Geographical and industry differences on remuneration gap-enhanced labour productivity levels in a developing economy: South Africa as a case study

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Abstract

The aim of the article was to determine the geographic and industry differences for employee-remuneration gap-enhanced labour productivity levels in a developing economy. The Winter-Ebmer and Zweimuller model was used to estimate the signs and magnitudes of the employee-remuneration gap-enhanced labour productivity levels for the different industries in the different geographical areas. The estimation results for all three industries indicated a significant difference between the higher gross geographical product (GGP) provinces and the lower GGP provinces in terms of the employee-remuneration gap-enhanced labour productivity indicator coefficients (*ERGLP* indicator coefficients). The negative sign of the *ERGLP* indicator coefficients for the industries of some of the lower GGP provinces relates to the non-existence of any possible positive labour productivity effects that might stem from employee-remuneration gaps. The introduction of business uncertainty resulted in smaller *ERGLP* indicator coefficients across all industries and geographical areas. The impact was much more severe in the case of the lower GGP provinces

Keywords

Employee-remuneration gap, gross geographical product, employee-remuneration gap-enhanced labour productivity effects, employee-remuneration gap labour productivity (ERGLP) indicator coefficient, skills levels, business uncertainty, labour, labour economics.

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1. INTRODUCTION

The aim of the article was to determine the geographic and industry differences for employee-remuneration gap-enhanced labour productivity levels (greater remuneration levels are instituted for different employee categories with the sole aim of enhancing labour productivity levels for those particular employee categories) in a developing country (South Africa was used as a case study).

In this article the debate between the opponents of broadening remuneration gap dispersion in the workplace and the defenders for the necessity of employee- remuneration gaps was specifically broadened in order to investigate possible industry and geographical differences in this regard.

An extensive study on the link between employee remuneration dispersion and labour productivity in the manufacturing sector of the Gauteng Province of South Africa (Van Zyl, 2010) established a positive link between remuneration gaps and labour productivity. Employee-remuneration gap labour productivity indicator coefficients (hereafter referred to as *ERGLP* indicator coefficients) were estimated. Positive *ERGLP* indicator coefficients are an indication that greater remuneration levels for certain employee categories resulted in higher levels of labour productivity while negative *ERGLP* indicator coefficients are an indication that higher remuneration levels did not result in higher productivity levels. The results of this particular study indicated that the positive remuneration gap impact on labour productivity was i) greater in the higher-skilled employee segment and ii) in general weaker in a highly uncertain business environment. Similar positive links between employee-remuneration gaps and labour productivity were established by various international studies (Mahy, Rycx and Voral, 2009; Martins, 2008; Pfeffer and Langton, 1993 and Eriksson, 1999). In these particular studies it was argued that positive employee-remuneration gap-enhanced labour productivity effects are due to the fact that skill levels are advanced by higher levels of employee-remuneration gaps and that higher levels of labour productivity are stimulated by the implementation of higher remuneration structures.

In the Winter-Ebmer and Zweimuller model a quadratic format of the remuneration-gap dispersion was also estimated in order to determine any possible marginal productivity characteristics that would indicate optimal remuneration levels beyond which no positive employee-remuneration gap-enhanced labour productivity effects are possible. Van Zyl (2010), Mahy et al. (2009), Bingley and Eriksson (2001) and Martins (2008) indicated that the positive employee-remuneration gap-enhanced labour productivity effects are not infinite due to the clear existence of diminishing marginal productivity characteristics.

Mahy et al., (2009), Van Zyl (2010), Belfield and Marsden (2003), Foss and Laursen (2005), Lallermond (2007) and Jirjahn and Kraft (2007) are of the opinion that realistic estimations of employee-remuneration gap-enhanced labour productivity effects require the inclusion of important general employee characteristics (size of the labour force, % male and % female, age and the different occupations), detail on the different skill levels (higher- and lower-skilled employees), remuneration structures (including performance-linked regimes for different skilled employees) and some measure of business uncertainty (high or low) in the estimation process.

International studies (Goschin, 2007; Millea, 2002; and Feldstein, 2008) that were done on industry and geographical differences on employee-remuneration gap-enhanced productivity levels are exclusively focused on developed economies. The results of these studies indicate that

i) the *ERGLP* indicator coefficients between the more economically industrialised countries are relatively small, but greater when compared to the less industrialised countries
ii) the *ERGLP* indicator coefficients are generally greater in the case of the more substantive urban areas
iii) the *ERGLP* indicator coefficients are also generally greater in the case of the financial services industry when compared with the *ERGLP* indicator coefficients of the manufacturing and retail sectors of these economies
iv) the *ERGLP* indicator coefficients tend to be greater for the higher-skilled category of all industries in all these countries and
v) the relative size of the *ERGLP* indicator coefficients tends to decrease when economic growth slows down.

2. RESEARCH DESIGN

2.1 Research approach and method

The research design comprise

i) the specification of an econometric model that would capture the geographical and industry differences of the employee-remuneration gap-enhanced labour productivity levels,
ii) the identification of the different geographical areas and the relevant industries,
iii) the statistical validation of the required sample of businesses and the data collected in the selected industries and geographical areas, and
iv) the estimation process and the interpretation of the estimation results.

2.2 Model specification

As was the case in the Mahy et al. (2009) and Van Zyl (2010) studies, the Winter-Ebmer and Zweimuller (1999) model was also used in this particular study as it could cater for the estimation of the various ERGLP indicator coefficients for the different geographical regions and industries. The model specifically included all the general employee characteristics, the different skill categories and a measure of the level of business uncertainty. ERGLP indicator coefficients for employee characteristics and the subsequent inclusion of skill categories and business uncertainty could be estimated for all the proxy industries and the proxy areas.

The first set of regressions (log-linear) was performed for average employee remuneration based on general employee characteristics per industry in the different geographical areas (van Zyl, 2010 and Mahy et al., 2009).

$$\mathrm{L}_n\, r_{\mathrm{nm}} = \beta_0 + c_{\mathrm{nm}}\, \beta_1 + \varepsilon_{\mathrm{nm}} \qquad \textbf{(1)}$$

(r_{nm} denotes the average monthly remuneration of employee n in organisation m, c_{nm} represents the vector that concerns employee and skills characteristics and $\varepsilon_{\mathrm{nm}}$ is simply the error term)

The standard deviations of the estimated residuals of all the regressions done in step 1 were used as a measure of the employee-remuneration gap dispersion in order to derive a productivity equation (van Zyl, 2010 and Mahy et al., 2009).

$$\mathbf{L}_n \, \mathbf{prod}_m = \alpha_0 + \alpha_1 \, \sigma_{\mathrm{m}} \, (+\alpha_2 \, \sigma_{\mathrm{m}}^2 \;) + x_{\mathrm{m}} \, \alpha_3 + z_{\mathrm{m}} \, \alpha_4 + \mathbf{v}_{\mathrm{m}} \qquad \textbf{(2)}$$

($\mathbf{prod}_m$ represents the average labour productivity of organisation m ($\mathbf{L}_n$ of the value added per employee is used as a proxy for $\mathbf{L}_n \, \mathbf{prod}_m$), $\boldsymbol{\sigma}_{\mathbf{m}}$ is the ERGLP indicator coefficient (it is also specified in quadratic format simply to test for increasing and diminishing marginal productivity characteristics), $\boldsymbol{x}_{\mathbf{m}}$ is the aggregated employee characteristics of firm m, $\boldsymbol{z}_{\mathbf{m}}$ contains information on business/economic uncertainty (variations in net operating surplus is used as the proxy) and $\mathbf{v}_{\mathbf{m}}$ is simply the error term)

Equation (2) was run separately for each firm in the different industries and in the different geographical areas. In order to cater for multi-collinearity, equation (2) is estimated with the log of the value added per employee (defined as operating surplus / number of employees) for n-years instead of n-1 years. The assumption is that the value added of year n does not influence the remuneration structure of year n-1 (Van Zyl, 2010 and Mahy et al., 2009).

The final estimation results will be reported. The first set of estimation results concerns the general specification ERGLP indicator coefficient estimates based on employee characteristics per industry in the different geographical areas. The next set of estimation results concerns the ERGLP indicator coefficient estimates based on the different skill categories per industry in the different geographical areas. The last set of estimation results concerns the ERGLP indicator coefficient estimates for variations in the level of business uncertainty per industry in the different geographical areas.

2.3 Data collection process

Six provinces were identified as proxies for the determination of possible geographical *ERGLP* indicator coefficient differences, namely:

- Gauteng,
- Western Cape,
- KwaZulu-Natal,
- Eastern Cape,
- Limpopo, and
- the Free-State.

These six provinces were chosen on the basis of the availability of data and a realistic sample of provinces based on GGP differences (ranging from the high GGP provinces to the lower GGP provinces). Gauteng, Western Cape and KwaZulu-Natal were classified as the higher GGP provinces, while the Eastern Cape, Limpopo and the Free State were classified as the lower GGP provinces. Based on the diversification of economic activity per province and the importance of realistic comparisons, it was decided to use the manufacturing, trade and accommodation and construction industries as proxies for *ERGLP* indicator coefficient differences per industry (in the different geographical areas). Sample groups per industry and per geographical area were statistically validated.

In terms of the different employee categories, the International Standard Classification of Occupations (ISCO-88) was used (category A constitutes the more skilled employee segment

while category B constitutes the less skilled employee segment). For each firm per industry in the different geographical areas, data on the size of the workforce and % for each of categories A & B was collected. As was the case with the Van Zyl (2010) and Mahy et al., (2009) studies, these two categories were further sub-divided into large and small subcategories. In order to differentiate between the large and small components, the mean values were used (a small component was defined as less than the mean and a large component was defined as greater than the mean).

The methodology adopted in the sourcing and structuring of the required data was similar to the methodology adopted in the Van Zyl (2010) study. In terms of employee characteristics, data was collected on

i) the average age,
ii) the average gender composition (% male and % female), and
iii) the average tenure. In terms of training/education levels data was collected on the average percentages of employees per lower secondary (grade 9 and lower), upper secondary (grades 10 – 12) and tertiary education. Data on average gross monthly employee remuneration per ISCO-88 category was also collected. In order to cater for business/economic uncertainty in the *ERGLP* indicator coefficient estimations (and to calculate the annual value added per employee for each industry and geographical area), data was collected on the operating surplus (earnings before the deduction of interest expenses, taxes, depreciation and amortisation) of each firm in the sample groups (for the past three financial years).

Information on firms in the different industries and the different geographical areas was supplied by CETA, CATHSSETA, SERVICES SETA, MERSET, W&RSETA, FoodBevSETA, Department of Labour and StatSA. It was also the aim of the data collection process to make sure that the spread of firms throughout the different industries and the different geographical areas was statistically significant. In the manufacturing and construction industries, only firms that have more than eighty employees were included in the sample groups. For the trade and accommodation industry, only firms that had more than ten employees were included. Given the aforementioned constraint and statistical validation requirements, the sample response sizes were statistically significant (for all the industries in all of the geographical regions). The response sizes of the sample group per province and per industry are listed in annexure A.

The mean values (the standard deviations S_D are indicated in brackets) of the data collected on the estimation variables per industry and per geographical area are listed in Annexures B, C and D. In terms of the mean values of the data of the sample groups, it is important to note that

i) the average % category B employees in all three industries is greater for the geographical areas with the higher GGPs,
ii) the average age of employees for all three industries is younger in the lower GGP provinces,
iii) the average % male workforce participation rate for the manufacturing and construction industries in all the geographical areas is in excess of 60% (for the trade and accommodation industry, the average % split between male and female employees is more even for all the geographical areas),
iv) in terms of education and training levels the combined average % rates for the lower secondary and upper secondary levels for all industries in all the geographical areas are in excess of 80% (the average % tertiary training rates for all three the industries are in general smaller in the lowest GGP areas),

v) the average gross monthly remuneration levels for the trade and accommodation industry are generally smaller than those for the manufacturing and construction industries, and
vi) in terms of the geographical areas the average gross monthly remuneration levels are smaller for the lowest GGP areas.

3. THE ESTIMATION RESULTS

The estimation results of the general specification of the *ERGLP* indicator coefficients and the squared *ERGLP* indicator coefficients for the different industries in the geographical areas are listed in **TABLE 1**.

The general specification (in which employee characteristics are included) estimation results range from positive to some negative *ERGLP* indicator coefficients. For the higher GGP provinces the *ERGLP* indicator coefficients for all three industries indicates relatively strong positive linkages between employee-remuneration gaps and labour productivity (for the different sample groups).

TABLE 1: ERGLP indicator coefficients for the different industries in the different geographical areas

Province	*ERGLP indicator coefficient*			*Squared ERGLP*		
	M	*C*	*T*	*M*	*C*	*T*
Gauteng	2877.21 *(0.83)*	1766.23 *(0.76)*	1356.76 *(0.87)*	-2583.56 *(0.99)*	-1434.71 *(1.67)*	-1073.88 *(2.01)*
Western Cape	2011.87 *(0.95)*	1388.12 *(0.81)*	1000.67 *(1.56)*	-1945.93 *(1.34)*	-1156.33 *(0.98)*	-876.56 *(0.93)*
KwaZulu-Natal	1900.27 *(1.01)*	1698.21 *(0.79)*	1275.65 *(1.13)*	-2023.55 *(0.83)*	-1383.54 *(1.21)*	-1004.35 *(1.03)*
Eastern Cape	876.45 *(0.92)*	621.76 *(1.13)*	5.89 *(0.65)*	-1471.98 *(0.89)*	-1211.02 *(1.28)*	-957.87 *(0.67)*
Limpopo	462.22 *(1.11)*	397.55 *(0.78)*	-27.56 *(0.88)*	-285.78 *(1.18)*	-146.88 *(0.54)*	-1.76 *(1.21)*
Free State	288.48 *(1.20)*	101.62 *(0.93)*	-83.22 *(1.07)*	-148.99 *(1.31)*	-66.28 *(1.09)*	-2.07 *(0.73)*

Source: *Own estimations*

(*M = Manufacturing; C = Construction; T = Trade & industry; * A one-period lead was introduced into the estimations in order to cater for the possibility of simultaneity; * The standard errors are shown in brackets, the results are significant at a 5% confidence level and the general adjusted R^2 was 0.64)

For both Limpopo and the Free State the *ERGLP* indicator coefficients for the trade and accommodation industry are negative. This is a clear indication that employee-remuneration gaps in this specific industry in these two provinces do not enhance labour productivity. This particular finding is in line with some international studies (Erdill and Yetkiner, 2001 and Genre,

Momferatou and Mourre, 2005) that indicate a negative relationship between employee-remuneration gaps and labour productivity.

For all the industries in all of the geographical areas the sign of the quadratic estimates were negative thus, in general, indicating diminishing marginal labour-productivity characteristics beyond an optimal level of employee-remuneration gap dispersion.

The *ERGLP* estimation results, in which the different skill categories (lower-skilled/large, lower-skilled/small, higher-skilled/large and higher-skilled/small) are included in the estimations, are listed in **TABLE 2**.

The introduction of the different skill categories to the estimations resulted in positive *ERGLP* indicator coefficients for the three industries in the higher GGP provinces. The positive *ERGLP* indicator coefficients for all three industries in these provinces are greater for the higher-skilled/large and higher-skilled/small categories when compared with the lower-skilled/large and the lower-skilled/small categories. This is a clear indication that positive employee-remuneration gap-enhanced labour productivity benefits are more prevalent in the higher-skilled segment of all the industries in these provinces.

TABLE 2: ERGLP indicator coefficients for the different industries in the different geographical areas when the different skill categories are included

Province	*Skill level*	*ERGLP indicator coeffi-cient*			*Squared ERGLP*		
		M	*C*	*T*	*M*	*C*	*T*
Gauteng		1745.71	1456.67	1233.89	-1477.98	-1322.87	-965.44
		(1.01)	*(1.08)*	*(1.29)*	*(1.33)*	*(1.31)*	*(1.27)*
	LL	1804.22	1504.11	1366.52	-1502.79	-1211.67	-1088.89
	LS	*(0.99)*	*(0.76)*	*(0.73)*	*(0.81)*	*(0.93)*	*(0.74)*
	HL	5256	4225.65	3265.11	-4533.65	-3543.22	-2665.32
	HS	*(1.11)*	*(1.21)*	*(1.29)*	*(1.19)*	*(1.21)*	*(1.27)*
		3021.43	2964.67	1688.57	-2611.03	-2344.11	-1055.11
		(0.88)	*(0.84)*	*(1.09)*	*(1.05)*	*(0.65)*	*(1.43)*
Western Cape		1423.77	1299.01	956.05	-1178.09	-911.08	-647.67
		(1.29)	(1.19)	(0.94)	(1.07)	(1.13)	(1.08)
	LL	1504.77	1309.28	988.67	-1255.67	-967.03	-734.11
	LS	(1.09)	(0.82)	(1.31)	(0.88)	(1.15)	(0.87)
	HL	4133.57	3577.02	2511.57	-3076.34	-2622.11	-1255.79
	HS	(1.06)	(1.22)	(1.03)	(1.25)	(0.99)	(1.28)
		2854.81	2195.34	1076.06	-1577.45	-1176.27	-1001.57
		(0.94)	(0.77)	(0.81)	(0.78)	(1.23)	(1.31)
KwaZulu-Natal		1377.12	1102.76	901.55	-1188.05	-903.55	-655.11
	LL	*(1.02)*	*(1.09)*	*(0.75)*	*(1.13)*	*(1.07)*	*(1.18)*
	LS	1407.12	1278.08	924.98	-1200.76	-922.09	-692.56
	HL	*(1.19)*	*(1.17)*	*(1.11)*	*(0.79)*	*(0.88)*	*(0.92)*
	HS	3988.62	3044.57	2322.06	-3162.01	-2511.03	-1134.22

Province	Skill level	ERGLP indicator coeffi-cient			Squared ERGLP		
		M	C	T	M	C	T
		(1.13)	*(1.03)*	*(1.15)*	*(1.05)*	*(1.13)*	*(1.09)*
		2577.91	2077.01	1004.11	-2007.56	-1211.44	-988.45
		(0.72)	*(0.94)*	*(0.78)*	*(0.66)*	*(1.08)*	*(1.18)*
		712.88	809.45	11.09	152.88	-367.88	-2.78
		(1.29)	*(1.28)*	*(0.81)*	*(1.19)*	*(1.09)*	*(1.24)*
	LL	430.45	419.77	25.87	-188.06	-99.30	-2.23
Eastern	LS	*(1.06)*	*(1.35)*	*(1.14)*	*(0.91)*	*(0.76)*	*(0.99)*
Cape	HL	1499.77	1208.03	355.43	-497.99	-266.56	-86.56
	HS	*(1.19)*	*(0.99)*	*(1.19)*	*(1.15)*	*(1.19)*	*(1.01)*
		1000.87	922.09	87.99	-201.22	-188.56	-17.11
		(0.69)	*(1.03)*	*(0.85)*	*(0.98)*	*(1.13)*	*(1.13)*
		277.08	211.07	-57.34	-200.09	-123.71	-15.87
		(1.11)	*(1.09)*	*(0.83)*	*(0.95)*	*(1.21)*	*(1.06)*
	LL	302.56	276.99	-28.11	-234.77	-165.11	-11.47
Limpopo	LS	*(0.99)*	*(1.11)*	*(1.04)*	*(0.96)*	*(0.69)*	*(0.81)*
	HL	1411.02	1199.45	210.11	-811.57	-705.11	-89.45
	HS	*(1.06)*	*(0.81)*	*(1.19)*	*(1.08)*	*(1.07)*	*(1.01)*
		911.49	884.56	71.56	-604.77	-613.59	-50.34
		(0.81)	*(1.12)*	*(0.76)*	*(0.73)*	*(1.21)*	*(1.09)*
		212.06	188.77	-71.03	-125.04	-107.69	-35.44
		(1.06)	*(1.18)*	*(0.89)*	*(0.91)*	*(1.08)*	*(0.96)*
	LL	276.09	201.09	-55.08	-153.11	-137.06	-21.33
Free State	LS	*(1.17)*	*(1.07)*	*(1.11)*	*(0.66)*	*(0.99)*	*(0.78)*
	HL	1200.11	1156.28	160.34	-722.81	-511.02	-78.56
	HS	*(1.21)*	*(0.99)*	*(1.01)*	*(1.12)*	*(1.17)*	*(1.13)*
		911.09	799.52	32.05	-588.06	-375.22	-45.24
		(0.82)	*(1.19)*	*(0.99)*	*(0.67)*	*(1.01)*	*(1.16)*

Source: *Own estimations*

(*M = Manufacturing; C = Construction; T = Trade & industry; *LL = lower-skilled/large; LS = lower-skilled/small; HL = higher-skilled/large; HS = higher-skilled/small * A one-period lead was introduced into the estimations in order to cater for the possibility of simultaneity; * The standard errors are shown in brackets, the results are significant at a 5% confidence level and the general adjusted R^2 was 0.62)

The *ERGLP* indicator coefficients are substantially smaller for the lower GGP provinces when the different skill categories are introduced into the estimations. It is especially small for the two lower-skilled categories in the manufacturing and construction industries of the Limpopo and Free State provinces. The fact that the *ERGLP* indicator coefficients are negative for the lower-skilled/large and lower-skilled/small categories of the trade and accommodation industries of these two provinces clearly indicates the non-existence of employee-remuneration gap-enhanced productivity gains.

The fact that the sign of the quadratic estimates were negative for all the skill categories in all three industries in all of the provinces is a further confirmation of the existence of diminishing marginal labour-productivity characteristics beyond an optimal level of employee-remuneration gap dispersion.

In order to measure the impact of business/economic uncertainty on the relationship between employee-remuneration gaps and labour productivity, per industry and per geographical area, the methodology of the Van Zyl (2010) and Mahy et al. (2009) studies were adopted. In those two studies the levels of business uncertainty were differentiated between high levels and low levels of uncertainty based on variations in operating surplus around the mean values (variations below the mean values were classified as low uncertainty while variations above the mean values were classified as high uncertainty). The *ERGLP* indicator coefficients for the impact of business/economic uncertainty per industry and per geographical area are listed in **TABLE 3**.

In the case of the higher GGP provinces the *ERGLP* indicator coefficients remain positive for all three industries, regardless of whether the business/economic environment is viewed as indicating a low or a high level of uncertainty. The results also indicate (for all three geographical areas)

i) that the positive *ERGLP* indicator coefficients are greater in a low uncertain business environment and
ii) that the *ERGLP* indicator coefficients are at its greatest level for the manufacturing industry when compared with the construction and trade and accommodation industries.

TABLE 3: ERGLP indicator coefficients for the different industries and geographical areas in a low or high uncertain business environment

Province	*Industry*	*ERGLP indicator coefficient*	*ERGLP indicator coefficient*	*Squared ERGLP*	*Squared ERGLP*
		High uncertainty	*Low uncertainty*	*High uncertainty*	*Low uncertainty*
Gauteng	M	3511.56	3741.72	-3241.09	-3422.05
		(0.93)	*(1.03)*	*(0.72)*	*(1.12)*
	C	2977.34	3158.66	-2427.53	-2899.61
		(1.05)	*(1.05)*	*(1.12)*	*(0.99)*
	T	2170.47	2516.88	-1978.41	-2169.29
		(0.91)	*(0.94)*	*(0.73)*	*(0.85)*
Western Cape	M	2941.83	3167.81	-2733.12	-2966.73
		(0.89)	*(1.09)*	*(0.92)*	*(1.16)*
	C	2539.49	2859.38	-2195.59	-2478.95
		(1.16)	*(1.05)*	*(1.02)*	*(0.78)*
	T	1897.59	1986.51	-1537.61	-1737.55
		(1.01)	*(0.81)*	*(0.89)*	*(0.79)*
KwaZulu-Natal	M	2801.63	2988.21	-2539.81	-2638.77
		(0.77)	*(1.17)*	*(0.84)*	*(1.09)*
	C	2358.81	2607.36	-1988.04	-2075.74
		(0.99)	*(1.12)*	*(0.99)*	*(0.84)*

Province	Industry	ERGLP indicator coefficient	ERGLP indicator coefficient	Squared ERGLP	Squared ERGLP
		High uncertainty	Low uncertainty	High uncertainty	Low uncertainty
		1784.59	1867.99	-1400.83	-1500.33
		(1.11)	*(0.97)*	*(1.09)*	*(0.86)*
EasternCape	M	15.08	29.11	-6.07	-13.11
		(0.88)	*(0.79)*	*(0.97)*	*(0.99)*
	C	5.96	6.09	-2.42	-3.99
		(1.02)	*(1.12)*	*(1.18)*	*(1.02)*
	T	-19.41	-9.78	-7.88	-3.61
		(1.06)	*(1.04)*	*(1.03)*	*(0.88)*
Limpopo	M	-41.13	-35.81	-27.37	-15.05
		(0.84)	*(0.88)*	*(0.99)*	*(0.81)*
	C	-65.91	-46.55	-34.42	-21.81
		(1.18)	*(1.19)*	*(1.01)*	*(1.13)*
	T	-95.09	-83.31	-44.02	-56.09
		(0.97)	*(1.08)*	*(1.08)*	*(0.81)*
Free State	M	-48.56	-37.91	-21.39	-25.63
		(0.98)	*(0.77)*	*(0.86)*	*(0.89)*
	C	-83.01	-61.25	-43.91	-38.61
		(1.01)	*(1.09)*	*(1.07)*	*(1.12)*
	T	-99.41	-80.44	-70.39	-62.81
		(0.91)	*(1.01)*	*(1.16)*	*(1.09)*

Source: *Own estimations*

(*M = Manufacturing; C = Construction; T = Trade & industry; * A one-period lead was introduced into the OLS estimation in order to cater for the possibility of simultaneity; * The standard errors are shown in brackets, the results are significant at a 5% confidence level and the general adjusted R^2 was 0.67)

For the lower GGP provinces the *ERGLP* indicator coefficients are negative for all the industries (except for the manufacturing and construction industries of the Eastern Cape), regardless of whether the business environment is defined as having a low or high level of uncertainty. It is also noted that i) the negative values of the *ERGLP* indicator coefficients are smaller in the low uncertain business environment and ii) the negative *ERGLP* indicator coefficients are at their highest levels for the trade and accommodation industries.

4. SUMMARY AND CONCLUSION

The aim of the article was to determine the geographical and industry difference for employee-remuneration gap-enhanced labour productivity levels in the South African economy.

When only employee characteristics were considered in the estimations it was clear that i) the higher GGP provinces attained higher positive *ERGLP* indicator coefficients (compared with the smaller GGP provinces) and ii) the manufacturing industry produced the highest positive *ERGLP* indicator coefficients (for all of the geographical areas). These results support the findings of the Beaumont and Harris (2003) study in which it was argued that the greater the size of organisations and the more intense the level of business activity (within industries and

geographical areas), the greater the positive employee-remuneration gap-enhanced labour productivity effects. It can be deduced from the negative *ERGLP* indicator coefficients for the trade and accommodation industry of two of the smaller GGP provinces that variations in labour productivity are not derived from employee-remuneration gap dispersions.

The introduction of the different skill categories in the estimations resulted in smaller positive *ERGLP* indicator coefficients (except for the lower-skilled categories in the Limpopo and Free State provinces, where the *ERGLP* indicator coefficients were negative). It is also noted that i) these positive *ERGLP* indicator coefficients are bigger for the higher GGP provinces (especially for the higher-skilled categories) and ii) the greatest level of positive employee-remuneration gap-enhanced productivity effects are generated by businesses that have a larger component of higher-skilled employees (this is true for all three the industries in all of the geographical areas). These results confirm the Turner and Jackson (2009), Mahy et al. (2009) and Van Zyl (2010) studies that indicated that the positive employee-remuneration gap-enhanced labour productivity effects are more prominent when employees are more skilled.

The estimation results when business uncertainty was introduced indicted that

i) the magnitude of positive *ERGLP* indicator coefficients is much higher for the higher GGP provinces,
ii) that the positive employee-remuneration gap-enhanced labour productivity effects are more prominent in a low uncertain business environment, and
iii) any level of uncertainty (high or low) tends not to create any positive employee-remuneration gap labour productivity effects in the lower GGP provinces as indicated by the negative *ERGLP* indicator coefficients for these provinces. The estimation results are a confirmation of the Fagio, Salvanees and Van Reenen (2007) study in which it was argued that the employee-remuneration gap-enhanced labour productivity effects are weaker in a highly uncertain business environment.

It can be concluded from all the estimation results that the magnitude of positive employee-remuneration gap-enhanced labour productivity effects are more prominent for businesses in more economically active geographical areas (greater GGPs) and that these productivity effects differ for different industries. In this regard, it would be worthwhile to undertake further research on the possible impact that

i) variations in competition levels,
ii) the state of employee cohesion,
iii) employee perception of a fair remuneration structure, and
iv) iv) differentiated remuneration structures might have on employee-remuneration gap-enhanced labour productivity effects.

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ANNEXURES

ANNEXURE A: The sample size statistics (number of firms) per province and per industry

Province	Industry		
	Manufacturing	Construction	Trade & Accommodation
G	192	96	89
WC	145	73	72
KN	141	62	78
EC	61	32	42
L	45	25	36
F	42	21	32

Source: *Own estimations*

(* G = Gauteng; WC = Western Cape; EC = Eastern Cape; KN = Kwa Zulu-Natal; L = Limpopo; F = Free State.** The standard deviations are in parenthesis)

ANNEXURE B: The mean values of the collected data per category for the manufacturing industry per geographical area

Data category	G	WC	KN	EC	L	F
Size	225.71 *(82.93)*	188.34 *(74.23)*	184.11 *(72.34)*	172.56 *(65.33)*	164.23 *(44.21)*	172.57 *(47.66)*
Category A	40.88% *(9.87)*	40.02% *(7.34)*	41.44% *(3.44)*	40.01% *(4.56)*	37.56% *(4.11)*	39.72% *(4.57)*
Category B	59.12% *(5.12)*	59.98% *(4.22)*	58.56% *(3.77)*	59.99% *(3.77)*	62.44% *(2.66)*	60.28% *(2.98)*
Age	30.12 *(3.25)*	29.34 *(2.78)*	27.76 *(2.66)*	26.37 *(2.78)*	26.67 *(3.45)*	26.07 *(2.75)*
% Male	63.78% *(2.22)*	66.45% *(2.11)*	61.15% *(2.56)*	64.56% *(2.01)*	66.47% *(2.11)*	65.99% *(2.61)*
% Female	36.22% *(3.15)*	33.55% *(2.66)*	38.85% *(2.56)*	35.44% *(2.11)*	33.53% *(2.78)*	34.01% *(2.14)*
% lower secondary	42.25% *(3.21)*	46.34% *(3.78)*	45.33% *(2.55)*	46.55% *(2.33)*	49.24% *(2.66)*	48.76% *(2.05)*
% upper secondary	40.65% *(3.58)*	41.11% *(2.05)*	41.52% *(2.11)*	43.00% *(2.99)*	41.63% *(2.56)*	41.33% *(2.33)*
% tertiary	17.10% *(4.11)*	12.55% *(3.34)*	13.15% *(2.67)*	10.45% *(3.55)*	9.13% *(2.76)*	9.91% *(2.32)*
Gross monthly income per employee	7424 *(893)*	6185 *(766)*	6255 *(698)*	6203 *(578)*	5877 *(465)*	5911 *(466)*
Annual value added per employee	45838 *(4356)*	40589 *(4996)*	41578 *(4899)*	40489 *(4743)*	36235 *(4463)*	35491 *(4745)*

Source: *Own estimations*

(* G = Gauteng; WC = Western Cape; EC = Eastern Cape; KN = Kwa Zulu-Natal; L = Limpopo; F = Free State ** The standard deviations are in parenthesis)

ANNEXURE C: The mean values of the collected data per category for the trade and accommodation industry per geographical area

Data category	*G*	*WC*	*KN*	*EC*	*L*	*F*
Size	25.24	24.97	24.69	23.76	21.39	20.81
	(2.65)	*(3.52)*	*(2.86)*	*(3.13)*	*(2.11)*	*(3.06)*
Category A	41.01%	39.93%	39.07%	39.21%	38.78%	38.73%
	(5.11)	*(5.78)*	*(4.41)*	*(4.19)*	*(4.22)*	*(4.14)*
Category B	58.99%	60.07%	60.93%	60.79%	61.22%	61.27%
	(5.04)	*(4.68)*	*(3.69)*	*(3.22)*	*(2.87)*	*(2.53)*
Age	27.82	28.01	27.11	26.93	26.88	26.12
	(3.76)	*(3.15)*	*(3.04)*	*(2.99)*	*(3.17)*	*(2.99)*
% Male	55.98%	51.07%	54.87%	52.33%	51.66%	52.55%
	(2.44)	*(2.71)*	*(2.68)*	*(2.88)*	*(2.67)*	*(2.88)*
% Female	44.02%	48.93%	45.13%	47.67%	48.34%	47.45%
	(3.67)	*(2.99)*	*(2.43)*	*(2.39)*	*(2.29)*	*(2.76)*
% lower secondary	43.85%	45.97%	46.76%	46.23%	49.78%	49.06%
	(3.65)	*(3.66)*	*(2.12)*	*(2.92)*	*(2.76)*	*(2.99)*
% upper secondary	47.80%	45.90%	45.29%	46.72%	43.71%	44.83%
	(3.58)	*(2.05)*	*(2.11)*	*(2.99)*	*(2.56)*	*(2.33)*
% tertiary	8.35%	8.13%	7.95%	7.05%	6.51%	6.11%
	(3.51)	*(3.77)*	*(2.87)*	*(3.08)*	*(2.12)*	*(2.01)*
Gross monthly income	5611	5118	5284	5076	4651	4277
	(439)	*(502)*	*(486)*	*(418)*	*(411)*	*(459)*
Annual value added per employee	38351	33511	33992	31419	27831	26659
	(3017)	*(4306)*	*(4306)*	*(4027)*	*(3806)*	*(3906)*

Source: *Own estimations*

(* G = Gauteng; WC = Western Cape; EC = Eastern Cape; KN = Kwa Zulu-Natal; L = Limpopo; F = Free State.
** The standard deviations are in parenthesis)

ANNEXURE D: The mean values of the collected data per category for the construction industry per geographical area

Data category	*G*	*WC*	*KN*	*EC*	*L*	*F*
Size	120.77	116.02	105.54	102.61	92.01	90.66
	(2.44)	*(3.01)*	*(2.78)*	*(3.07)*	*(2.46)*	*(3.11)*
Category A	41.73%	40.13%	40.88%	39.97%	38.05%	38.72%
	(5.64)	*(5.82)*	*(4.78)*	*(4.32)*	*(4.76)*	*(4.38)*
Category B	58.27%	60.87%	60.12%	60.03%	61.95%	61.28%
	(5.11)	*(4.55)*	*(3.81)*	*(3.32)*	*(2.99)*	*(2.74)*
Age	28.04	28.82	27.54	26.45	26.56	26.78
	(3.98)	*(3.38)*	*(3.88)*	*(2.19)*	*(3.63)*	*(2.66)*
% Male	61.62%	62.81%	61.73%	60.01%	64.85%	63.79%
	(2.63)	*(2.66)*	*(2.93)*	*(2.69)*	*(2.34)*	*(2.07)*
% Female	38.38%	37.19%	38.27%	39.99%	35.15%	36.21%
	(3.67)	*(2.99)*	*(2.43)*	*(2.39)*	*(2.29)*	*(2.76)*
% lower secondary	45.77%	46.73%	46.98%	47.06%	49.33%	49.11%
	(3.78)	*(3.97)*	*(2.71)*	*(2.95)*	*(2.33)*	*(2.19)*
% upper secondary	46.49%	46.26%	46.13%	46.19%	45%	44.92%
	(3.44)	*(2.29)*	*(2.91)*	*(2.74)*	*(2.96)*	*(2.77)*
% tertiary	7.74%	7.01%	6.89%	6.15%	5.67%	5.97%
	(3.66)	*(3.29)*	*(2.91)*	*(3.45)*	*(2.99)*	*(2.51)*
Gross monthly income	7243	6856	6808	6734	5185	5064
	(499)	*(478)*	*(501)*	*(487)*	*(389)*	*(422)*
Annual value added per employee	42745	39661	38977	34981	32978	31996
	(2949)	*(3392)*	*(4529)*	*(4397)*	*(3367)*	*(4006)*

Source: *Own estimations*

(* G = Gauteng; WC = Western Cape; EC = Eastern Cape; KN = Kwa Zulu-Natal; L = Limpopo; F = Free State
** The standard deviations are in parenthesis)