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The Spillover Effects of University to Business Growth: Evidence from Malaysia

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Higher education institutions (HEI) or universities are known as knowledge and learning centres that produce skilled human capital, educate productive workers and entrepreneurs. Their functions have changed with current demands of society, making significant their role in stimulating and sustaining economic growth. However, there are few studies that investigate the effects of the establishment of universities to cater for and address local economic development. This study aims to examine the spill over effects of universities in nurturing local business activities. With regards to universities, the study explores the (i) stakeholders' spending impact; faculty, staff, student and visitors; (ii) human capital impact and; (iii) knowledge and exploration impact of business growth. Using a Structural Equation Model (SEM), the research applies multistage sampling to survey 445 university stakeholders involving alumni, community and industry from three universities; (i) University of Technology Malaysia (UTM); (ii) Universiti Utara Malaysia (UUM) and; (iii) Universiti Malaysia Terengganu (UMT). The findings show that university expenditure, human capital and knowledge exploration positively influence local business growth. This affirms a positive spill-over effects of universities to regional business growth. Hence, the findings of the research suggest that the positive roles of universities to the local economic development need to be given a priority by related stakeholders.

Key words: *Higher education, spill over effect and business growth.*

Introduction

Universities are 'ivory towers' that create and disseminate knowledge. The importance of universities to regional economic development has been recognised since the 1970s (Caffrey & Isaacs, 1971). This has led to numerous studies on the impact of universities on economic development. Universities are expected to add value to regional economic development by (i) increasing student and employee influx, employment opportunities, enhanced local GDP, housing demand and other ancillary benefits, and (ii) stimulating knowledge-based economy growth (Keane & Allison, 2010). Studies have empirically evaluated the impact of universities on local economic development (Bonaccorsi, Colombo, Guerini & Rossi-Lamastra, 2014; Fromhold-Eisebith & Claudia, 2013; Miller, McAdam, Moffett, Alexander & Puthusserry, 2016; Di Nauta, Merola, Caputo, & Evangelista, 2018). These studies prove the dissemination of knowledge and research activities from universities have a positive impact on local development.

From a micro perspective, universities drive socio-economic changes. The strength of a university changes according to levels of modernisation, geographical structure and community culture. Timing also affects a university's role as population needs differ (Siegfried, Sanderson & McHenry, 2007). Since the 1970s, universities have played a vital role in developing local economies with their spending (Caffrey & Isaacs, 1971). University spending can be defined as expenses in operations, management, and project capital (Anton & Behling, 2006).

Universities facilitate increases in a local population as well as the volume of local business transactions. Population density in areas surrounding a university increases up to 6% within ten years (Liu, 2015). University spending beyond its immediate surroundings are outside the scope of this study as this paper focuses on the impact of university spending on local growth only (Shiel, Leal Filho, Do Paco & Brandli, 2016).

A university's stakeholders also contribute to local economic development through their daily spending. Stakeholders are students, staff, faculty and visitors who spend to meet daily needs. These four groups are the main contributors to local business growth as they spend their income on local business. Select studies take stakeholders' monthly spending and calculate it as a yearly contribution (Carroll & Smith, 2006; Razak, Dziauddin, & Che Ngah, 2014; Sen, 2011) or calculate their average spending (Ohme, 2003). These calculations need to be made carefully to avoid over-estimation (Siegfried, Sanderson & McHenry, 2007). Stakeholders' spending includes food, services, learning equipment, housing, entertainment and other miscellaneous items (Shiel, Leal Filho, Do Paco & Brandli, 2016) which contribute to local economic development. Academic visitors who attend university activities, as well as parents, also contribute to the impact of university spending (Armstrong, 1993).

The university boosts regional economic growth through its role as an 'ivory tower'. In an economic context, an increase in the level of individual education is proven to increase a person's income (Hill, Hoffman & Rex, 2005; Mendy & Widodo, 2018). The knowledge, expertise and skills acquired by individuals are added value to compete in work environments. The academic achievements of university alumni enhance their aggregate income (Bloom, Canning, & Chan, 2006). The average individual income of a bachelor's degree holder will be higher than the average salary of those with a senior high school qualification (Blackwell, 2002; Oreopoulos & Petronijevic, 2013). Higher academic achievement is, therefore, linked to higher than average wages. More interestingly is that human capital investment yields higher returns than stock investment. University growth contributes to economic impact from a labour force with higher levels of education. The skills of a given workforce increase productivity, subsequently contributing to higher output and increased income (Moretti, 2004). Nevertheless, many impact studies in this field fail to provide accurate information or correct interpretations and commit double on a particular expenditure (Siegfried, Sanderson & McHenry, 2007).

A university contributes to nurturing local business via research and development activities and output. There is substantial evidence that research benefits the economy (Salter & Martin, 2001; Yu, Yuan, & Li, 2019) and that universities can play a leading role in innovation and enhancing community knowledge (Etzkowitz & Leydesdorff, 2000). Decisions of firms and industries in the development of innovation are affected by the scope of learning (Distanont & Khongmalai, 2018). They benefit from knowledge spill over to form new ideas and generate creativity in business. Research also contributes to the creation of technology and new products (Christopherson, Kitson & Michie, 2008; Etzkowitz & Leydesdorff, 2000; Huggins & Johnston, 2009; Lockett, Wright & Franklin, 2003). The production and dissemination of technology by universities influences technology departments, commercialisation policy, and the size of the university's operating environment (Boh, De-Haan, & Strom, 2016).

University research increases the dissemination of knowledge. They train highly skilled graduates, create new methods of work quality and efficacy, establish networks, promote social interaction and create new business opportunities (Mendy & Widodo, 2018). An overview of research benefits to improve economic factors is necessary (Salter & Martin, 2001). In line with this, Abramovsky, Harrison and Simpson (2007) demonstrate a significant relationship between the location of research facilities and the quality of the academic research department.

Universities also develop new technology by capitalising on the expertise of disciplinary experts and motivated students. Such new technologies aid in the commercialisation of firms

and increase productivity (Diez-Vial & Fernandez-Olmos, 2015; Vidican, 2009). The impact of old and new universities involved in technology research and development are more closely related to business compared to those that are not (Lockett, Wright & Franklin, 2003). A university's core business is to enhance individual and community research capabilities and activities (Bonaccorsi et al., 2014).

Studies from Malaysia focus on the role universities play in economic development and with little substantiation by inferential statistics (Abdul Rahman, Muhamad Darus, Mohamad Japeri & Yunos, 2008). Abdul Rahman et al. (2008) verify how a university contributes to the economy through the amount of its spending (in RM). On the other hand, Razak, Dziauddin, & Che Ngah, (2014) do not provide an in-depth analysis of a university's impact on business activities through spending, human capital and knowledge development.

Using primary data, our study contributes to the measurement of a university's spill over effect. In this respect, the main spill over impact is "knowledge". The current study uses the number of patents and licences to measure the effect of knowledge (Ponds, Oort & Frenken, 2010). This is important to know because innovation is the combination of human capital, expertise and knowledge through university research (Audretsch, Hülsbeck & Lehmann, 2012).

Knowledge generated by university research influences business performance and provides new products that boost productivity and growth (Audretsch et al., 2012; Cassia & Colombelli, 2008). Universities play a vital role in this process as they innovate by capitalising on specialised human capital, knowledge as well as research and development facilities (Anselin, Varga & Acs, 1997). Critically, the knowledge gained by graduates is transferred to businesses (Fischer & Varga, 2003). Nevertheless, knowledge decreases as distance increases and the most affected area are local surroundings (David & Foray, 2003).

This study measures the spill over effect from a university to regional business growth through three channels.

Methodology

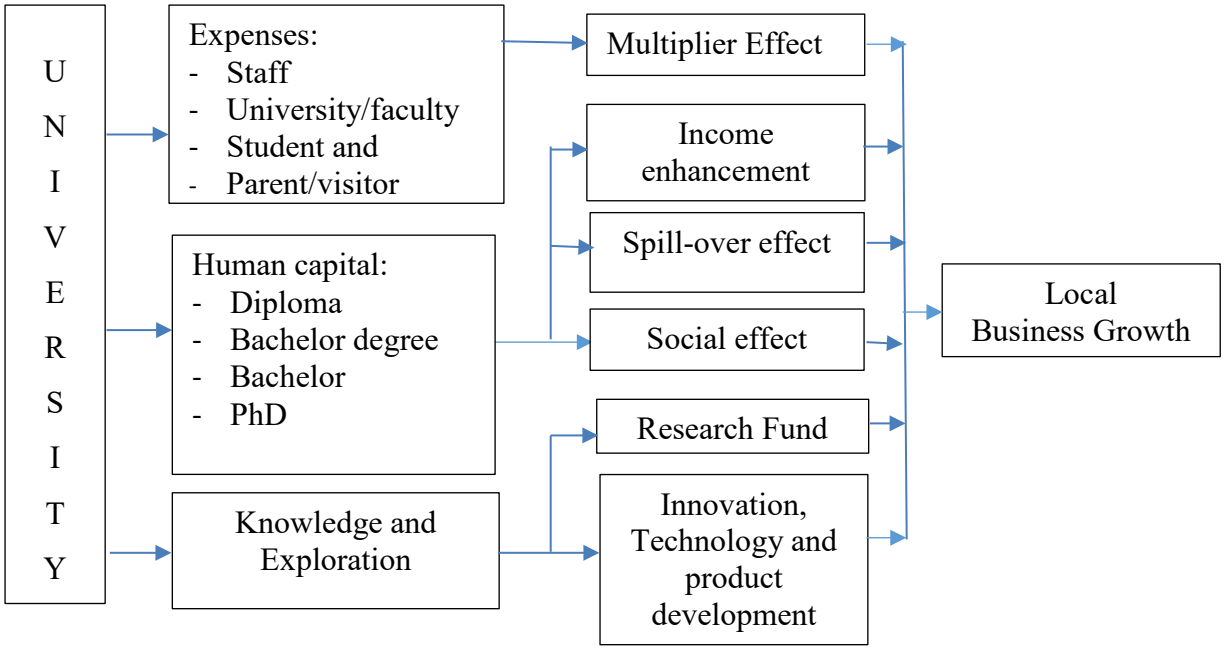
Conceptual Framework

The impact of a university on socio-economic growth can be channelled in three ways. Firstly, through university stakeholder spending, where transaction activity nurtures business growth. Secondly, the university plays a role in producing human capital via excellent academic achievement. University alumni are expected to receive a higher income compared to those who do not obtain academic qualifications. Variables in academic achievement not only affect income but also change business growth owing to spill over effects. Thirdly, a

university is a centre of knowledge dissemination (knowledge exploration) through research activities. Research activities enhance innovation, bring about new product creation and new technology. Together, these improve productivity and, in turn, nurture local business growth. Overall, this investigation seeks to integrate the impact of a university on regional business growth through its spending, human capital and dissemination of knowledge.

Figure 1 below provides the conceptual framework of the spill over effect.

Figure 1. Conceptual framework of linkages between universities and business growth (Partially adapted from Hill, Hoffman & Rex, 2005).



Data Collection and Sampling

The study uses surveys and grounded research. The units of analysis are the stakeholders of a university: alumni, community and business organisations surrounding the university. Data is derived from 445 stakeholders within a 10km radius of a university and from three different areas of the Malaysian peninsular: the east, southern and northern regions.

This study collected data from 445 respondents through face to face interviews. A five-point Interval Questionnaire was used to collect data. This questionnaire was pilot tested and achieved a Cronbach's alpha higher than .7 for each item. Multistage sampling, consisting of cluster and systematic random sampling (Jirangkul, 2018), was performed at three public universities in along the Malaysian peninsular.

The sample selection involves two techniques. A cluster random sampling technique was used to group different geographic areas; namely, Universiti Malaysia Terengganu (UMT) of the East Coast region, University of Technology Malaysia (UTM) of the Southern region and; Universiti Utara Malaysia (UUM) of the Northern region.

The second technique, Stratified Random Sampling, used three representative groups of community, business and alumni. Each sample group has a known population. In selecting a community sample, a list of addresses, situated within the 10km radius, was obtained from the Head of the village under the Village Development and Security Committee. The addresses were given a number and random samples then chosen. Secondly, business samples were categorised into two groups: small and medium enterprises. From the groupings, a sample was randomly selected. The third were alumni working in the area close to the respective universities. The details of the alumni were obtained through the alumni office of each participating university and names randomly chosen.

The determination of a minimum sample size, suggested by Krejcie and Morgan (1970), has a value of chi-square for degree of freedom at the desired confidence level (3.844). The degree of accuracy expressed as a proportion (0.05) and the population proportion 0.5 for providing a maximum sample size. Subsequently, the required sample size was determined to be 385 units. 180 samples were randomly chosen for each category - alumni, business and community - from the three universities involved. The total sample gathered was initially 540. However, after a normality test was carried out on the data set, only 445 samples were valid for further analysis. This represents more than the required sample. Other samples were excluded as there were seen as an outlier in the data set. To undertake the research, all approvals for fieldwork and data was legally obtained from the institution.

Data Analysis

To achieve the objectives of this research, Structural Equation Modelling (SEM) was used by analysing collected data through Exploratory Factor Analysis, Confirmatory Factor Analysis and Structural Equation Modelling.

Step 1: Exploratory Factor Analysis

Five steps are required in the Exploration Factor Analysis (EFA) process. Identifying the value of the mean score as well as the standard deviation of each item is mandatory. Secondly, the EFA using Component Analysis Component (PCA) with a Varimax Rotation which includes the Bartlett Test with a significant value (P-Value <.05) was applied. This was followed with using a Measure of Sampling Adequacy by Kaiser-Meyer-Olkin (KMO) where a minimum value of .6 for the test of sphericity must exist (Hanghon & Rinthaisong,

2018). The third step is to obtain the total estimated value variance (total variance explained) that should be over 60%. Fourth is to determine the weighting factor for each item (factor loading) which must exceed the minimum limit of .6. The final step relates to the reliability of items used to measure the construct. Measurement of instrument reliability is estimated through Cronbach's alpha and must exceed the minimum of .7 (Awang, 2010 & 2012; Hoque & Awang, 2016).

Step 2: Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) links the constructs with the measurement items. Validation of each construct of the measurement model should be done prior to creating a model. The chosen model must combine all constructs for SEM analysis.

The CFA aims to evaluate the constructs regarding uni-dimensionality, validity, and reliability. The tests involve the fitness indexes with chi-square statistics ($p < .05$), chi-square relative < 5.00, root mean square error of approximation (RMSEA) <.07) comparative fit index (CFI) > .90, the average variance extracted (AVE) (minimum of .5) and the composite reliability (CR) (minimum of .6) to evaluate the validity of convergence and compatibility of each construct, and the distribution normality for the items in the model. The skewness values for all items in the model must range between -1.0 and 1.0 for normal distribution of data (Awang, 2014 & 2015; Hair & Black, 2006; Kashif, Samsi, Awang & Mohamad, 2016).

Step 3: Structural Equation Model

A Structural Equation Model presents the causal link between constructs in a study where the relationship is supported by theory. The constructs are grouped into structured models based on hypotheses. SEM is also used to estimate the relationships between multiple endogenous and exogenous factors (Jaijit, Paoprasert & Pichitlamken, 2018).

Results and Discussion

The results consist of a three part analysis.

Exploratory Factor Analysis

All constructs have an identified analysis component (PCA) with a varimax rotation that includes Bartlett's test with a significant value (P-Value < .05). A sampling adequacy by KMO for university expenditure is .85, human capital.823, knowledge exploration .868, and business growth.834. The total estimated value variance (Total Variance Explained) for university expenditure is 68.345%, human capital is 57.913%, knowledge exploration 69.624%, and business growth 57.862%. The weighting factor for each item exceeded the

minimum.6 except for four items from university expenditure (A.2.1, A.2.5, A3.2 and A.4.2). The items that do not reach the minimum limit were rejected. Finally, the reliability of the items, in the form of Cronbach's alpha, must exceed the minimum of .7. All constructs exceeded the minimum value with .897 for university expenditure, .847 for human capital, .890 for knowledge exploration, and .853 for business growth.

Confirmatory Factor Analysis

The loading factor for each item should exceed .5 while developed items should exceed .6, with the correlation between constructs less than .85. No multi-collinearity problem was apparent. The tests found that all loading factor items were above .5 except for item A.5.1 where the loading is .39. This item was removed and the CFA procedure resumed. To test for normality and to prove the data's reliability, fitness indexes were used where the RMSEA is .68, CFI is .921, TLI is .908, and ChiSq/df is 3.042. All fitness indexes (absolute, increment and parsimonious fit) achieved the required level.

Table 1 below shows the results of the construct validity. The results demonstrate that all instruments measure what the construct intends to regulate. Table 1 shows the value of AVE and Composite Reliability (CR). The AVE value needs to be more than .5 to test the convergent validity, and the value of CR needs to be more than .6 to achieve reliability. Based on Table 1, the CR value for AVE is low as a rule of thumb for the university expenditure construct which is .451 and for the human capital construct at .485. Since all items are a new build, the value is accepted as reliable. The result implies that all variables have achieved reliability and validity.

Table 1: The CR and AVE for the main construct

Construct	Item/ sub construct*	Factor loading	AVE (.5)	CR (.6)
University Expenditure	FAC	.64	.451	.766
	STAFF	.65		
	STUD	.75		
	VISITOR	.64		
Human Capital	A.5.1	Reject	.485	.824
	A.5.2	.73		
	A.5.3	.77		
	A.5.4	.71		
	A.5.5	.62		
	A.5.6	.64		
Knowledge – Exploration	A.6.1	.79	.628	.894
	A.6.2	.84		

	A.6.3	.80		
	A.6.4	.75		
	A.6.5	.78		
Business Growth	B.3.1	.76	.534	.873
	B.3.2	.71		
	B.3.3	.71		
	B.3.4	.77		
	B.3.5	.70		
	B.3.6	.73		

Notes: (*) Full abbreviation in Appendix I

Table 2 below shows that the values in the diagonal are the value of the AVE square root for the constructs while other values correlate with row and column constructs. Discriminant validity for all constructs is achieved when the diagonal value is higher than the value in the row and its column. With regard to Table 2, it is evident that the value for variable 1, the value of the AVE of .68, is greater than .65, .42 and .6 . For variable 2, the value of the AVE of .68 equals .68 and is greater than .66 and .47 respectively. In terms of variable 3, the value of .79 is greater than .42, .68 and .49 and; for variable 4, the value of .73 is greater than .60, .47 and .49. The conclusion is that discriminant validity of the four constructs, namely university expenditure, human capital, knowledge exploration and business growth, has been achieved. Also, normality test results show that the skewness value between -1.0 to 1.0 and the kurtosis value is higher than 7.0. As such, data is normally distributed according to central tendencies.

Table 2: The discriminant validity index summary

Constructs	University Expenditure	Human Capital	Knowledge - Exploration	Business Growth
University Expenditure	**.68**			
Human Capital	.64	**.70**		
Knowledge - Exploration	.42	.68	**.79**	
Business Growth	.59	.47	.49	**.73**

Structural Equation Model

Figure 2 below presents the results of a standardised structure equation model that analyses the linkages of university development and business growth. University development is measured by university expenditure, human capital, and knowledge and exploration. The results indicate that the three main variables influence business activity growth to the degree

of 42%. The robust testing of the model is displayed by fitness indexes; RMSEA of .067, CFI of .921, TLI of .910, ChiSq/df of 3.011 and P-value of .00. Subsequently, all required conditions are achieved.

Figure 2. The role of the university in local business growth (*standardised*)

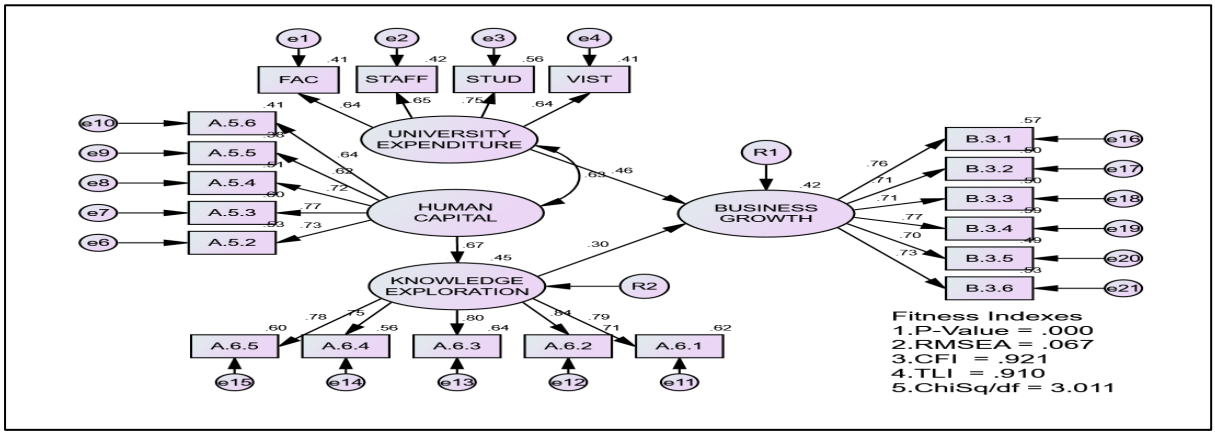
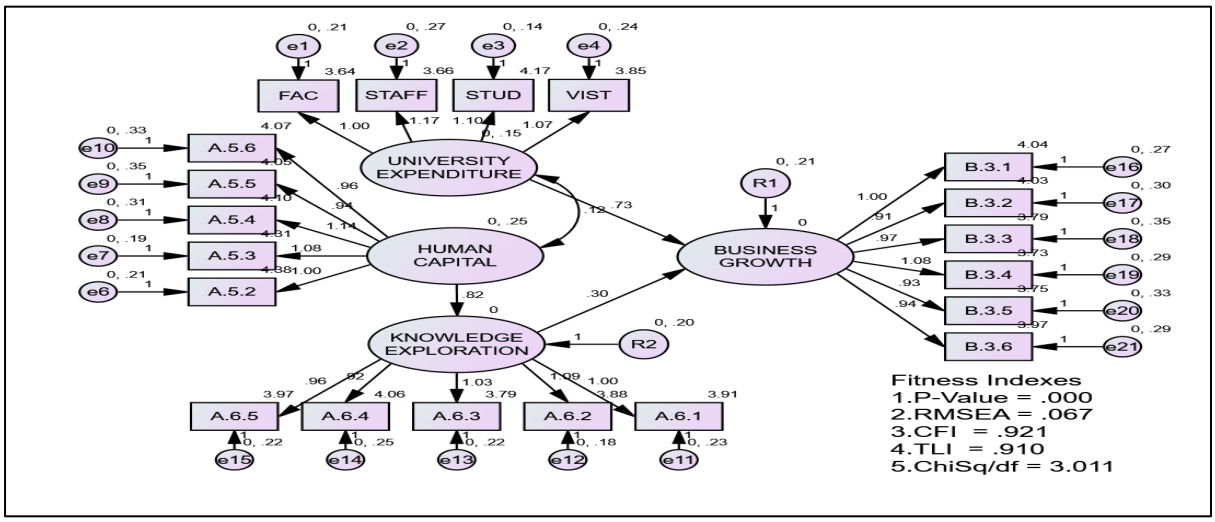


Figure 3. The role of the university in local business growth (*unstandardised*)



To complement the analysis of these linkages, an unstandardised structure equation model is provided as Figure 3. The results indicate that university expenditure partially explains business growth at .73, with a significance of 1%, and knowledge and exploration can explain the business growth of .3 with a significance of 1%. The indirect effect of human capital can explain business growth by .82 X .3 = .25, through knowledge exploration, as a full mediation that has a significance level of 1%.

Benhabib and Spiegel (1994) prove that the relationship between human capital and economic growth was inversely correlated. Economic growth occurs before the increase in

human capital. It explains why human capital does not affect business growth directly. In addition, the possible explanation of results is affected by the type of business activities of small and medium enterprises (SMEs). Secondly, entrepreneurship in university curricula is still lacking and contributes to a small effect size of local business human capital. The university that provides entrepreneurship in their curricula, as discussed by Happ, Forster, Zlatkin-Troitschanskaia and Carstensen (2016), fosters business growth. Entrepreneurship in is believed to play a significant role and leads to university graduates being successful entrepreneurs. Besides, Mcguirk, Lenihan and Hart (2015) prove that small enterprises are more likely to innovate and grow using innovative human capital. Thus, this study proves the significant effect between human capital and business growth by using knowledge exploration as a mediator. The use of a mediator shows that the combination of human capital and knowledge exploration create innovative human capital and stimulates the growth of local businesses.

The results also show that universities significantly influence business growth within the surrounding area. University expenditure, human capital and knowledge exploration partially affect business growth. These findings support the expected outcome that universities have a substantial impact on business growth (Lockett, Wright & Franklin, 2003; Salter & Martin, 2001).

Conclusion

Stakeholders' spending affects business activities surrounding the university. This is brought about by expenditure on food, housing, clothes and other necessities such as entertainment and home goods. It implied that this expenditure increases the sale volume of businesses. A 1% increase on university spending would increase local business growth by .59%.

University graduates use their skills and knowledge to increase productivity. A 1% increase in human capital directly increases local business growth by .47% (Hill, Hoffman & Rex, 2005). The dissemination of knowledge and subsequent exploration of that knowledge helps to form new ideas, technology and funds research (Lockett, Wright & Franklin, 2003). The benefits of research projects on local business growth comprise highly skilled graduates, improved work efficiency, network creation and stimulating social interaction. Seen collectively, these benefits create new business opportunities (Salter & Martin, 2001). The results also support the empirical evidence provided in previous studies. These studies prove that a 1% increase in knowledge exploration increases local business growth by .49%.

The impact of knowledge spill over is the most significant on business growth and it is proven to influence business performance (Cassia & Colombelli, 2008). Some firms and industries do not collaborate with a university and yet they are the indirect recipients of the

spill over as they are located within the vicinity of the university. The hiring of university graduates also contributes to a spill over effect to industries in in terms of innovation, new ideas and new technology.

The findings of this reserach can be used by universities to promote and enhance local economic development. Supported by empirical evidence, this study confirms the role of linkages between universities and local business growth. University expenditure, human capital and knowledge exploration partially influence local business growth.

There are three significant impacts from the establishment of the university towards business activities. Firstly, there is increased sale and purchase of goods and services by stakeholders, namely students, staff, faculty and visitors. Secondly, a university can improve the quality of human capital where salaries are fair and competitive. Thirdly, through R&D processes and knowledge exploration, universities increase research and innovation funds, technology and product development to improve job quality and business opportunities.

It is recommended that future research should include new items such as geographic and demographic items. The impact of each item should be measured separately for each university.

Conflict of interest

None.

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Appendix I

Bill	Question
FAC	*University/Faculty Expenses*
A.1.1	The university spends locally on day-to-day activities (such as paper and stationery purchases)
A.1.2	The university often spends locally (purchase of building tools, especially nails) for maintenance activities
A.1.3	The university often deals with local companies/contractors when they spend on construction projects
A.1.4	The university regularly hires local labourers from surrounding villages
A.1.5	The university often engages local entrepreneurs for activities/programs (e.g. catering service)
STF	*Staff Expenses*
A.2.1	University staff often spend around the university area to meet their needs (e.g. clothing, bags, designer watches etc.)
A.2.2	University staff spend on household items locally (electronic items, etc.)
A.2.3	University staff spend on household furniture locally (e.g. home furniture)
STD	*Student Expenses*
A.3.1	University students often spend locally to meet daily needs (eating and drinking)
A.3.2	Expenses for learning needs (e.g. books and stationery) are often spent locally
A.3.3	Expenses for transportation (e.g.: bicycle hire, car rental etc.) are often spent locally
A.3.4	University students often spend locally to meet their personal hygiene needs (e.g. soap, shampoo, etc.)
A.3.5	University students spend locally for beauty needs and products (e.g. hair products and salons)
A.3.6	University students often spend locally to meet housing needs (e.g. rental houses, bed sheets, etc.)
STF	*Staff Expenses*
A.4.1	University visitors often spend locally to meet their dietary and nutritional needs
A.4.2	University visitors often spend locally on leisure activities (e.g.: karaoke, sightseeing etc.)
A.4.3	Visitors spend locally for transportation (e.g.: taxi, uber etc.)
A.4.4	University visitors often spend locally on gifts (e.g.: souvenirs, batik

	fabrics, etc.)
HC	*Human Capital*
A.5.1	Differences in education levels have a significant impact on income levels
A.5.2	The university educates human resources at various levels of education (e.g. diploma, bachelor, undergraduate and PhD)
A.5.3	The university produces human resources in various fields of study (e.g.: accounting, social sciences, fishery science, food technology)
A.5.4	The university works with other industries, institutions and universities to prepare graduates who are competitive in facing the work environment.
A.5.5	The university is able to produce graduates proficient in language (Malay, Arabic, Mandarin, English etc.).
A.5.6	The university contributes to improving the academic level of the local community through collaboration with schools
KE	*Knowledge exploration*
A.6.1	The university conducts useful research into the daily lives of locals
A.6.2	The university successfully produces innovation by utilising technology and natural resources
A.6.3	Research conducted by universities has created new technologies.
A.6.4	Community education levels can be improved through motivational programs and training workshops for local communities
A.6.5	The university successfully disseminates knowledge especially in relation to human and environmental resources
BG	*Business Growth*
B.3.1	The university creates business opportunities for local communities
B.3.2	Local business/transactions is increasing significantly
B.3.3	The university creates employment opportunities for local youth
B.3.4	The university provides part-time or full-time employment opportunities for locals
B.3.5	University graduates also open up business opportunities in the local community
B.3.6	The existence of universities improves the quality of local community work