An Analysis of Labor and Capital Productivity in the Malaysian Timber Sector

Jegatheswaran Ratnasingam,^{a,*} Chin Khoon Ark,^a Shukri Mohamed,^a Lim Choon Liat,^{a,b} Geetha Ramasamy,^{a,*} and Abdul Latib Senin ^a

The remarkable transformation of the Malaysian timber sector from a net-importer to a multi-billion-dollar export-oriented sector has become a success model for many other resource-rich countries throughout the world. In view of the increasing socioeconomic importance of the timber sector in this country, the productivity performance of the six major timber sub-sectors was investigated in this study. Productivity is defined as the ratio of output to input and was analyzed from the year 2010 through 2014. The productivity performance was evaluated based on certain input factors, namely labor and capital. Generally, the productivity of the timber sector can be regarded as stagnating. Furthermore, the value-added was affected due to high reliance on labor for production. Among the factors that account for this lack of productivity growth are the increased competition in the international market, small domestic market, improper industrial development policies, poor adoption of technology, and the high dependency on human capital.

Keywords: Timber sector; Productivity; Value-added; Labor; Capital

Contact information: a: Universiti Putra Malaysia, Faculty of Forestry, 43400 UPM, Serdang, Selangor, Malaysia; b: Malaysian Wood Moulding and Joinery Council (MWMJC), Tingkat 19, Menara PGRM, 8, Jalan Pudu Ulu, Cheras 56100, Kuala Lumpur, Malaysia; * Corresponding authors: jegaratnasingam@yahoo.com; gita209@gmail.com

INTRODUCTION

Since its transformation from an agricultural-based economy, Malaysia's manufacturing sector has been the key engine of economic growth for over half of a century. The significant contribution of the manufacturing sector to Malaysia's economic performance is proven by its increased contribution towards the country's gross domestic product (GDP) (Bachtiar *et al.* 2015). Similarly, the Malaysian timber products' manufacturing sector has gained prominence over the last few decades. The country is endowed with vast forested land with resources rich in diversity, and its timber industry ranges from the primary processing, namely logging, sawmilling, veneer and plywood, and panel products industries to downstream processing, particularly furniture and furniture components, builders' joinery and carpentry (BJC), and molding industries. This vast diversity of sub-sectors is why the timber industry has emerged as one of the fastest growing manufacturing sectors within the Malaysian economy (Menon 2000; Woon and Norini 2002; National Timber Industry Policy 2009; Zakaria *et al.* 2014).

The impressive growth of the Malaysian timber sector is well acknowledged globally. The strong encouragement and relentless efforts by the government have transformed the timber industry from a domestic consumption into a multi-billion-dollar export-oriented industry at the international level. The implementation of a series of

Industrial Master Plans (IMPs) since 1986 has provided opportunities for the timber industry, particularly the downstream processing, to develop into a well-established manufacturing hub in the region. As a result, the foreign exchange earnings, as well as employment opportunities, have significantly increased over the years (National Timber Industry Policy 2009).

However, over the years, the rate of expansion of the timber sector in Malaysia has slowed, and its contribution towards the nation's economy has also decreased in comparison to the other manufacturing sectors (Ministry of International Trade and Industry 2014). Inevitably, an in-depth study of the driving factors and future growth trajectory of the timber sector is warranted. In this context, the productivity growth and its contribution towards the sectoral growth need to be evaluated. Productivity is described as a basic relationship between output and input, which shows an extent of technical efficiency in the production and a source of competitiveness (Diewert and Nakamura 2005). According to Salehirad and Sowlati (2006), productivity performance influences economic growth because profits seem to escalate when there is a gain in productivity.

Previous studies on resource-based sectors in other countries have shown that production factors, including raw materials, labor, and capital, have the strongest influences on the productivity and industrial growth (Sriyani 1991; Rahmah *et al.* 2012; Rosenkranz *et al.* 2015). With regards to Malaysia, far too little attention has been given to the productivity performance of the timber sector. Although a study by Ratnasingam *et al.* (2013) on the extent of innovation in the Malaysian furniture industry had shown an indirect link to productivity growth, the literature available on this topic is scarce (Pang *et al.* 2015). Against the background of a huge industry, contributing more than RM 22 billion in export earnings in 2015, and with almost 3,000 manufacturing establishments employing nearly 180,000 workers, the questions of what drives the industry's growth and the relative performance of the various timber sub-sectors has not been well researched. In this context, the need to examine the productivity performances of the various timber sub-sectors in Malaysia is necessary to benchmark and identify challenges that could hamper future growth.

The objective of this study is to provide an analysis of the productivity and valueaddition performance of the various sub-sectors within the Malaysian timber industry, and to illustrate its growth trajectory in the future. The results from this study will serve as a useful benchmark for the productivity performance of the timber industry and assist policy-makers and industrialists in taking the necessary remedial measures to ensure future competitiveness within the industry.

METHODOLOGY

Six major timber sub-sectors were selected for the study, which together accounted for 97% of total production in the overall timber sector. The timber sub-sectors studied were categorized using the Harmonized Community Description and Coding System (HS codes), *i.e.* (1) joinery wood products (*16222*); (2) particleboard and fiberboard (*16212*); (3) wooden and cane furniture (*31001*); (4) sawmilling of wood (*16100*); (5) veneer sheet and plywood (*16211*); and (6) builders' joinery and carpentry (*16221*).

Data Sources

The sectoral data required for this study was extracted from the Annual Survey of the Manufacturing Industries that was published by the Department of Statistics of Malaysia (DOSM), from the years 2010 to 2014.

Manufacturing	Data	2010	2011	2012	2013	2014
Sector						
Joinery wood	No. of mills	60	63	61	65	67
products*	Output	99,023	104,460	828,938	813,110	815,009
	Input	81,441	81,187	287,175	289,880	294,006
	No. of workers	1,100	1,061	884	898	910
	Salary	12,306	13,334	10,946	11,004	11,831
	Value of asset	58,939	63,644	48,775	47,613	46,001
	No. of mills	13	21	23	24	24
Particleboard	Output	2,471,020	2,555,070	2,536,063	2,581,111	2,579,601
and fiberboard	Input	1,822,915	1,896,613	2,021,921	2,180,114	2,218,001
	No. of workers	7,653	8,450	9,719	10,001	9,800
	Salary	191,460	191,635	234,070	242,080	241,800
	Value of asset	2,686,357	2,182,388	1,858,809	1,741,188	1,743,106
	No. of mills	1,603	1,584	1,569	1,711	1,698
Wooden and	Output	7,507,268	8,134,564	7,212,048	7,616,008	7,618,003
cane furniture	Input	5,598,026	5,766,931	5,311,908	5,519,101	5,601,100
	No. of workers	67,744	65,032	65,748	67,800	67,850
	Salary	1,015,486	1,069,935	1,094,722	1,132,110	1,233,810
	Value of asset	2,552,997	2,525,358	2,386,134	2,410,001	2,411,811
	No. of mills	654	569	560	560	524
Sawmilling of	Output	4,371,644	5,237,815	5,167,220	5,131,110	5,237,815
wood	Input	3,538,485	4,168,050	4,214,170	4,244,181	4,168,050
	No. of workers	33,121	32,312	41,740	40,800	32,312
	Salary	523,566	522,621	708,856	731,111	522,621
	Value of asset	1,475,809	1,578,035	1,677,183	1,681,111	1,578,035
	No. of mills	125	143	138	134	131
Veneer sheet	Output	7,504,928	8,700,282	8,019,320	7,998,110	8,001,100
and plywood	Input	6,099,608	6,410,858	6,385,269	6,681,004	6,711,008
	No. of workers	50,828	52,276	49,042	49,002	50,108
	Salary	585,282	672,779	776,884	801,114	809,818
	Value of asset	3,494,335	3,391,574	3,299,051	3,191,514	3,089,147
Builders'	No. of mills	378	334	329	329	327
joinery and	Output	1,424,097	1,310,024	1,501,731	1,527,114	1,533,108
carpentry	Input	1,102,152	992,555	1,129,726	1,130,110	1,136,008
	No. of workers	11,951	9,574	12,766	12,800	12,790
	Salary	203,361	169,301	244,267	247,110	246,990
	Value of asset	616,555	485,702	488,427	493,117	494,108
Note: (1) The unit for output, input and value of asset is Ringgit Malaysia (RM); (2) Value of input						
includes labor, capital and all other production operating cost; (3) Value of asset which includes the						
technology and machinery did not see any increase due to lack of re-investment. The decreasing value						
of asset is due to the depreciation factor; (4) * This sub-sector showed exceptional output increased						
due to large industry consolidation with the acquisition of several local mills by a single foreign investor.						

Table 1. Data Set of Timber Sub-Sectors from 2010-2014

The data were compiled using the sectoral HS codes, *i.e.*, (1) joinery wood products (16222); (2) particleboard and fiberboard (16212); (3) wooden and cane furniture (31001); (4) sawmilling of wood (16100); (5) veneer sheet and plywood (16211); and (6) builders' joinery and carpentry (16221). The data were also verified against the timber statistics compiled by the Malaysian Timber Industry Board (MTIB) and the Ministry of Plantation Industries and Commodities (MPIC) to ensure consistency. The data set compiled for each timber sub-sector includes the number of mills, input value, output value, number of workers, salary, and the value of assets (capital) at each year's end, which is presented in Table 1. Prior to 2010, the data sets available for the various timber sub-sectors were incomplete and hence, were not taken into consideration in this study.

Measurement of Productivity and Value Added

Productivity is based on the input-output concept, which shows the efficiency at which output is produced per unit input. Productivity can simply be determined, *via* Eq. 1.

$$Productivity = \frac{Output (RM)}{Input (RM)}$$
(1)

The productivity growth of an industrial sector can be analyzed through a series of indices. These indices are based on the ratio analysis of various inputs and outputs, which reflect the productivity growth from two distinct categories, namely the gross output and the value-added based measures (Sauian *et al.* 2013). The value-added based measures of productivity, are however more relevant to the timber sector, as the extent of value-addition is the key driver of growth and profitability in the sector (Zakaria *et al.* 2014; Pang *et al.* 2015; Ratnasingam 2015).

The value-added is the measure of the difference between output value and input value, and it does not take into account the intermediate inputs. The value-added measurement is used to show the effectiveness and efficiency at which resources are used. Equation 2 shows the calculation for value-added.

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Value - added (RM) = Net value of output (RM) - Net value of input (RM) (2)
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In the timber sector, however, the labor and capital inputs have a stronger influence on productivity and value-addition compared to raw materials input. In Malaysia, the wood materials used in the domestic market is not subjected to any quality grading requirement, as the Malayan Grading Rules is only applicable for exported sawn timber. Therefore, the quality and cost of wood raw material is very much on a willing buyer-seller basis, which leads to somewhat standard raw material for all the sub-sectors. This is because of the fact that raw material is a common factor to all timber sub-sectors, while the nature of labor force and capital (technology) may differ according to the various sub-sectors. On this account, productivity growth is significantly influenced by labor and capital as opposed to the raw material input in the timber sector (Ratnasingam *et al.* 2013).

The value of timber products is derived from the raw material, processing technologies, and product design. It has been shown that increasing the product value through the raw material is marginal and unsustainable as the raw material is also available to manufacturers in other countries. In this context, value increment through labor and capital inputs often leads to higher competitiveness and sustainable growth (Choong and Tham 1995; Saujan 2013). The conventional measures of labor productivity and capital productivity are shown in Eqs. 3 and 4, respectively.

$$Labor \ productivity \ (RM/worker) = \frac{Value - added \ (RM)}{Number \ of \ workers}$$
(3)

$$Capital \ productivity = \frac{Value - added \ (RM)}{Value \ of \ assets \ (RM)}$$
(4)

Capital turnover measures the efficiency of the industry in terms of utilizing the capital (*i.e.*, materials, work in progress, machinery, technology, *etc.*) to produce final products. The calculation is as shown in Eq. 5.

$$Capital \ turnover = \frac{Output \ (RM)}{Value \ of \ assets \ (RM)}$$
(5)

The labor share reflects the proportion of value added that is allocated to the labor cost (Eq. 6). It essentially shows the extent to which the workers contribute towards the value-added through their skills.

$$Labor share = \frac{Salaries/Wage (RM)}{Value - added (RM)}$$
(6)

Equation 7 defines the capital intensity, which reflects the degree at which capital is used to reduce its dependence on workers, or the extent of capital utilization within the industry.

$$Capital intensity (RM/worker) = \frac{Value \ of \ asset (RM)}{Number \ of \ workers}$$
(7)

RESULTS AND DISCUSSION

The results of this study are presented in four parts: (1) the productivity performance of Malaysian timber sub-sectors, (2) labor input, (3) capital input, and (4) industrial implications.

Productivity Performance of the Malaysian Timber Sub-sectors

Productivity, which measures the efficiency of resource consumption in an industry, is the most important driver of industrial growth. Generally, the efficient use of resources will minimize the waste left over in the production processes and subsequently lead to a higher productivity. Figure 1 shows the productivity of the six timber subsectors in Malaysia. It is clear that the productivity growth in the various timber subsectors is stagnating, although the joinery wood products sub-sector has shown a comparatively higher productivity growth. This result reaffirms the argument that the

productivity growth in the various timber sub-sectors in Malaysia is driven by incremental capital inputs, rather than actual productivity gains. Ratnasingam *et al.* (2013) suggested a similar observation, that the stagnating productivity has an adverse effect on the value-added growth within the furniture making industry.

Productivity is gained when the output increases, and the input reduces or remains constant. However, as shown in Table 3, it is clear that the output increment in the various timber sub-sectors is contributed by the increasing factor inputs, such as labor, capital, and raw materials. Sauian (2002) pointed out that such productivity growth is not sustainable in the long-term, as incremental inputs do not lead to industrial competitiveness in the global market.



Fig. 1. Productivity performance for the six major timber sub-sectors (16222- joinery wood products; 16212- particleboard and fiberboard; 31001- wooden and cane furniture; 16100-sawmilling of wood; 16211- veneer sheet and plywood; and 16221- builders' joinery carpentry)

Value-added

The value-added is a reflection of the profits gained from the production processes. In the sawmilling sub-sector, the product yield determines the level of profitability (Pang *et al.* 2015), but in other sub-sectors, the profitability is closely linked to the perceived value of the products. An analysis of the value-added growth for the various timber sub-sectors is presented in Fig. 2.



Fig. 2. Value-added growth for the six major timber sub-sectors (16222- joinery wood products; 16212- particleboard and fiberboard; 31001- wooden and cane furniture; 16100- sawmilling of wood; 16211- veneer sheet and plywood; and 16221- builders' joinery carpentry)

Labor Input

Labor productivity

The value-added per employee is a good measure of labor productivity in an industry (Rahmah et al. 2012; Nayak and Patra 2013; Auzina-Emsina 2014; Pang et al. 2015). Generally, increasing the labor productivity is important to enhance the competitiveness of the industry. The labor productivity growth for the various sub-sectors of timber industry in this study is shown in Fig. 3. It is clear from the histograms that the value-added per employee in the various sub-sectors is stagnating; underlining the fact that labor force is no longer a competitive advantage to the industry. Sauian (2002) explained that the increment in output with constant input subsequently increased productivity. Another key issue is that the extent of value-addition within the industry was affected due to its heavy reliance on labor in the production process (Rahmah et al. 2012; Bachtiar et al. 2015). Several studies have suggested that reducing the dependency on labor through automation and mechanization may boost value-addition and productivity (Bush and Sinclair 1989; Salehirad and Sowlati 2006; Zhang and Rao 2006; National Timber Industry Policy 2009; Auzina-Emsina 2014). This is evident from Fig. 3, which shows that the panel products manufacturing sub-sector, which has the highest level automation and mechanization in the timber industry, also has the highest valueadded per employee.



Fig. 3. Labor productivity for the six major timber sub-sectors (16222- joinery wood products; 16212- particleboard and fiberboard; 31001- wooden and cane furniture; 16100- sawmilling of wood; 16211- veneer sheet and plywood; and 16221- builders' joinery carpentry)

Labor share

The contribution of labor cost to the value-added is shown in Fig. 4. Although the labor cost to value-added in the particleboard and fiberboard-manufacturing sector was the highest among the various timber sub-sectors, the overall trends among all of the sub-sectors appear to be constant. This may be the most significant after-effect of employing contract workers, as their skills retention suffers due to their short-term tenures (Russell 2015). Doubtless the flow of foreign workers into the Malaysian timber sector contributed to cheaper labor force, which lowered the production cost proportionately, facilitating rapid industrial growth (Bachtiar *et al.* 2015). Yet, it is imperative to emphasize the fact that the employment of foreign workers is not a long-term solution for the Malaysian timber industry, and efforts to shift towards a higher degree of automation and mechanization within the industry is necessary to ensure industrial competitiveness in the future (National Timber Industry Policy 2009).



Fig. 4. Labor share for the six major timber sub-sectors (16222- joinery wood products; 16212- particleboard and fiberboard; 31001- wooden and cane furniture; 16100- sawmilling of wood; 16211- veneer sheet and plywood; and 16221- builders' joinery carpentry)

Relationship between labor productivity and salary per worker

A correlation analysis between the workers' salary/wage and the labor productivity was performed. As shown in Table 2, the growth of the value-added per worker was faster than the salary/wage increment per worker. Although, Nayak and Patra (2013) argued that higher wages often resulted in better productivity, as suggested in the efficiency wage theory, in the case of the Malaysian timber industry, this argument does not hold true. This is possibly due to the fact that the industry is very much focused on contract manufacturing based on designs provided by the buyers. Hence, a change in design will often lead to higher value added per worker although the workers' salary/wage has not increased (Ratnasingam 2015).

Another factor could also be the poor factory organization due to the predominantly family-ownership of the companies, which in many instances is not managed professionally (Ratnasingam and Ioras 2014). Poor management can also affect workers' morale to an extent that productivity suffers. Unlike other manufacturing sectors, value is added to timber products during the production processes with marginal assistance from labor. Inevitably, it is pertinent to recognize that the labor inputs have been significantly reduced through automation and mechanization in some of the subsectors, such as the builders' joinery and carpentry.

Sub-sectors	Variables	2010	2011	2012	2013	2014
16222	Labor productivity	15.98	21.93	17.78	18.72	18.68
	Salary per worker	11.18	12.57	12.38	12.25	13.00
16212	Labor productivity	84.69	77.92	52.9	50.11	51.12
	Salary per worker	25.02	22.68	24.08	24.21	24.67
31001	Labor productivity	28.18	36.41	28.9	28.07	28.05
	Salary per worker	14.99	16.45	16.65	16.70	18.18
16100	Labor productivity	25.16	33.11	22.83	23.08	33.11
	Salary per worker	15.81	16.17	16.98	17.92	16.17
16211	Labor productivity	27.65	43.79	33.32	32.63	32.15
	Salary per worker	11.51	12.87	15.84	16.35	16.16
16221	Labor productivity	26.94	33.16	29.14	30.42	30.61
	Salary per worker	17.02	17.68	19.13	19.31	19.31

Table 2. Labor Productivity and Salary per Worker in the Six Major Timber Sub

 Sectors

Table 3 reveals that there is no clear relationship between the workers' salary and the labor productivity among the various timber sub-sectors. The absence of any trend indicates small variation in the relationship between the data, and suggests that the possibility of salary increment is too small to stimulate workers' retention and skillsbuilding.

Table 3. Relationship between Labor Productivity and Salary per Worker in the	Э
Six Major Timber Sub-Sectors	

	16222	16212	31001	16100	16211	16221
Correlation Coefficient	0.655	0.156	0.083	0.595	0.066	0.230
P-value	0.230	0.802	0.895	0.290	0.916	0.710

Capital Inputs

Capital productivity

Figure 5 shows the capital productivity in the six major timber sub-sectors. The findings indicated that the capital productivity growth pattern is markedly different than that of the labor productivity. Although, the ratio of the valued-added to capital was the highest for the manufacturing of wooden and cane furniture, the general pattern for all of the timber sub-sectors appears to suggest poor asset utilization levels. This is arguably due to the fact that investments into the timber sector are relatively slow, and the type of

the products manufactured are also matured, stable priced products, which results in low value-adding (Ratnasingam 2015).



Fig. 5. Capital productivity for the six major timber sub-sectors (16222- joinery wood products; 16212- particleboard and fiberboard; 31001- wooden and cane furniture; 16100- sawmilling of wood; 16211- veneer sheet and plywood; and 16221- builders' joinery carpentry)

Capital turnover

The capital turnover identifies the effectiveness of an industry in utilizing its capital input, which includes the raw materials, stocks, machinery, *etc.* A higher capital turnover would suggest that the industry is able to convert its capital into profits quickly, and vice-versa. Figure 6 illustrates that the capital turnover of the manufacturing of joinery wood products was the highest in comparison to the other timber sub-sectors. This is attributed to the quick turn-around of joinery products because of its larger market size, compared to the other products (Ratnasingam 2015).



Fig. 6. Capital turnover for the six major timber sub-sectors (16222- joinery wood products; 16212- particleboard and fiberboard; 31001- wooden and cane furniture; 16100- sawmilling of wood; 16211- veneer sheet and plywood; and16221- builders' joinery carpentry)

Capital intensity

Capital intensity is described as a measure of the capital consumption compared to other input factors. The most common measurement of capital intensity is the ratio of capital to labor. The result shown in Fig. 7 indicated that the ratio of capital to labor for all the timber sub-sectors is relatively low, with the exception of the particleboard and fiberboard manufacturing sub-sector showing the highest value. There is a possibility that the various timber sub-sectors are showing an increasing tendency towards automation and mechanization with the intention to reduce reliance on labor (National Timber Industry Policy 2009; Bachtiar *et al.* 2015). The stagnating capital intensity suggests that although capacity is more important than labor, the use of capacity to boost productivity has not been realized in the Malaysian timber industry as it is an export-oriented sector dependent on the global market.



Fig. 7. Capital intensity for the six major timber sub-sectors (16222- joinery wood products; 16212- particleboard and fiberboard; 31001- wooden and cane furniture; 16100- sawmilling of wood; 16211- veneer sheet and plywood; and 16221- builders' joinery carpentry)

Industrial Implications

Based on this study, it is apparent that the Malaysian timber sector, which comprises six major sub-sectors, namely joinery wood products, particleboard and fiberboard, wooden and cane furniture, sawmilling of wood, veneer sheet, and plywood, and builders' joinery and carpentry, warrants close attention due to its stagnating productivity performance. Such a decrease in the productivity performance threatens to seriously undermine its competitiveness in the global market in the future.

Generally, the productivity performance of the various timber sub-sectors in the country is influenced by several factors (Ministry of International Trade and Industry 2014). These important factors include: (1) competition in the international markets, (2) policies and regulations, (3) market structure, (4) technology application, and (5) dependency on human capital.

Competition in the international markets

Malaysia is a well-established producer and exporter of tropical wood products in the world. However, the increasing competition in the global wood products market is beginning to take a toll on the growth of the Malaysian industry. The comparative advantage, due to cheap labor and the country's ample supply of raw materials, is beginning to decrease rapidly. The emergence of China and Vietnam has severely eroded the country's competitiveness in commodity-type products that sell based on price points. Therefore, as shown in this study, in order to remain competitive, there is an urgent need for the industry to move further along, in the value chain, towards manufacturing highervalue products (National Timber Industry Policy 2009).

Policies and regulations

Although the government should be praised for its far-sighted industrial policies that transformed the timber sector into a large value-added manufacturing hub, some of the policies implemented could have been better planned to ensure sustainable development. Notably, the industrial expansion plan should be closely regulated to ensure sufficient availability of the production factors (Ministry of International Trade and Industry 2014). Although on one side, investments (either domestic or foreign) should be encouraged, the unregulated expansion of industrial capacity will lead to large supply elasticity, hence forcing price points down. This can have negative consequences on profitability, especially during the period of an economic slowdown (Ratnasingam and Ioras 2015).

Market structure

With a population of about 30 million and a relatively low disposable income of RM 1,850 per household in 2015, the domestic market for timber products is relatively small (Department of Statistics 2015). As a result, 90% of the timber products that are manufactured in the country are exported, and Malaysia is among the leading exporter of various timber products globally. However, the export destination of Malaysian timber products is still focused on the traditional Organisation for Economic Co-operation and Development (OECD) markets, which are very competitive market places. With strength in commodity-type product manufacturing, Malaysian exporters are finding it difficult to compete in this marketplace and retain their profit margin (Ratnasingam and Ioras 2015). As implied in this study, the Original Equipment Manufacturing (OEM) strategy, which accounts for 75% of the manufacturing capacity, must be reduced and shifted towards Original Design Manufacturing (ODM) and Original Brand Manufacturing (OBM) strategies (Ziaie *et al.* 2012). This will allow the Malaysian timber products to be exported to other non-traditional markets, in which the products are expected to face less competition and be more profitable.

Dependency on human capital

It is a well-known fact that the timber industry is lowly automated and therefore, the demand for labor is high. Due to the reluctance of the local workforce to seek employment in the timber industry (Ratnasingam *et al.* 2013), foreign workers have to be employed to fill up the vacancies (National Timber Industry Policy 2009). The increasing dependency on foreign contract workers is evident as shown in Table 4.

Manufacturing	Workers	2010	2011	2012	2013	2014	
360101							
16222	Local	715	668	504	507	355	
	Foreign	385	393	380	391	555	
16212	Local	4,974	5,323	5,540	4800	3,822	
	Foreign	2,679	3,127	4,179	5,001	5,978	
31001	Local	44,034	40,970	37,476	31,900	26,461	
	Foreign	23,710	24,062	28,272	35,900	41,389	
16100	Local	21,529	20,357	23,792	16,000	12,602	
	Foreign	11,592	11,955	17,948	24,800	19,710	
16211	Local	33,038	32,934	27,954	24,607	19,542	
	Foreign	17,790	19,342	21,088	25,501	30,566	
16221	Local	7,768	6,032	7,277	5,997	4,988	
	Foreign	4,183	3,542	5,489	6,803	7,802	
*Note: 16222- joinery wood products; 16212- particleboard and fiberboard; 31001- wooden and							
cane furniture; 16100- sawmilling of wood; 16211- veneer sheet and plywood; and 16221-							
builders' joinery carpentry							

Careers in the timber sector is often associated with the 3Ds syndrome (dangerous, demeaning, and dirty), which makes it unattractive to the local workforce, who also perceives it to be a low wage economy. These foreign contract workers are regarded as unskilled or semi-skilled workers. Nevertheless, working for several years on the job enables them to enhance their skills. As a matter of fact, Russell (2015) indicated that industrial productivity can be impaired when the short-term tenure of foreign laborers comes to an end, which depletes the industry of its much-needed skills.

With the anticipation of continuous growth of the timber industry in the future, employment of foreign contract workers will be a major challenge. In this context, automation and mechanization is much needed in order to ensure consistent quality products. Although employment of foreign workers appears to be a necessity for the low-cost industry, it does not solve the long term human capital problem. Boosting productivity and value addition through automation and mechanization are possible solutions to ensure a high wage economy. This in turn will create high-skilled employment opportunities in the timber industry, which is attractive to workers, local and foreign, as well as professional graduates in the field of Wood Science and Technology (Kammesheidt *et al.* 2007).

Technology

Investments in advanced technology contribute towards the growth in industrial productivity (Bush and Sinclair 1989). According to Pang *et al.* (2015), the technology used in the timber sector, particularly in the value-added industries, was found to be on par with other developed countries, such as Japan, Germany, Italy, and Taiwan. However, the inefficient use of these technologies has hindered the manufacturing of higher value-added products. There are dedicated training centers for the wood-based industry, such as the Wood Industry Skills Development Centre (WISDEC), which trains a sufficient pool of skilled workforce for the industry (National Timber Industry Policy 2009). Bureš and Stropková (2014) highlighted that training is a prerequisite for workers to increase their level of skills. Rahmah *et al.* (2012) added that training opportunities will eventually lead

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to the adaption of current industry needs and expertise absorption among the workers in timber industry.

CONCLUSIONS

- 1. This study looked at the productivity performance from the years 2010 through 2014 of the six major timber sub-sectors in Malaysia, namely joinery wood products, particleboard and fiberboard, wooden and cane furniture, sawmilling of wood, veneer sheet and plywood, and builders' joinery and carpentry. The productivity performance is becoming stagnate, which accounts for the relatively low value-addition within the industry.
- 2. The labor productivity within the timber sector is stagnant and affected the capital utilization. The high dependence on labor, particularly foreign contract workers has impaired skills retention within the sector, which has severely hindered value-added manufacturing.
- 3. To boost productivity and value-addition within the timber sector, remedial measures in the form of industrial development policies, to address shortcomings in the market, technology application, and human capital, must be taken seriously by the various timber industry development agencies.

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