HOW MALAYSIAN CONSTRUCTION INDUSTRY PERFORMS IN THE INTERNATIONAL PRODUCTIVITY COMPARISON

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Abstract

Productivity re-emerged as one of the important pillars in the Eleventh Malaysia Plan (2016-2020). Unlocking the potential of productivity is identified as one of the six game changers in the plan. Since the mid-1990s, Malaysia has focused on increasing innovation and productivity to transform from an input-driven to a knowledge based economy. However, Malaysia continues to lag behind many economies. Construction is an important industry because its output is large and it represents a significant part of the economy. Comparing industry productivity between countries provides a crucial information base for research in comparative analysis and policy making. The construction industry is characterised by the heterogeneity and uniqueness of construction product, complexity of its delivery process and industrial structure and the country specificity of construction products. These characteristics exacerbate difficulties of productivity comparison between different economies. Purchasing Power Parity data from the World Bank's International Program 2011 and employment statistics of the International Labour Organisation are used to generate comparative data of 88 economies after removal of outliers. Malaysia achieved 76% of the world's average of construction labour productivity in the year 2011. It had improved from 62% achieved in the year 2005. The results indicate that developed economies achieve higher construction labour productivity than developing economies in both PPPs and by exchange rates measurement methods. There is converging phenomenon of productivity measured in PPPs and exchange rates when economies transit from developing to developed status. It concluded that construction is transforming from a non-internationally traded product to an internationally traded product.

Keywords: *Productivity, construction industry, international comparison, purchasing power parity*

1. INTRODUCTION

Construction accounts for a significant portion of economic activity and is a catalyst for many other sectors (Langston, 2015). In most countries, construction provides about half their gross domestic fixed capital formation (Hillebrandt, 2000). The world construction industry stands at 5.5% of world Gross Domestic Product (GDP) in 2013 (United Nation Statistics Division, 2014). The construction industry has long been criticized for apparent underperformance (Langston, 2015). In Malaysia, the construction industry employed 9.1% of the country's labour force but shared 4% of the country's GDP and contributed only 0.5% to its growth in 2014. It is the least productive industry among the five major industries in the economy (Table 1). Since 1970s, the construction productivity fluctuated within the bandwidth of RM22,000 per person to RM40,000 per person at constant 2010 price while the overall country's labour productivity had improved more than threefold from RM22,269 per person in 1971 to RM75,092 in 2014 (Figure 1). There was a recovery of construction productivity in mid-1980s after the declination in early 1980s. But the recovery only last until mid-1990s. The growth at the time was predominantly input-driven, supported by private investments in industry and public investments in infrastructure. The growth is not sustainable. By the beginning of 2000s, the construction productivity fell back to almost what had achieved in mid 1980s.

The heterogeneity of construction output remains a complicating factor in productivity measurement (Best and Meikle, 2015). The search for appropriate measures lies on the leading edge of research into the performance of contractors, projects and industries and probably will do so well into the future (Langston, 2015). Over the years, numerous attempts have been made to determine the main drivers of productivity and efficiency in the construction industry (Abbott, 2015).In reality, performance is relative and assessed via comparison to observed best practice. This requires appropriate and current data in an objective (i.e. numeric) format across a wide range of building types, locations, times and regulatory environments that makes the task difficult if not impossible to complete (Langston, 2015). Measurement is the first step that leads to control and eventually to improvement. No single framework or approach fits all situations. The aim of this paper is to establish how Malaysian construction industry compares with the similar industries of the rest of world. The objective of this paper is to use Purchasing Power Parity (PPP) data from the World Bank's International Program 2011 and employment statistics of the International Labour Organisation in order to generate comparative data of construction labour productivity. The study contributes to the knowledge of the world ranking of Malaysian construction labour productivity. The output will be useful to review and reflect how effective are the policies or procedures practiced in the past by the industrial actors and the regulatory institutions and what are the areas for further improvement of the industry.

Table 1: GDP by Economy Activity, Employment by Industry and Labour Productivity in 2014 (at constant 2005 prices)

Industry	GDP By Economic Activity		Employment by Industry		Labour Productivity
	RM million	% share	Thousand persons	% share	(RM/person)
Agriculture	58,245	7.0	1,676.5	12.4	34,742
Mining and quarrying	64,136	7.7	77.7	0.6	825,431
Manufacturing	205,534	24.7	2,207.8	16.4	93,094
Construction	33,297	4.0	1,228.5	9.1	27,104
Services	460,202	55.3	8,293.3	61.5	55,491

Sources: Computed from the data in Economic Report 2014/2015

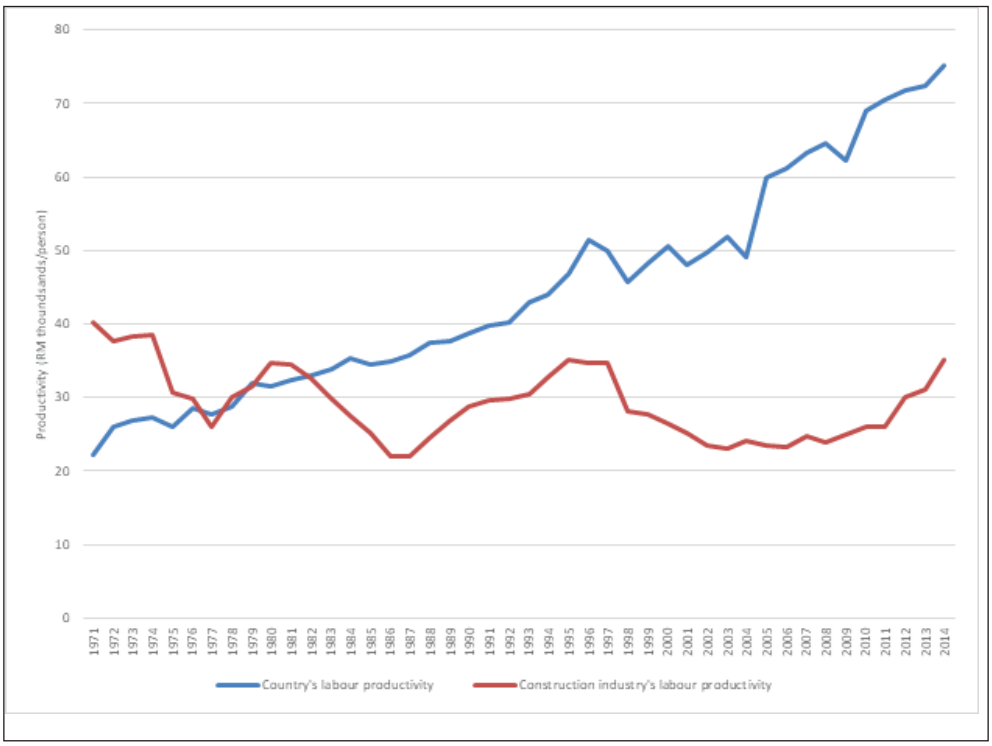

Figure 1: Total Labour Productivity and Construction Labour Productivity of Malaysia, 1971-2014 (at constant 2010 prices)

Source: Computed from Various Issues of Economy Reports

2. INTERNATIONAL COMPARISON OF CONSTRUCTION PRODUCTIVITY

It is not feasible to quantify construction output aggregately because of heterogeneity of these outputs. It leaves the use of monetary value as the only way to aggregate the output of the industry. Often cost of construction is converted in USD to make comparisons. However, using exchange rates when comparing one country's national economy with another could be distorted by price level differences between the countries (Best and Meikle, 2015). The difference between GDP levels in two or more economies reflects differences in both the volume of goods and services produced by the economies and the price levels of economies. These differences do not reflect the relative purchasing power of the currencies in their national market (The World Bank, 2015). Moreover, the supply and demand for currencies are influenced by many factors such as currency speculation, interest rates, government intervention and capital flows between economies. Hence, the volatility of exchange rates often distorts a country's construction costs making it difficult to compare with the cost of construction in other countries (Meikle and Gruneberg, 2015).

2.1 Nominal and Real Expenditure

Normally economies report nominal expenditures on GDP and its constituent aggregates and product groups. Nominal expenditure is expenditure that is valued at national price levels, which are expressed in national currencies or in a common currency after being converted by exchange rates. However, the exchange rates do not correct for differences in price levels between economies and so expenditure is still valued at national price levels. Conversely, real expenditure or purchasing power parity (PPP) deflate the nominal expenditure so that expenditure is valued at a common price level. This reflects real or actual differences in the volume purchased in economies and provides the measures required for international volume comparisons (The World Bank 2015).

2.2 Purchasing Power Parity

PPP is a neutral way of stating the ability of one nation's currency to purchase goods in different nation costs recorded in various national currencies in a single currency (Taillard, 2013). It is defined as a spatial price deflator and currency converter (The World Bank, 2015). A most popular example of such measurement approach is the Big Mac Index. The Bic Mac Index was created by The Economist in 1986 as a lighthearted guide to whether currencies are at their "correct" level. It is based on the notion that in the long run exchange rates should move towards the rate that would equalise the prices of an identical basket of goods and services (The Economists, 2016).

The International Comparison Program (ICP) conducted under the charter of the United Nations Statistical Commission (UNSC) is the principal sources of data on the PPPs. The latest round of the ICP 2011 was published in 2015. There are 199 economies participated and produced a full set of results for 177 economies. It accounts for around 97% and 99% of the world's population and the world nominal GDP respectively (The World Bank, 2015). Construction expenditure is one of the 25 sub aggregates of expenditure reported in ICP 2011.

2.3 Productivity

'Performance' and 'productivity' are often used interchangeably in the literature. Studies into the efficiency of multiple projects or contractors may help to understand industry performance, and these types of studies tend to focus on comparative productivity (Langston, 2015). Productivity is an average measure of the efficiency of production, which is expressed as the ratio of output to inputs used in the production process. The productivity measures can be classified as single factor productivity or multifactor productivity. Single factor productivity relates a measure of output to a single measure of input, while multifactor productivity relates a measure of output to a bundle of inputs.

An example of single factor productivity is labour productivity. Labour productivity is easy to measure. It partially reflects the productivity of labour in terms of the personal capacities of workers or the intensity of their efforts and how efficiently labour is combined with other factors of production. It also reflects how many of these other inputs are available per worker and how rapidly embodied and disembodied technical change proceeds (OECD, 2001).

In addition, labour productivity captures the movements of output with gross output or value-added.

When measured as gross output, labour productivity rises as a consequence of outsourcing and falls when in-house production replaces purchases of intermediate inputs. The efficiency gain as a consequence of input substitution such as a change in the individual characteristics of the workforce and a shift in technology or efficiency will not be captured (OECD, 2001).

Value-added based labour productivity measures tend to be less sensitive to processes of substitution between materials plus services and labour. When labour is replaced by intermediate inputs, which takes place in outsourcing, leads to a fall in value added as well as a fall in labour input. The first effect raises measured labour productivity; the second effect reduces it. Hence, value-added based labour productivity measures reflect the combined effects of changes in capital inputs, intermediate inputs and overall productivity, they do not leave out any direct effects of embodied or disembodied technical change (OECD, 2001).

3. Research Methods

The choice of productivity measures depends on the purpose of productivity measurement and the availability of data. Labour productivity used in this paper is a single factor productivity measure based on gross output. The PPP data for construction expenditure of different economies found in the ICP 2011 are used as proxy for output in order to derive the value of productivity. In a nutshell, construction labour productivity (CLP) is the ratio of the quantity of gross construction output to the quantity of labour input (OECD, 2001).

The quantity of labour input in this study is obtained from the International Labour Organisation's central statistics database (ILOSTAT) which is the primary source for cross-country statistics on the labour market. There are 100 indicators and 165 economies labour data available in ILOSTST database. Employment by construction of the different economies are used as proxies of quantity of

labour input are extracted from the section of Employment by Economic Activity and Occupation of the database (International Labour Organization, 2015).

There are only 93 matching pairs of economies found in the construction expenditure in ICP 2011 and employment statistics of ILOSTAT. They account to 82.5% and 89.9% of real construction expenditure and nominal construction expenditure respectively reported in ICP 2011.

A one-way analysis of variance (ANOVA) was conducted to evaluate the significance of relationship between the development status (independent variables) and the construction labour productivities (dependent variables). The developing status is based on the World Bank's classification of economies, which is based on estimates of gross national income (GNI) per capita for the previous year. As of 1 July 2011, low-income economies are those that had average 2010 incomes per capita of not more than $1005; lower-middle-income economies had average incomes of $1,006 to $3,975; upper-middle-income economies had average incomes of $3976 to $12,275; and high-income had average incomes of $12,276 or more. Low and middle-income economies are commonly referred to as developing economies (The World Bank, 2015).

4. RESULTS AND DISCUSSION

Figure 1 is a boxplot of the CLPs grouped by developing status and shows there are five outliers, two in high income economies (i.e. Aruba and Macao), and two in upper middle income economies (i.e. China and Seychelles), and one in lower middle income economies (i.e. Bhutan). The five outliers are removed from this study. Among these outliers, China and Bhutan appeared to be two extreme cases that might merit more careful checking separately. For example, Bhutan is a small country. Its Eleventh Five Year Plan (2013-2018) reported that its construction sector contributed about 16 percent of nominal GDP and recorded an annual growth of 35 percent in 2011. The construction sector employed less than 5,000 Bhutanese in 2012 (Gross National Hapiness Commission, 2013). Is the statistics include all the construction labour in the country?

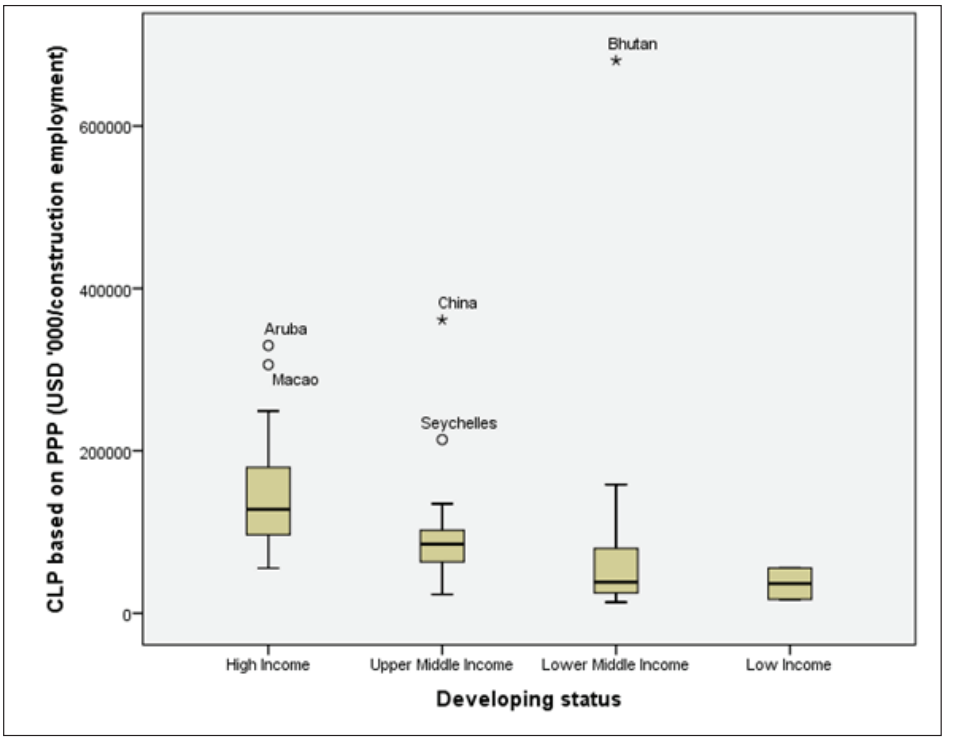

Fig. 2: Boxplot of CLP based on PPP (USD '000/construction employment) and developing status

Table 2 shows the construction labour productivities based on PPP are higher than the construction labour productivities based on exchange rates. In addition, the average construction labour productivity is higher in the economies with higher development status than those economies in the lower development status.

Table 2: Average Construction Labour Productivity based on PPP and Exchange Rates by Development Status

Developing status		Construction Labour Productivity based on PPP		Construction Labour Productivity based on Exchange Rates	
	N	M	SD	M	SD
High Income	47	133 334	47 745	106 529	59 714
Upper middle income	24	81 335	25 588	31 608	10 578
Lower middle income	15	50 290	40 772	16 664	10 100
Low income	2	36 435	27 328	7 812	1 999

Table 3 shows that ratio of variances of construction labour productivity based on PPP or exchange rates and development status are $F(3, 84) = 20.43$, $p = .00$ and $F(3, 84) = 24.71$, $p = .00$ respectively, which indicates that the construction labour productivities are significantly different according to the development status.

Table 3: One-way Analysis of Variance of Construction Labour Productivity on Comparing Developing Status

Developing status	Construction Labour Productivity based on PPP					Constriction Labour Productivity based on Exchange Rates				
	Sum of squares	df	Mean square	F	Sig	Sum of squares	Df	Mean square	F	Sig
Between groups	105 046 285 722	3	35 015 428 574	20.434	.000	148 305 307 835	3	49 435 102 611	24.713	.000
Within groups	143 937 784 845	84	1 713 545 058			168 029 397 656	84	2 000 349 972		
Total	248 984 070 568	87				316 334 705 492	87			

Table 4 presents top 10 economies of the remaining 88 economies which have highest construction labour productivity based on PPP and exchange rates. Singapore has the highest construction labour productivity among the 88 economies included in this study when measured in PPP. Singapore's construction labour productivity index value is 678 which is 6.8 times higher than the world average (World average index = 100). However Singapore's construction labour productivity is 4.8 times of average world index when measured in exchange rates. Luxembourg's construction labour productivity is the highest if it is based on exchange rates measurement. Construction labour productivity tends to be higher in the high income economies than the low income economies. In higher-income economies, the gaps between construction labour productivity measures in PPPs and exchange rates are narrower. The construction labour productivity is higher based on exchange rates measurement in higher income economies. The increase in the number of very large projects or projects that require some form of vertical integration causes the growth of very large firms (Runeson and Valence, 2009). As Gruneberg and Ive (2000) explain, the larger firms obtain a higher productivity and faster rate of productivity increase because they own or invest in larger amounts of plant and equipment or other fixed capital per worker; larger firms hire or lease a larger proportion of the fixed capital they use; larger firms have a lower porosity of the working day, higher work intensity or greater non-capital-embodied efficiency; and for the larger firms there is an implied bargain that workers will work with above average intensity and in return will receive above average wages (Gruneberg and Ive, 2000).

Table 4: The Top 10 Economies with Highest Construction Labour Productivity based on PPP

Economies	Construction Labour Productivity based on PPP		Construction Labour Productivity based on exchange rates	
	USD/Person	Index (world=100)	USD/Person	Index (world=100)
Singapore	867,863	678.20	372,628	481.52
Luxembourg	492,639	384.98	421,138	544.21
Saudi Arabia	248,933	194.53	58,159	75.15
Belgium	206,154	161.10	168,909	218.27
Netherlands	199,997	156.29	191,795	247.84
Finland	199,983	156.28	194,469	251.30
Canada	192,678	150.57	213,732	276.19
Hong Kong	192,501	150.43	99,243	128.25
Ireland	189,143	147.81	119,622	154.58
Israel	183,807	143.64	157,050	202.95

Source: Computed from ICP 2011 and employment database maintained by ILOSTAT

Table 5: Malaysian Construction Productivity based on PPP in years 2005 and 2011

Year	Construction Labour Productivity based on PPP		Construction Labour Productivity based on exchange rates	
	USD/Person	Index (world=100)	USD/Person	Index (world=100)
2011	93,417	73.00	29,351	36.64
2005	46,365	62.00	11,140	20.00

Source: Computed from ICP 2011, and ICP 2005 and employment database maintained by ILOSTAT

Malaysian Construction Labour Productivity is 73% of world average in year 2011 based on PPP and 37% of world average if based on exchange rates measurement (Table 5). Low productivity is one of the biggest challenges faced by the local construction sector. The Productivity Report 2015/2016. Reported that the majority of construction works were driven by the private sector. The lack of interest to undertake IBS, especially among private sector project owners, dampened productivity growth of the sector (Malaysia Productivity Corporation, 2016).

One possible explanation of higher value resulted from measurement based on PPP is the construction industry is non-international traded product, it consumes and utilises local resources most of the time. Construction labour productivity in Malaysia improved from 62% of world average in year 2005 to 73% in 2011 (Table 5). It ranks 51 position among the 88 economies in this study. The industry has an obvious improvement between the two periods of measurement, but it is far away from the world average. There is considerable efforts to increase the application of the country's Industrialised Building System (IBS) to increase mechanisation of the industry and to reduce over-dependency on unskilled foreign labour. Government has make it compulsory for public and private projects to utilise IBS components to a minimum of 70% and 50% respectively by 2015.

Construction labour productivity measures of the two methods are tending towards convergence as the economies grow from developing to developed status. Such convergences indicate increasing influenced of the exchange rates on the construction labour productivity. In the case of Malaysia, the

42% difference of two measurement methods in 2005 is narrowed to 36% in 2011. This suggests that the construction industry is changing from being a long-established non-international traded industry to a more complex international traded industry. The role of international contracting is going to change the productivity performance of the construction industry. Construction projects have increased both in their complexity and scale and there are increasing numbers of construction contracts being won by the international contractors. Advanced construction technology, newly developed construction materials, integrated project delivery and trade liberalization are removing the traditional barriers of the construction markets driving their transformation into a competitive international marketplace.

5. CONCLUSION

There are many productivity enhancers within the construction industry worldwide. Lean, BIM, value-based procurement, innovative industry tools and collaboration are all powerful tools to be adopted, but they need to be used together to deliver the most dramatically improved results. Meeting the productivity challenge is an industry-wide problem which requires changing expectations and behaviors of all stakeholders and breaking down the existing siloes and adversarial culture in the industry. The culture of productive excellence can be inculcated amongst all stakeholders in the industry to produce more with less, upskilling rather than expanding workforce, sharing risks and rewards across the value chain and willing to think and act beyond the context of individual projects.

This study evaluates Malaysian construction labour productivity position in the global setting. The PPP measured of productivity corrects the price level differences and reflects real or actual differences in the volume of construction produced in economies. The below world average performance of the industry highlighted the industry needs to learn from the industries in more successful countries on the areas of improvement such as industry practices, construction processes and regulatory interventions.

In the run-up to 2020, the Malaysian government plans to spend RM 260 billion on development projects. About half of this allocation is earmarked for infrastructure development. This substantial amount in the volume of construction works provides an opportunity for the construction sector to adopt new technologies and new methods of construction to provide a possible quantum leap in productivity through the more efficient utilization of technologies, manpower and resources in future.

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