

*, and **, denotes that the statistics under consideration are significant at the 1% and 5% significance levels, respectively.

TABLE 5: Illustrates labour productivity data as a dependent variable to past capital investment (lagged by 1 quarter).

Regression	Coefficient	*t*-statistic	Probability
Model 1: Company A regression			
Constant (Bo)	-1.387463	-0.784840	0.444800
Past capital investment (lagged by 1 quarter)	0.810535	6.547857	0.000000
Spoilage rate	0.041050	1.499065	0.154600
Absenteeism rate	-0.002225	-0.127798	0.900000
Number of workers	0.323907	1.010184	0.328400
Gainsharing dummy	0.079908	2.827210	0.012700
R-squared	0.983569	F-statistics	179.5779
Adjusted R^2	0.978092	Prob (F-statistic)	0.000000
S.E. of regression	0.032805	Mean dependent var.	4.541183
S.D. dependent var.	0.221635	Durbin–Watson stat.	2.354170
Model 2: Company B regression			
Constant (Bo)	9.308245	1.886486	0.078700
Past capital investment	0.215905	1.185821	0.254100
Spoilage rate	0.075752	0.697804	0.496000
Absenteeism rate	0.086224	1.310002	0.209900
Number of workers	-0.878498	-1.332745	0.202500
Gainsharing dummy	0.474492	3.426895	0.003700
R-squared	0.846551	F-statistics	16.550470
Adjusted R^2	0.795401	Prob (F-statistic)	0.000012
S.E. of regression	0.099707	Mean dependent var.	4.594075
S.D. dependent var.	0.220432	Durbin–Watson stat.	2.273307
Model 3: Company C regression			
Constant (Bo)	12.98467	0.491943	0.628400
Past capital investment	0.340728	2.328527	0.031100
Spoilage rate	0.490514	3.809934	0.001200
Absenteeism rate	0.214852	1.669034	0.111500
Number of workers	-1.405156	-0.377915	0.709700
360° dummy	0.297861	1.434140	0.167800
R-squared	0.522472	F-statistics	4.157645
Adjusted R^2	0.396806	Prob (F-statistic)	0.010139
S.E. of regression	0.234600	Mean dependent var.	5.793536
S.D. dependent var.	0.302065	Durbin–Watson stat.	2.046693

Source: Calculated from research data

Model 1, Company A regression: The OLS estimation is based on the equation: Productivity = Bo + B1 Absenteeism + B2 Spoilage + B3 Workers + B4 Post-gainsharing dummy. Regression data: 2005Q1–2010Q4. 22 observations after adjustment.

Model 2, Company B regression: The OLS estimation is based on the equation: Productivity = Bo + B1 Absenteeism + B2 Spoilage + B3 Workers + B4 Post-gainsharing dummy. Regression data: 2005Q1–2010Q4. 22 observations after adjustment.

Model 3, Company C regression: The OLS estimation is based on the equation: Productivity = Bo + B1 Absenteeism + B2 Spoilage + B3 Workers + B4 Post-360° dummy. Regression data: 2004Q1–2009Q4. 24 observations.

OLS, ordinary least squares, S.E., standard error, S.D., standard deviation, Prob, probability, stat., statistics, var., variable

increase in spoilage rate would result in an increase in labour productivity. The findings for company C must be viewed with caution. The co-integration results suggest that there is no long-run co-integrating relationship between the variables.

Labour productivity as a dependent variable to absenteeism rate

Results for the three companies as illustrated in Table 4 show that absenteeism rate has no relationship to labour productivity. This is determined by the *t*-values of 0.04 for company A, 1.68 for company B and 1.25 for company C. Values are below the critical *t*-value of 2.08 at the 5% level of significance for both companies (A and B). The value for company C is also below its critical *t*-value of 2.06, thus accepting the null hypothesis of no relationships between these two variables.

Labour productivity as a dependent variable to the number of workers involved in production variable

Results for both companies (A and B) in Table 4 show that the number of workers involved in production variable has a statistical significant relationship to labour productivity. This is determined by the *t*-values of 5.70 and -2.42 for company A and company B, respectively. Both results are above the critical *t*-value of 2.08 at the 5% level of significance, thus accepting the assumption of a relationship between the two variables. Results for company A show a positive relationship. This indicates that an increase in the number of workers involved in production increases labour productivity. Generally, the opposite is true for most companies because they are operating in the optimal region of a theoretical production function. Hence, company A might do well to raise its employment level to the region where additional labour decreases productivity. On the contrary, company B results show a negative relationship. An increase in the number of workers in production decreases labour productivity, thus implying that this company is operating in the optimal region of its production matrix. However, the results for company C show that the number of workers involved in production has no relationship to labour productivity. This is determined by its *t*-value of 1.73, which is below the critical *t*-value of 2.06 at the 5% level of significance. This result is confirmed by the co-integration test that shows the non-existence of long-run relationships.

Labour productivity as a dependent variable to dummy variables

Results for both companies (A and B) in Table 4 show that the gainsharing programme has a positive relationship and is statistically significant to labour productivity. This is determined by their *t*-values of 4.01 and 6.58 for company A and company B, respectively. Both results are above the critical *t*-value of 2.08 at the 5% level of significance, thus accepting the assumption of a relationship between the two variables. The introduction of gainsharing at both companies (A and B) resulted in an increase in labour productivity. However, the results for company C show that the 360-degree performance appraisal system has no relationship to labour productivity. This is determined by its *t*-value of -0.03 which is below the critical *t*-value of 2.06 at the 5% level of significance, thus accepting the null hypothesis of a relationship between these two variables.

Results of Table 4 show that companies A and B have an adjusted R^2 of 0.93 and 0.78, respectively. However, company C has an adjusted R^2 of 0.35. The serial correlation as determined by the Durbin–Watson statistic is low at 1.20 for company A and 1.95 for company B, when compared to the standard value of 1.99 at the 5% level of significance. Furthermore, the serial correlation is also low at 1.32 for company C when comparing it to the standard value of 1.89 at the 5% level of significance. Overall, the results are consistent with the co-integration tests displayed in Table 3, which asserts that long-run relationships between the variables exist for companies A and B, but not for company C.

Labour productivity results with past capital investment data lagged by 1 quarter

Labour productivity as a dependent variable to capital investment

Results for both companies (A and C) in Table 5 show that capital investment has a positive relationship with, and is statistically significant to, labour productivity. The accumulation of past capital investment (lagged by 1 quarter) plays a significant role in explaining current productivity increases. Results are determined by the *t*-values of 6.55 and 2.33 for company A and company C, respectively. Note that the findings in Table 5 for company C must be viewed with caution. They suggest that there is no long-run co-integrating relationship between the variables. However, both companies' (A and C) results are above their critical *t*-values of 2.08 and 2.06, respectively (at the 5% level of significance), thus accepting the assumption of a relationship between the two variables. Positive relationships indicate that past capital investments increased labour productivity for both companies. However, results for company B show that past capital investment has no relationship to labour productivity. This is determined by its *t*-value of 1.19 which is below the critical *t*-value of 2.08 at the 5% level of significance. The results for company A and company C accept the null hypothesis that past capital accumulation explains productivity rises.

Labour productivity as a dependent variable to spoilage rate

Results for both companies (A and B) in Table 5 show that spoilage rate (1 quarter after the two companies have invested capital) has no relationship to labour productivity. This is determined by the *t*-values of 1.49 and 0.70 for company A and company B, respectively. Both results are below the critical *t*-value of 2.08 at the 5% level of significance, thus accepting the null hypothesis of the relationship between these two variables. In contrast, results for company C show that spoilage rate (1 quarter after the company has invested capital) has a positive relationship, and is statistically significant to, labour productivity as shown by its *t*-value of 3.81, which is above the critical *t*-value of 2.06 at the 5% level of significance. The positive relationship indicates that any increase in spoilage rate would result in an increase in labour productivity.

Labour productivity as a dependent variable to absenteeism rate

Results for companies A, B and C in Table 5 show that absenteeism rate (1 quarter after the three companies have invested capital) has no relationship to labour productivity. This is determined by the *t*-values of -0.13, 1.31 and 1.67 for companies A, B and C, respectively. Results for both companies (A and B) are below the critical *t*-value of 2.08 (at the 5% level of significance), whereas company C's result is below its critical *t*-value of 2.06 (also at the 5% level of significance), thus accepting the null hypothesis of no relationship between these two variables.

Labour productivity as a dependent variable to the number of workers involved in production

Results for companies A, B and C in Table 5 show that the number of workers involved in production variable (1 quarter after the three companies have invested capital) has no relationship to labour productivity. This is determined by the *t*-values of 1.01, -1.33 and -0.38 for companies A, B and C, respectively. Results for both companies (A and B) are below the critical *t*-value of 2.08 (at the 5% level of significance), whereas company C's result is below its critical *t*-value of 2.06 (also at the 5% level of significance), thus accepting the null hypothesis of no relationship between these two variables.

Labour productivity as a dependent variable to dummy variables

Results for both companies (A and B) in Table 5 show that gainsharing programme (1 quarter after the 2 companies have invested to capital) has a positive relationship with, and is statistically significant to, labour productivity as shown by the *t*-values of 2.83 for company A and 3.43 for company B. Both results are above the critical *t*-value of 2.08 at the 5% level of significance, thus accepting the assumption of a significant relationship between the two variables. The positive relationship indicates that the implementation of the gainsharing programme (1 quarter after the two companies have invested capital) increased labour productivity. However, results for company C show that the 360-degree performance appraisal (1 quarter after the company has invested capital) has no relationship to labour productivity. This is determined by its *t*-value of 1.43 which is below the critical *t*-value of 2.06 at the 5% level of significance, thus accepting the null hypothesis of no relationship between these two variables.

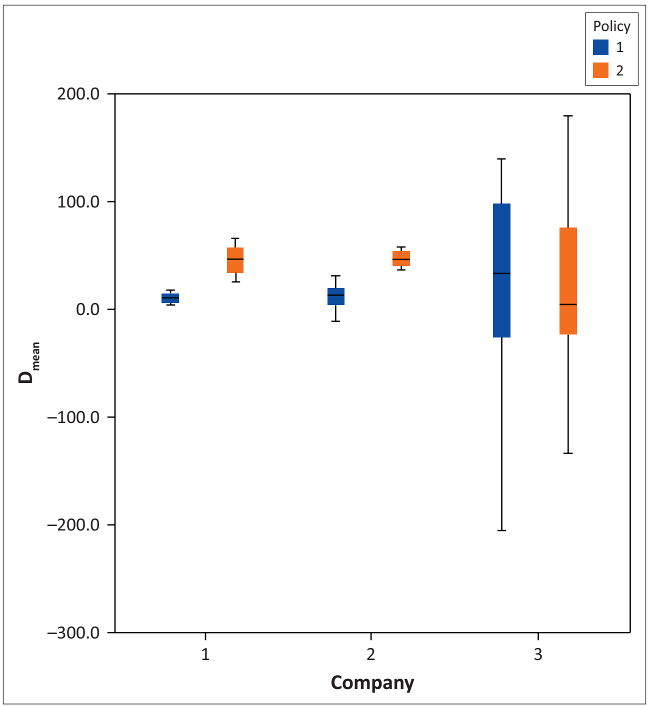
In addition, Table 5 shows that companies A and B have an adjusted R^2 of 0.98 and 0.80, respectively. However, company C shows an adjusted R^2 of 0.40. The serial correlation as determined by the Durbin–Watson statistic is acceptable at 2.35 for company A and 2.27 for company B when comparing these to the standard value of 1.99. Furthermore, the serial correlation is also acceptable at 2.05 for company C when comparing it to the standard value of 1.89 at the 5% level of significance.

Summary of results: Box plots for determining whether the normality and homogeneity of variance have been met

This section analyses data using factorial designs. It incorporates box plots to determine whether the factorial ANOVA assumptions of normality and homogeneity of variance have been met. Porkess (2005) explains that the populations represented should be normally distributed (i.e. the normality), making the mean an appropriate measure of central tendency. However, the homogeneity of variance indicates that the population from which the data are sampled should have the same variance. In this study, 'policy 1' is the pre-dummy period, whereas 'policy 2' is the post-dummy. Figure 1 represents the box plots for this study.

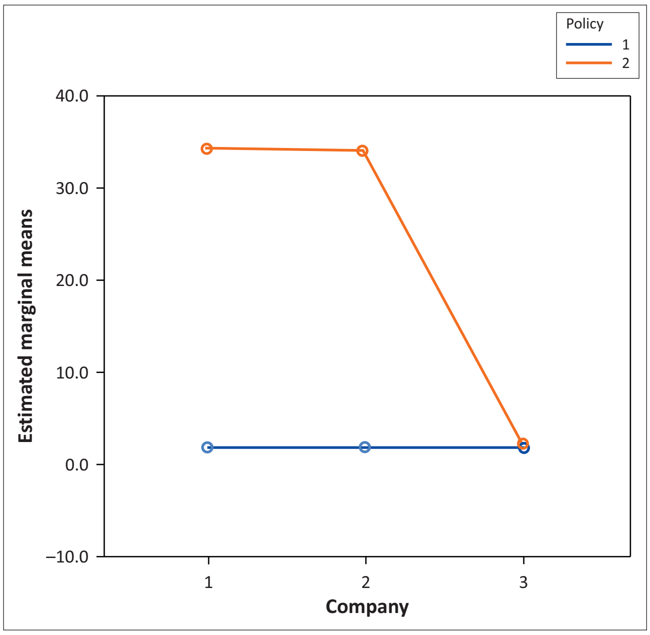
Figure 1 shows that there are similar spreads of D_{mean} for company A (labelled as company 1) and company B (labelled as company 2). Although the D_{means} are similar, the variances of company C (labelled as company 3) are much larger when compared to company A and company B. In all cases, the D_{means} for the three companies are normally distributed.

Figure 2 presents the estimated marginal means of D_{means} for companies A, B and C (labelled as 1, 2 and 3, respectively).



Source: Author's own work

FIGURE 1: Box plots determining the normality and homogeneity of variance.



Source: Author's own work

FIGURE 2: Estimated marginal means of D_{means} for companies A, B and C (labelled as 1, 2 and 3, respectively).

Figure 2 shows the interaction between the three companies. The interacting factors between the marginal means for company policy 1 (pre-dummy) and policy 2 (post-dummy) periods have yielded patterns of differences between the D_{means}. This means that policy interactions that took place between companies A and B are significant in relation to company C. The effect of marginal means of the policy variable at companies A and B is relatively different to the marginal means of company C. The mean difference is partly based on the fact that the method of operations, the product classification and policy types (i.e. gainsharing system) for companies A and B are almost similar to each other, whereas company C uses the 360-degree performance appraisal system. Thus, there are no mean changes for company C when comparing the mean changes for both companies (A and B) in relation to pre- and post-policy periods.

Therefore, the results indicate that the implementation of gainsharing improved labour productivity for companies A and B. In contrast, they indicate that the implementation of 360-degree performance appraisal does not improve labour productivity, as measured in company C. The results are confirmed by study analysis from sections 'Labour productivity as a dependent variable to dummy variables'.

Discussions

The study results indicate that absenteeism and the number of workers involved in production have no relation to labour productivity for companies A, B and C. However, spoilage rate has a relationship with labour productivity for company C. In addition, there is no relationship between labour productivity and the 360-degree performance appraisal system. The study revealed the relationship between gainsharing programme and labour productivity. The positive relationship indicates that the implementation of the gainsharing programme does increase labour productivity. This is supported by Fourie (2008) who states that the organisational effectiveness depends on appropriate reward systems.

The study also provides the comparative results of a gainsharing programme and the 360-degree performance appraisal system to labour productivity (1 quarter after the three companies have invested in capital). The results show that absenteeism and the number of employees involved in production have a relation with both the gainsharing programmes and the 360-degree performance appraisal system (1 quarter after the companies have invested in capital). In addition, there is no relation between spoilage rate and labour productivity (for both companies that have adopted gainsharing). Similarly, the results showed no relations between the 360-degree dummy variable and labour productivity. In contrast the gainsharing variable as well as capital investment (for the three companies) has a positive relation with labour productivity (1 quarter after the companies have adopted the systems). The relationship indicates that the implementation of a gainsharing programme and capital investment increase labour productivity. Hence, Rondeau (2007) indicates that gainsharing is about improving productivity and attracting and retaining high achievers as well as creating a working environment that encourages worker participation.

Implications of results for policy and practice

The South African companies are encouraged to revise their reward philosophies and develop strategies, policies and practices that help to achieve new business goals and support organisational and cultural change. This must be based on an understanding of the economic factors affecting pay, the significance of the psychological contract and the practical implications of motivation theory as it affects the provision of both financial and non-financial rewards. Besides the achievement of study objectives, the following conclusions can be made:

- The implementation of the gainsharing programme increases labour productivity in the automotive parts manufacturing companies in SA. As a comparison, the 360-degree performance appraisal does not have an impact on labour productivity.
- Capital investment plays a role in labour productivity improvement. Companies that have invested capital (after the implementation of a gainsharing programme) experience an improvement in labour productivity.

Study limitations

The study was limited to the automotive parts manufacturing industry within the eThekwini District Municipality. The investigation was conducted in two companies that have adopted gainsharing and a single one that has adopted the 360-degree performance appraisal system. As there are 378 registered automotive parts manufacturers in SA (SAinfo 2008) and the investigation was conducted on 3 of these companies (representing 0.79%), the result cannot be generalised to other companies within the industry. Lastly, the econometrics model used was of the OLS variety, solely because of data constraints. Future studies ought to use the more advanced Johansen VAR methodology or panel data analysis, both of which rely on large data sets.

Conclusion

In order to maximise performance, a comprehensive performance policy must be developed, which aligns pay (and other incentives) to performance. Gainsharing creates a working environment that encourages worker participation and provides opportunity for linking improved labour productivity to compensation. However, it is not a quick fix for inherent problems. Hence, the results indicate that there is no relationship between both absenteeism and the number of workers in production and labour productivity under a gainsharing programme.

Future research required

The nature of this study did not allow the investigation to determine the long-term labour productivity survival to a wider sector of economic activity. It is recommended that future studies should examine the following issues in greater depth:

- when to use and when not to use a gainsharing programme or 360-degree performance appraisal system
- the applicability of gainsharing to other industrial sectors
- a more comprehensive investigation should be carried out using a randomised sample of the registered automotive component manufacturers that use gainsharing to see if the results can be generalised.

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Competing interests

The author declares that he has no financial or personal relationships that may have inappropriately influenced him in writing this article.

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