Economic development and construction productivity in Malaysia

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ECONOMIC DEVELOPMENT AND CONSTRUCTION PRODUCTIVITY IN MALAYSIA

Abstract

The productivity of the construction industry has a significant effect on national economic growth. Gains from higher construction productivity flow through the economy, as all industries rely on construction to some extent as part of their business investment. Contractions and expansions of economic activity are common phenomena in an economy. Three construction cycles occurred between the years 1970 and 2011 in Malaysia. The relationships between construction productivity and the economic development are examined by the partial correlation method to establish the underlying factors driving the change in construction productivity. Construction productivity is statistically significantly correlated with GDP per capita in a positive direction for the 1985-1998 and 1998-2009 cycles, but not the 1970-1985 cycle. Fluctuations in construction activities and the influx of foreign workers underlie the changes of construction productivity in the 1985-1998 cycle. There was less fluctuation in construction activities in the 1998-2009 cycle, with changes being mainly due to the fiscal stimulation policies of the government in attempting to stabilise the economy. The intensive construction of mega-projects resulted in resource constraints and cost pressures during the 1980s and 1990s. A better

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management of the ‘boom-bust’ nature of the construction business cycle is required to maintain the capability and capacity of the industry.

Keywords: productivity, economic development, Malaysia.

Introduction

The construction industry plays a vital role in economic development. It promotes growth, accumulates capital formation, contributes a source of employment, and provides critical backward and forward linkages to the rest of the economy (Wells, 1985; Kirmani, 1988). The productivity of the construction industry, therefore, has a significant effect on national economic growth. Gains from higher construction productivity flow through the economy, as all industries rely on construction to some extent as part of their business investment.

The relationship between construction output and the economy has received intensive study (Turin, 1973; World Bank, 1984; Wells, 1986; Ofori, 1990; Bon, 1992; Crosthwaite, 2000; Chan, 2001; Giang & Low, 2011), but there has been a lack of attention paid to the relationship between construction productivity and economic development. Whereas productivity is often used to describe the relationship between output and the inputs that are required to generate that output in the production process, usually expressed in ratio form, economic development is often used to refer to all changes in the economy including the social, political, and institutional changes that accompany changes in output (Berg, 2005). A narrow definition, involving the growth of output in an economy being normally measured as GDP per capita, is often used as a proxy to measure economic development. As Lewis (2006) explains, GDP per capita is simply the product of the fraction of the population that works and average worker productivity because the fraction of people who work in most countries is about the same. Thus differences in GDP per capita should primarily reflect differences in productivity. Lewis also concludes that an evaluation of economic performance requires an analysis at the individual industrial level for the causal factors involved (Lewis, 2006). However, GDP measurement is increasingly criticised for its inclusion of some 'nonmarket' production such as defence spending and nonprofit spending on emergencies. On the other hand, many important economic activities such as volunteer work and social capital formation are entirely excluded from GDP (Costanza et al., 2009). Nevertheless, as Costanza et. al. explain, "*GDP is not inherently bad – it measures what it measures. Rather it is being misused as an indicator of something it doesn't measure and was never intended to measure*."

Malaysian GDP per capita was USD10879 in year 2012 (Ministry of Finance, 2012) and is classified as an upper middle income country according to the World Bank classification of countries (World Bank, 2013). The construction industry contributed 3.3% in GDP. There were 69490 contractors registered with Construction Industry Development Board Malaysia (CIDB) as at 2012. The construction industry in Malaysia, as in many other countries, is characterised by a mass of small enterprises. The shape of the industry structure is that of a flattened pyramid, with 5144 large contractors at the top and 36399 micro and small contractors forming the broad base (Construction Industry Development Board, 2013). The average annual growth rate of value-added of Malaysian construction activity has drastically contracted from 11.8% in the 1970s to 1.8% in the 2000s, with its contribution to Gross Domestic Product (GDP) falling from 4.3% in 1970s to 3.1% in the 2000s. However, the amount of labour resources consumed by the construction sector has

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risen from 4.0% in the 1970s to 7.2% in the 2000s. What does the increase in employment and decrease in contribution to GDP indicate?

In the first section, the relationships between the productivity levels and various economic indicators at the industry level are examined in order to understand the implications of economic fluctuation on construction productivity. The next then examines the celebrated Verdoon's law concerning the relationship between labour productivity and output, the subsequent evolution of the law and reviews the controversial Real Business Cycle (RBC) theorists' assumptions on economic boom and productivity shock. Details are provided of the data sources, research methods adopted and use of partial correlation coefficients to identify the productivity drivers among the components of proxies used in economic development and construction productivity. The research results are then presented according to the different construction cycles and productivity drivers in each construction cycle are isolated for further discussion. The fourth section attempts to validate the results in the Malaysian construction industry context. The final section concludes with the likely implications of the study.

Business cycle

In his celebrated article, Verdoorn (1949) investigated the relationship between labour productivity and output, using data drawn from a number of different countries in 1870-1914 and 1914-1930 (Verdoorn 1949 cited by Rowthorn 1979). Verdoorn's work did not achieve the immediate attention of the economics profession. It was quoted by Arrow in his classic 1962 paper on 'learning by doing' (Arrow, 1962 cited by McCombie et al., 2002) but not receiving widespread recognition until 1966, when Nichloas Kaldor explicitly referred to it and coined the term Verdoorn's Law in his

Cambridge Inaugural Lecture (Arrow, 1962 cited by McCombie et al., 2002). Since Kaldor's seminal work in 1966 the relationship has been renamed Verdoorn-Kaldor's Law (Castiglione, 2011).

Verdoorn found a sizeable positive relation between the rate of growth of labour productivity and the rate of growth of output (Rowthorn, 1979). Verdoorn makes the assumption that industry employs all the labour available at the going wage rate, the supply of labour to industry is influenced by the industrial wage rate, and the wage rate is proportional to industrial productivity. With these assumptions, a rise in industrial productivity causes wages to rise, which attracts new workers from other sectors, notably agriculture, and industrial employment increases. Implicit in Verdoorn's model is a linear relationship between the growth rate of industrial productivity and output growth, which is determined by labour supply conditions and is independent of the technology of production (Rowthorn, 1979).

Kaldor adds the contribution of capital growth to the original Verdoorn's Law, estimated by gross investment. The investment contributes to the economic growth by itself as well as its effects on the aggregate demand, level of output and new capital goods and hence technological progress in the overall economy (Ofria and Millemaci 2010). Kaldor gives new meaning to the original Verdoorn Law by stating that the relationship between productivity growth and output growth is a dynamic rather than static one (Castiglione, 2011). Kaldor views the increasing returns to scale as essentially a "macroeconomic phenomenon" and arising from specialisation, learning and accumulation mechanisms and in the theory of incorporated technical progress (Ofria and Millemaci, 2010).

The recent study of Kaldor-Verdoorn’s law by Ofia and Millemaci (2010) suggests that the law is valid for manufacturing in Italy, Belgium and Australia. The estimated Verdoorn coefficients are found to be stable throughout the period. Castiglione's (2011) analysis of tests of quarterly USA data for 1987-2007 also confirms Verdoorn-Kaldor’s law.

Another line of inquiry of output and productivity is Finn Kyland and Ed Prescott's Real Business Cycle (RBC) Theory. RBC theory says that booms occur at a time of high productivity and technology shocks. As a result, firms want to produce high levels of output, to employ many workers and to invest in new machinery. Firms then pay high wages because productivity is high, resulting in economic expansion. The effect of positive technological development is thus spread over several periods. By contrast, recessions happen because productivity/technology is poor. This is bad time to produce, and firms will not wish to pay high wages, invest, or hire workers. With wages low, workers will not be eager to work. Recessions are simply bad times to become economically active (Miles and Scott, 2005).

Christiano and Fitzgerald (1998) show that even in the presence of a common shock, it is difficult to generate comovement across industries that produce consumption and investment goods. This difficulty results from the fact that when there is a technology shock, investment increases by much more than does consumption. In a standard two-sector model, this shock response implies that labour should move from the consumption sector to the investment sector. As a result, hours fall in the consumption sector in times of expansion (Rebelo, 2005).

In contrast to RBC theorists, most Keynesians assume that demand shocks, rather than supply (productivity) shocks, cause most cyclical fluctuations(Abel and

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Bernanke, 2011).*The General Theory of Employment, Interest and Money* edited by John Maynard Keynes in 1936 essentially argues that recessions are not occasions when individuals optimally choose to produce low output, but periods when the market does not work properly, leading to suboptimally low output (Miles and Scotts, 2005). Prices, wages, and interest rates might be unable to change, or change enough, to prevent the economy getting caught in a period of low output and high unemployment. In other words, recessions are bad, and governments should, and can, improve things (Miles and Scott, 2005).

In addition, Keynesians assume the production function to be fairly stable over the business cycle. Increase in employment during booms should reduce average labour productivity because of the diminishing marginal productivity of labour. Thus, the Keynesian model predicts average labour productivity to be countercyclical, contrary to the business cycle fact (Abel and Bernanke, 2011). Keynesians include ‘labour hoarding’ in their model. Labour hoarding occurs if firms retain labour during a recession, rather than dismissing workers to avoid the cost involved, and then having to reemploy them or employ and train new workers when the recession ends. Thus the hoarded labour may be used less intensively or be assigned to activities that do not directly contribute to measured output, and labour productivity may fall during a recession even though the production function is stable. The labour hoarding provides a way of explaining the procyclical behaviour of average labour productivity (Abel and Bernanke, 2011).

Sharpe (2002) explains that the short- to medium-term movement of productivity is determined by two influences – an underlying productivity trend and a cyclical movement. Actual productivity growth between cyclical output peaks provides an approximation of trend productivity. The trend may be influenced by average

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capacity utilisation over the cycle and differences in capacity utilisation at the peaks. The short-term behaviour of labour productivity is explained by lags in adjustment of labour input to changes in output. Lags in the adjustment of labour input, both employment and total hours worked, are caused by firms' unfulfilled expectations concerning demand conditions, the existence of overhead labour that is relatively invariant to output levels, and a tendency for firms to hoard skilled labour in downturns so as not to lose their investment (Sharpe 2002).

Construction projects involve long term investment and long term risks. They are the first to be suspended at the first sign of an economic downturn, and the last to be revived during an economic upturn (Gruneberg and Ive, 2000). The fairly flexible demand for new construction work, together with the long life and expense of construction output (Runeson, 2000), leads to long periods of recession for the construction sector whenever a general business cycle is experienced. Nevertheless, not all construction demand is subject to market forces. The government accounts for the majority of infrastructure construction procured and can use its development programmes as an influential tool for economic stabilisation so as to compensate for the cyclical changes in private sector building activity (Runeson, 2000).

Productivity measurement

Productivity is commonly defined as the ratio of a volume measure of output to a volume measure of input used. There are many different productivity measures that include single factor measures of productivity, such as labour and capital productivity, and multifactor productivity measures (MEP), either in the form of capital-labour MFP, based on a value-added concept of output or in the form of capital-labour-energy-materials MFP (KLEMS), based on a concept of gross output

(The Organization for Economic Co-operation and Development, 2001). Labour productivity is a good starting point for the analysis of productivity. Labour productivity relates to the single most important factor of production. It reflects how efficiently labour is combined with other factors of production, how many of these other inputs are available per worker and how rapidly embodied and disembodied technical change is proceeding. It is a key determinant of living standards, measured as per capita income, of significant policy relevance, intuitively appealing and relatively easy to measure. However, it only partially reflects the productivity of labour in terms of the personal capacities of workers or the intensity of their effort. The ratio between output and labour input depends to a large degree on the presence of other inputs (The Organisation for Economic Co-operation and Development, 2001).

Two basic measures of output are value added and gross output. The value added measure excludes intermediate inputs (materials, energy and services used in production) while the gross output measure includes those inputs. The value-added approach has considerable advantages because it is a simple measure that ignores the difficulties of dealing with inter-industry and intra-industry flows of goods and services (Cobbold, 2003). Labour productivity measures based on gross output are sensitive to substitution between factor inputs and intermediate inputs, particularly through outsourcing. Outsourcing leaves gross output little affected, but reduces labour input. The value-added measure is more meaningful in the presence of outsourcing and is generally favoured for estimating labour productivity (Cobbold, 2003). The difference between the two concepts of productivity growth is less pronounced at the aggregate level.

Productivity can be measured at three levels in the construction industry - the industry, the project and the task levels. The industry-level measures are considered here. Lagging industry-level measures can be used to determine whether the productivity of the construction industry as a whole is improving or declining over time and to track industry trends for several years to help identify the root causes of improvement or decline (The National Academy of Sciences, 2009).

Data sources and methods

The data for overall GDP, population, GDP in construction and construction employment between years 1970 and 2011, were obtained from the annual publications, *Economic Reports* and *Bank Negara Reports* (Annual Report of Central Bank of Malaysia) published by the Ministry of Finance and Central Bank of Malaysia respectively. Malaysian national accounts data included in these reports have been prepared according to the Systems of National Accounts 1993 (1993 SNA) recommended by the United Nations (Department of Statistic Malaysia, 2008).All the prices employed in the study were deflated to year 2000 constant prices. This is done to avoid confounding changes in control costs over time with changes in the general price level. The GDP per capita is calculated as the aggregate of production (GDP) divided by the population size. GDP is the total value of goods and services produced within a given period after deducting the cost of goods and services absorbed in the process of production but before deducting allowances for the consumption of fixed capita (Ministry of Finance, 2010). GDP per capita is used as a proxy for economic development. Construction labour productivity is derived from the GDP of construction divided by employment in the construction sector. Construction refers to '*new construction, alteration, repairs and demolition. Installation of any machinery* *or equipment which is built-in at the time of the original construction but which requires structural alteration in order to install*' carried out by registered contractors (Ministry of Finance, 2010). Construction firms are divided to two main groups of general contractors and specialist contractors. General contractors are further divided into residential construction, non-residential construction and civil engineering work. They are engaged in constructing, altering, repairing and demolishing buildings; constructing, altering and repairing highways and streets, bridges, viaducts, railways, roads, harbours and waterways, piers, airports and parking areas; culverts, sewers, water, gas and electricity mains, dams, drainage, irrigation, flood-control and water power projects, hydroelectric plants, pipe lines and water wells; athletic fields, golf courses, swimming pools and tennis courts; communication systems such as telephone and telegraph lines; pile driving and land draining; and other type of heavy construction. Special trade contractors are engaged only in part of the work of a construction project. They may engage in such activities as plumbing installation; heating, air conditioning and refrigeration installation; roofing installation and concrete work; lighting and electrical wiring, sheet metal; bricklaying, stone setting, tiles setting, marble and stone works; floor-laying, plastering and lathing, carpentry; and painting and decorating.

Construction employment is measured by using the official statistics of the relevant authorities. However, the number of illegal workers not captured in the official statistics may cause estimates of the number of these workers to vary widely.

Pearson product-moment correlation coefficients (r) between construction labour productivity and GDP per capita were computed in order to assess the degree to which they are linearly related. The significance test for r evaluates the probability of there being a linear relationship between the two variables in the population (Green and Salkind, 2008). In addition, the coefficient of determination (r^2) gives the proportion of criterion variance that is accounted for by its linear relationship with the predictor (Green and Salkind, 2008). Similarly, correlation coefficients between construction labour productivity and other predictor variables were computed. In correlation research, variables are measured as they occur in participants, therefore it can be difficult or impossible to demonstrate unequivocally that one variable in any sense 'causes' another (Kinnear and Gray, 2010). Even when two variables *X* and *Y* are substantially correlated in some situations, several alternative explanations may be provided for correlation results: (a) *X* causes *Y*, (b) *Y* causes *X*, (c) *X* and *Y* are activated by one or more other variables and (d) *X* and *Y* influence each other reciprocally (Cooper and Schindler, 2008). Although the correlation between the two variables may be both statistically significant and substantial, it can be a 'spurious' correlation, in the sense that it suggests the presence of a direct causal link between the two variables when actually there is none (Kinnear and Gray, 2010). In some situations, even when two variables are substantially correlated, neither variable causes the other, and both are at least partly determined by a third variable (Kinnear and Gray, 2010). Whenever two or more characteristics of individuals (or groups) are correlated, there exists the possibility that yet other characteristics can explain any relationships that are found. In such cases, the other characteristics can be controlled through a statistical technique known as partial correlation (Fraenkel and Wallen, 2008).

A partial correlation between two variables is what remains of the association between them after taking into consideration their associations with a third variable (Kinnear and Gray, 2010). If the two variables correlate substantially with the third variable, the partial correlation between them may be much smaller than the original correlation; indeed, it may be statistically insignificant. In that case, it may be reasonable to interpret the original correlation as having driven by the third variable (Kinnear and Gray, 2010). This comparison provides some insights into the contribution of different variables.

The GDP, population, construction GDP and construction employment is held constant in turn to determine what remains of the association between GDP per capita and construction labour productivity. The significance test for a partial correlation evaluates whether in the population the partial correlation is equal to zero (Green and Salkind, 2008).

Results

The overall GDP, GDP in construction, construction employment and GDP per capita and construction labour productivity between years 1970 and 2011 are presented in Table 1.

Insert Table 1 here.

Two business cycles, a 14-year cycle between years 1985-1998 and a 12-year cycle between years 1998-2009 and three construction cycles (1975-1987, 1987-1998 and 1998-2009) are identified in Fig 1. The spans of the construction cycles are shorter than the business cycles.

Insert Fig 1 here.

Figure 2 shows the fluctuation in construction cycles to be more pronounced than the general business cycle, i.e. the upswings are steeper and the troughs are deeper.

Construction work involves long term investment and long term risks and is one of the first to be suspended at the first sign of an economic downturn, and the last to be revived during an economic upturn (Hillebrandt 2000; Ive and Gruneberg 2000). Although governments frequently intervene in construction investment through fiscal and monetary policies in order to regulate the economy, it is unlikely that this will lead to perfectly synchronised economic and construction fluctuations. In addition, the general business cycle as represented by GDP is the sum of its component industry parts, and therefore fluctuates less than any one of its parts (Hillebrandt 2000; Ive and Gruneberg 2000).

Insert Fig 2 here.

Graphically, no obvious relationship between construction productivity and GDP per capita can be detected before year 1984 (Fig 3). The shape of the construction productivity curve resembles the GDP per capita curve up to the year 1998.

Insert Fig 3 here.

The Pearson product-moment correlation coefficients (r) between construction productivity and GDP per capita, GDP, population, construction activity or construction employment are summarised in Table 2. Construction productivity and GDP per capita is not significantly correlated (r = .094, ρ = .552) when analysed as a whole for the period of 1970-2011. They are not significantly correlated (r = .161, p = .637) for the 1975-1985 construction cycle. However, they are strongly positive correlated in the 1985-1998 (r = .925, ρ = .000) and 1998-2009 (r = .791, ρ = .002) business cycles. The squared correlation coefficients (or coefficient of determination, r^2) reveal that GDP per capita accounts for 85.6% and 62.6% of the variance in construction productivity for the periods of 1985-1998 and 1998-2009 respectively.

Insert Table 2 here.

In addition, the result show that construction productivity is positively correlated to GDP (r = .898, ρ = .000), population (r = .831, ρ = .000), construction (r = .941, ρ = .000) and construction employment (r = .893, ρ = .000) for the 1985-1998 period. These relationships reveal that GDP, population, construction activity and construction employment account for 80.6%, 69.1%, 88.6% and 79.7% of the variances in construction productivity respectively.

Similar statistically significant results occur for the 1998-2009 period. Construction productivity is positively correlated with GDP (r = .840, ρ = .001), population (r = .869, ρ = .000), construction (r = .99, ρ = .000) and construction employment (r = .80, ρ = .002) for the 1985-1998 period. This indicates that GDP, population, construction activity and construction employment account for 70.6%, 75.5%, 98.0% and 64.6% respectively of the variances in construction productivity.

Partial correlation coefficients were then computed between construction productivity and GDP per capita while 'controlling' for the effect of GDP, population, construction activity, and construction employment in turn to investigate thevariances in construction productivity. The results of the partial correlation analyses are presented in Table 3.

Insert Table 3 here.

In the case of the 1985-1998 business cycle, the partial correlation coefficients between construction productivity and GDP per capita (r_p (14) = 0.089; ρ = 0.773) are considerably less when the effect of construction activity was controlled and become statistically insignificant. Similarly, the partial correlation is substantially decreased and statistically insignificant when construction employment is partialled out (r_p (14) = 0.534; ρ = 0.060). The relationship between construction productivity and GDP per capita is marginally diminished when the GDP or population is partialled out and the correlation is still statistically significant (r_p (14) = 0.914; ρ = 0.000 and r_p (14) = 0.899; ρ = 0.000). The GDP per capita can account for only 0.8% of the variance in construction productivity when the construction activity is partialled out and 28.5% when the construction employment is partialled out. The result indicates that the exclusion of construction activity or construction employment severely diminishes the amount of variation (85.6% originally) in construction productivity shared by GDP per capita in the 1985-1998 cycle.

In the case of the 1998-2009 business cycle, the correlation coefficients between construction productivity and GDP per capita switches to a negative relationship when GDP (r_p (12) = -0.916; ρ = 0.000)or population (r_p (12) = -0.703; ρ = 0.016) is partialled out. The r^2 values indicate that GDP per capita accounts for 83.91% and 49.42% of the variance in construction productivity when GDP and population respectively are controlled for. When construction activity is partialled out, the correlation coefficient reduces to 0.413 and becomes statistically insignificant (ρ = 0.207). The value of r^2 indicates GDP per capita can account for only 17.1% of the variance in construction productivity. When construction employment is controlled for, the correlation coefficient becomes 0.330 and statistically insignificant (ρ = 0.332). The value of r^2 means that GDP per capita accounts for 10.9% of the variance in construction productivity. In short, the exclusion of population or GDP causes more drastic changes in the variance of construction productivity shared by GDP per capita in the 1998-2009 business cycle than the exclusion of construction activity and construction employment.

Discussion

The above analyses are summarised as follows:

1. Construction productivity is positively correlated with the business cycles of years 1985-1998 and 1998-2009 and a stronger correlation is detected in the 1985-1998 business cycle.

2. The underlying factors of the correlation in the 1985-1998 business cycle are driven by construction activity and construction employment.

3. The underlying factors of the correlation in the 1998-2009 business cycle are driven by GDP and population.

Correlation of construction productivity and the business cycle

The result indicates that construction productivity is positively correlated with the short-term business cycles of years 1985-1998 and 1998-2009. The cyclical productivity growth aligns with Verdoorn' Law which states that faster growth in output increases productivity and RBC economists' advocation that booms are a time of high productivity. Construction projects involve long-term investment and risks and, according to Gruneberg and Ive (2000) and Runeson (2000), the demand for construction work is flexible. The government accounts for the majority of infrastructure construction procured and often uses its development programmes to regulate construction activity. Sometimes, dramatic swings in policy based on political considerations rather than economic ones greatly affect the workloads of contractors. The contractors are unable to work at peak efficiency because the adjustment of labour and capital inputs cannot be made instantaneously and hoarding of skilled labour by some, usually specialist, contractors.

The stronger correlation of construction productivity and GDP per capita in 1985-1998 cycle (r=.93) than the 1998-2009 cycle (r=.79) is because the Malaysian economy was driven by a massive amount of infrastructure project work from the end of the 1980s to the end of the 1990s. The share of construction activity in the GDP was 4.7% in the 1985-1998 cycle compared with 3.7% in the 1998-2009 cycle. When Malaysia entered into the new millennium, most of its large infrastructure projects had already been completed. The construction projects undertaken in the 2000s are mainly residential and non-residential construction. According to the reports of annual surveys of the construction industry conducted by the Department of Statistics, civil engineering works comprised 40.9% and 37.5% of total construction output in years 1996 and 1998 respectively (Table 4). The Asian Financial Crisis caused the construction sector to contract by 24% in 1998. In the civil engineering subsector, growth was affected by the deferment of infrastructure projects totalling RM65.6 billion as announced in the 1998 Budget as well as the completion of projects associated with the Kuala Lumpur International Airport (KLIA) and the Commonwealth Games Village. The impact became more severe in the second half of 1998 as more projects were deferred, including the Dedicated KL-KLIA Expressway, the People Mover-Rapid Transit System (Phase 1) and the South Klang Valley Expressway (Bank Negara Malaysia 1999). The civil engineering works continuously declined to 34.1% in year 2005. On the other hand, the more labour intensive residential construction sector increased from 19.1% in year 1998 to 27.1% in year 2005 (Table 4).

Insert Table 4 here.

Construction activity and construction employment in the 1985-1998 business cycle

The partial correlation test shows that construction activity and construction employment drove the change in construction productivity in the 1985-1998 cycle. This period is marked with both robust growth in public and private sectors investment in the supply side of the economy.

The New Economic Policy announced in 1970 that was primary aimed at achieving national unity by ‘eradicating poverty’, irrespective of race, and by ‘restructuring society’ to achieve inter-ethnic economic parity soon become grounds for criticism (Gomez and Jomo, 1997). More liberal investment policies were required following the mid-1980s recession. The restriction caused by the Industrial Coordination Act enacted in 1975, which required unexempted companies to ensure at least 30% Bumiputera participation in their ventures, was raised significantly. The 30% ceiling only applied to companies exporting less than 20% of its products (Gomez and Jomo, 1997). However, this relaxation does not benefited construction industry, as the construction market is mainly a domestic one. The Look East Policy announced in 1981 resulted in Japanese and South Korean construction companies descending on Malaysia and obtaining around RM5 billion in major contracts within three years after the launching of the policy (Wain 2009). Some particularly spectacular projects were undertaken by firms from these countries, such as the thirty-five storey Dayabumi complex in Kuala Lumpur.

More construction companies became corporatized during this period (Tan, 2004). Following the global recession in 1985, the construction industry underwent a correction with an average negative growth rate of 11.4% per annum the three

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consecutive years over 1985-87. By the end of the 1980's, the construction industry emerged from its economic doldrums and expanded by an average rate of growth of 13.0% during the period 1988-1997, with a peak of 21.1% in 1995 (Construction Industry Development Board, 2004). This tremendous growth was powered by the implementation of several mega building and infrastructure projects towards the realisation of Vision 2020 and development works carried out in preparation for the 1998 Commonwealth Games. The abundance of construction projects created a shortage of building materials and human resources which subsequently led to an increased employment of foreign workers (Construction Industry Development Board, 2004). To avoid disruption of the economic growth process, the government allowed foreign workers to be employed in the construction sector. Various policy measures pertaining to foreign workers have been instigated to regulate and administer their employment in selected sectors of the economy and to control the influx of illegal foreign workers. The Medan Agreement, signed between the Malaysian and Indonesian governments in 1984, was designed to regulate the recruitment of Indonesian workers. Subsequently, two agreements signed between the Malaysian and Bangladesh and Thailand governments, permit recruitment of labour from these two countries for the plantation and construction sectors in 1986 (Kaur, 2004). The Foreign Worker Rationalisation Programme to legalise illegal workers, amendments to the Immigration Act, 1977 and imposition of an annual levy were also introduced (Ministry of Finance, 2005). Currently, Malaysia allows recruitment of foreign workers from several countries including Indonesia, Nepal, Bangladesh, India and Myanmar (Ministry of Finance 2005). The Annual Labour Force Survey conducted by the Department of Statistics, revealed that the number of foreign workers has increased to 863,800 in 2001 compared to around 136,000 persons in the early 1980s (Ministry of Finance, 2005). As at 2001, foreign workers are employed in all major sectors of the economy, with agriculture accounting the largest share (32.9%), services (30.7%), manufacturing (24.7%) and construction (11.5%). There were 99,200 registered foreign workers in the construction industry in 2001 (Ministry of Finance 2005).

The 1985-1998 business cycle provided a robust annual growth of 6.4% and 3.4% of GDP and GDP per capita respectively. Construction value added experienced a 5.2% average annual growth while construction employment grew at 4.4% per annum. However, the average annual change in productivity declined marginally by -0.01% (Table 5).

In short, the policies in the 1985-1998 cycle were controversial, and of no benefit to construction industry productivity. Table 1 reveals nine occasions of negative construction productivity growth between 1975 and 1990. Among the criticisms are the suggestion that problems of NEP have hindered faster growth because of the emergence of 'cronyism', or the redistribution of renting opportunities to companies controlled by politicians, retired bureaucrats, parties in the ruling coalition and politically well-connected businessmen (Gomez and Jomo, 1997). The original intention of the Look East policy on technology transfer was not being realised, and their were complaints that Malaysia was reaping few tangible benefits from Look East that extended to trade, investment, management and shipping (Wain, 2009).

Insert Table 5 here.

Government stimulus in the 1998-2009 business cycle

The new millennium was marked with the global economy dwindling under the pressure of the slowdown of technology industries in the more developed countries.

This was exacerbated by uncertainties in the global environment arising from the USA September 11 incident in 2001, wars in Afghanistan and Iraq, unfavourable geopolitical climate in the Middle East, dotcom crash in 2000-2002, severe acute respiratory syndrome (SARS) in 2003, and the crude oil price upsurge in 2004-2005(Construction Industry Development Board, 2004). Malaysia, having an open economy, was very much affected by the situation of its trading partners so that the initiated recovery measures had little impact due to their weakening economies.

The government's stimulus package of RM3.0 billion in March 2001 prevented further decline of theMalaysian construction industry. This was extended by a further RM4.3 billion at the end of 2001. The civil engineering sub-sector was a significant benefactor from the Federal Government's development expenditure on projects related to construction, especially in the transportation, education and health sectors. Some of the large projects instigated by the Government during this period were the TanjungPelepas Phase 2 Harbour costing RM1.0 billion, the Kuala Lumpur Convention Centre costing an estimated RM550 million and the Universiti Malaysia Sarawak (UNIMAS) Development project costing RM750 million (Construction Industry Development Board, 2004). Construction projects implemented through the stimulus package also included the construction of rural roads, upgrading and maintenance work and privatisation projects in the construction of Kajang Ring Road, the Ipoh-Lumut Highway, the Guthire Corridor Highway, the Butterworth External Ring Road and an Independent Power Plant in Perlis (Construction Industry Development Board, 2004). By 2003, funds under the stimulus package were exhausted and the major projects in Putrajaya that contributed to the growth in the construction industry were completed (Construction Industry Development Board, 2004).

Private investments fell from an average of approximately 25% of GDP through the 1990s to an average of approximately 10% of GDP in the 2000s. This moderation in private investment was partially offset by a higher public investment averaging 6.2% per annum, producing a positive growth in fixed capital formation during the 2006-2010Ninth Malaysia Plan period. The problems in the USA financial system started in mid-2007 with a deteriorating quality of sub-prime assets that subsequently escalated into a major severe global financial crisis (GFC) in the second half of 2008. The impact of the global recession was felt strongly in the Malaysia external trade-related sectors and started to impact on the economy as a whole in the fourth quarter of 2008 (Bank Negara Malaysia, 2009). Malaysia experienced the full impact of the GFC in the first quarter of 2009. In response, the Government introduced several policy measures to mitigate its adverse impact and to prevent the economy from entering into a fundamental economic recession. These measures include two economic stimulus packages i.e. RM7 billion (US$2 billion) announced in November 2008 and RM60 billion (US$20 billion) in March 2009. The stimulus packages included the construction of low and medium cost houses; maintenance and refurbishment of public amenities such as schools, hospitals and roads; reviving abandoned housing projects; improving public infrastructure; and the implementation of new infrastructure projects (ank , 2010).

The regulatory interference of the construction industry during this period is the introduction of the Industrialised Building System (IBS) Strategic Plan in 1999 and IBS Roadmap 2003-2010 which aimed to work towards the adoption of the system in the private and public sectors. All government projects were mandated to contain an IBS content of no less than 70% by 2008 (Chan, 2013). The adoption of IBS moves away from labour intensive work to more factory built components and assemblies.

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Table 5 indicates that the average construction employment had reduced to 2.2% for the 1998-2009 cycle compared with 4.4% in the 1985-1998 cycle. Labour productivity had also improved from -0.01% in the 1985-1998 cycle to 0.4% in the 1998-2009 cycle.

The economic growth of Malaysia in the 1998-2009 was fuelled by aggregate demand, especially from the public sector, through a few stimulus packages at that time. The average annual growth rate of GDP and GDP per capita for the 1998-2009 cycle weakened to 3.9% and 1.7% respectively (Table 5) after the intensive growth of 6.4% and 3.4% in the previous cycle. Despite the marginal contraction of construction activity (-0.5%) and increase in construction employment (2.-21%), the construction labour productivity stilled recorded growth of 0.4% during this period.

Conclusion

The empirical analysis of Malaysia statistical data between 1970 and 2011 found significant positive correlation between construction productivity and economic fluctuations in the 1985-1998 and 1998-2009 construction cycles. Construction labour productivity between 1970-2011 was stagnant (0.00%). However, if it is analysed according to the construction cycle 1975-1985, 1985-1998 and 1998-2009, the average annual labour productivity growth achieved was -2.62%, -0.01% and 0.35% respectively (Table 5). The partial correlation analysis identified the underlying factors driving the change in construction productivity in the 1985-1998 cycle to be amplified construction activity and increased construction employment, which are associated the supply side of the economy. However, the change in construction productivity in the 1998-2009 cycle was energised mainly by the demand generated. This conclusion is aligned with the Keynesian model in that average labour productivity is countercyclical, i,e, increases in employment during booms should reduce average labour productivity because of the diminishing marginal productivity of labour.

In the 1985-1998 period, Malaysia witnessed an intensive launching of mega-projects and, especially in the 1990s, the industry failed to manage productivity by long range resource planning. The 'boom-bust' nature of the construction business cycle can be better managed by actions such as improving the visibility and transparency of future orders, especially in the public sector where individual government agencies could work together to formulate long-term and integrated development plans.

The complex relationship between GDP, population, construction activities and construction employment could be analysed further to establish the causal relationships involved. Which is the driver and which is the driven? This is a topic for further study involving such considerations as Granger causality among the variables.

References

Abel, A.B. and Bernanke, B.S. (2011) *Macroeconomics*. New York: Pearson Addison Wesley.

Arrow, K. (1962), The economic implicationgs of learning by doing', *Review of Economic Studies*, Vol 29, pp,155-73.In McCombie John, Pungo Maurizio and Soro Bruno. (2002) (eds.) *Productitvity Growth and Economic Performance: Essays on Verdoorn's Law*.London: Palgrave.

This is an Accepted Manuscript of an article published on 08 Aug 2014 by Taylor & Francis in Construction Management and Economics, available online: https://doi.org/10.1080/01446193.2014.938086

Ball, M., Lizieri, C. and MacGregor, B. (1998) *Economics of the commercial property market*. London: Routledge.

Berg, H.V.D. (2005) *Economic Growth and Development*. New York:McGraw-Hill

Bank Negara Malaysia (1999) *The central bank and the financial system in Malaysia - a decade of change*. Kuala Lumpur: Bank Negara Malaysia.

Bank Negara Malaysia (2006) *Annual report 2005*, Kuala Lumpur: Central Bank of Malaysia.

Bourlier, B.L. (1984) What lies behind Verdoorn's Law? *Oxford Economic Papers, New Series.* **36** (2), 259-267

Castiglione, C. (2011). Verdoorn-Kaldor's Law: An empirical analysis with time series data in the United States. *Advances in Management & Applied Economics.* **1** (3), 135-151

Chan, E.J. (2013) CIDB calls for clear labour policy. *The Edge Malaysia.* pp. 4-5 July 8, 2013.

Christiano, L. J. and Terry, J. F. (1998). The Business Cycle: It's still a Puzzle. *Federal Reserve Bank of Chicago Economic Perspectives.* **22**: 56-83.

Construction Industry Development Board (2004) *Malaysian construction industry after the 1997 Asian economic crisis*. *CIDB news*, Kuala Lumpur: Construction Industry Development Board.

Construction Industry Development Board (2013) *Construction statistics quarterly bulletin first quarter 2013*. Kuala Lumpur: Construction Industry Development Board.

Cobbold, T. (2003) *A comparison of gross output and valu-added methods of productivity estimation*. Research Memorandum Cat No: GA511. Australia: Productivity Commission.

Cooper, D.R. and Schindler, P.S. (2008) *Business research methods 10th edition.* New York: McGraw-Hill.

Costanza, R., Hart, M., Posner, S. and Talberth J. (2009) Beyond GDP: The need for new measures of progress. The Frederick S. Pardee Center for the Study of the Longer-Range Future. Boston University.

Crawford, P. and Vogi, B. (2006) Measuring productivity in the construction industry. *Building Research and Information*, **34**(3), 208-19.

Department of Statistics Malaysia (2008) *Annual national accounts Gross Domestic Product (GDP).* Kuala Lumpur: Dapartment of Statistics, Malaysia

Field, A. (2009) *Discovering statistics using SPSS*. Thrid ed. London: Sage.

Fraenkel, J.R. and Wallen, N.E. (2008). *How to design and evaluate research in education*. 7th Edition. New York: McGraw-Hill.

Giang, D.T. and Low S.P. (2011). Role of construction in economic development: Review of key concepts in the past 40 years. *Habitat International,* **35**(1), 118-125.

Gomez, E.T. and Jomo K.S. (1997). Malaysia’s political economy: politics, patronage and profits. Cambridge: Cambridge University Press.

Green, S.B. and Salkind, N.J. (2008) *Using SPSS for Windows and Macintosh analyzing and understanding data*. 5th ed. New Jersey: Pearson.

Gruneberg, S.L. and Ive, G.J. (2000) *The economics of the modern construction firm*. London: MacMillan.

Hillebrandt, P.M. (2000) *Economic Theory and The Construction Industry.* London:MacMillan

Ive, G.J. and Grunberg, S.L. (2000) *The economics of the modern construction sector*. London: Macmillan.

Jefferson, G.H. (1988) The aggregate production function and productivity growth: Verdoorn’s Law. *Oxford Economic Papers. New Series.* **40** (4) 671-691.

Kaur, A. (2004). Economic globalisation and the ‘new’ labour migration in Southeast Asia. In Tisdell, C. and Kumar, R. (2004) (eds) *Economic Globalisation: Social Conflicts, Labour and Environmental Issues.* Cheltenham: Edward Elgar. 244-268

Kinnear, P.R. and Gray, C.D. (2010) *PASW Statistics 17 made simple replaces SPSS Statistics 17*. Hove: Psychology Press.

Kirmani, S.S. (1988) *The construction industry in development: Issues and options*, Infrastructure and Urban Developemnt Department, World Bank.

Lewis, W.W. (2005). *The power of productivity: Wealth, poverty, and the threat to global stability*. University of Chicago Press.

This is an Accepted Manuscript of an article published on 08 Aug 2014 by Taylor & Francis in Construction Management and Economics, available online: https://doi.org/10.1080/01446193.2014.938086

Lucke, B. (1996) *Productivity Shocks in a Sectoral Real Business Cycle Model for West Germany*. EEA Annual Congress in Prague 1995.

McCombie J., Maurizio, P. and Soro, B. (eds.) (2002) *Productitvity Growth and Economic Performance: Essays on Verdoorn's Law*.London: Palgrave.

Miles, D. and Scott, A. (2005) *Macroeconomics: Understanding the wealth of nations*. London: Wiley.

Ministry of Finance. (2005) *Economic report 2004/2005*. Kuala Lumpur.

Ministry of Finance. (2010) *Economic report 2010/2011*. Kuala Lumpur.

Ministry of Finance. (2012) *Economic report 2012/2013*, Kuala Lumpur.

The Organization for Economic Co-operation and Development (2001) *Measuring productivity OECD manual measurement of aggregate and industry-level productivity growth* [on-line] accessed on 28 July 2013 available at www.oecd.org/std/productivity-stats/2352458.pdf

Ofria, F. and Millemaci, E. (2010). Kaldor-Verdoorn's Law and increasing returns to scale: a comparison across developed countries. *Munich Personal RePEc Archive.* Paper No. 30941, posted 17, May 2011

Rebelo S. (2005). Real business cycle models: past, present, and future. *The Scandinavian Journal of Economics.* **107** (2) 217-238

Rowthorn, R.E. (1979) A note on Verdoorn's Law. *The Economic Journal*, **89**(353), 131-3.

Runeson, G. (2000) *Building economics*. Victoria: Deakin University Press.

This is an Accepted Manuscript of an article published on 08 Aug 2014 by Taylor & Francis in Construction Management and Economics, available online: https://doi.org/10.1080/01446193.2014.938086

Sharpe, A. (2002) Productivity concepts, trends and prospects: an overview. *The Review of Economic Performance and Social Progress.*

Tan, K.L. (2004). Evolution of the construction industry in Malaysia. *Master Builders*: 56-57.

The National Academy of Sciences (2009). Advancing the compatitiveness and efficiency of the US construction industry. Washington, National Research Council of the National Academies.

Verdoorn, J.P. (1949). On the factors determining the growth of labor productivity, in L. Pasinetti (ed.), *Italian Economic Papers*, Vol. II, Oxford: Oxford University Press, 1993.

Wain, B. (2009). Malaysian maverick: Mahathir Mohamed in turbulent times. Hampshire: Palgrave Macmillan

Wells, J. (1985) The role of construction in economic growth and development. *Habitat International*, **9**(1), 55-70.

World Bank (2013) *How we classify countries* [on-line] accessed on 29 July 2013 available at data.worldbank.org/about/country-classifications.

This is an Accepted Manuscript of an article published on 08 Aug 2014 by Taylor & Francis in Construction Management and Economics, available online: https://doi.org/10.1080/01446193.2014.938086

Table 1. GDP, GDP in construction, construction employment, GDP per capita and construction labour productivity (1970-2011) at constant 2000 price in RM

Year	GDP in total economy (RM million)	GDP in construction (RM million)	Construction employment (thousands person)	GDP per capita (RM)	Construction labour productivity (RM/person)	GDP per capita annual growth (%)	Construction labour productivity annual growth (%)
1970	45525	2240	91.0	4195	24610	-	-
1971	48144	2533	102.0	4326	24832	3.07	0.90
1972	58059	2659	114.0	5090	23321	16.23	-6.28
1973	63263	3031	127.0	5412	23866	6.13	2.31
1974	66961	3394	143.0	5593	23736	3.29	-0.55
1975	67268	3045	160.0	5488	19031	-1.90	-22.00
1976	75829	3320	206.0	6045	16115	9.66	-16.59
1977	80906	3725	205.0	6305	18170	4.21	11.99
1978	86593	4279	219.0	6596	19538	4.51	7.26
1979	96340	4793	234.0	7169	20484	8.33	4.73
1980	101606	5623	270.2	7382	20812	2.93	1.59
1981	107613	6443	310.1	7629	20776	3.29	-0.17
1982	114318	7017	377.5	7902	18588	3.52	-11.12
1983	122408	7804	425.6	8245	18336	4.25	-1.36
1984	132341	8133	428.0	8678	19002	5.12	3.57
1985	131061	7453	419.4	8360	17770	-3.73	-6.70
1986	132988	6407	369.4	8244	17345	-1.40	-2.42
1987	139301	5653	336.3	8387	16811	1.72	-3.13
1988	152778	5724	339.9	8933	16839	6.30	0.17
1989	164708	6346	376.9	9356	16836	4.63	-0.02
1990	178957	7523	423.9	9885	17747	5.50	5.27
1991	195881	8693	465.0	10533	18694	6.35	5.20
1992	213155	9628	506.7	11167	19001	5.84	1.63
1993	233163	10667	538.8	11909	19797	6.43	4.10
1994	253830	12282	597.6	12642	20552	5.97	3.74
1995	280363	14868	611.3	13614	20733	7.40	0.88
1996	308939	17273	716.5	14624	21700	7.15	4.56
1997	332796	19103	793.0	15359	21804	4.90	0.48
1998	309417	14527	745.9	13929	18982	-9.77	-13.84
1999	328302	13895	722.8	14429	18556	3.53	-2.27
2000	356399	13971	759.9	15313	18505	5.94	-0.28
2001	358247	14427	829.8	15068	18739	-1.61	1.26
2002	377558	14762	905.1	15564	19239	3.24	2.63
2003	399413	15031	942.5	16152	19405	3.71	0.86
2004	426508	14903	890.8	16931	19423	4.71	0.09
2005	449250	14685	904.4	17513	19333	3.38	-0.46
2006	475525	14639	908.9	18210	19384	3.90	0.26
2007	506342	15707	922.5	18634	20741	2.30	6.76
2008	530683	16365	998.0	19138	21578	2.67	3.96
2009	522001	17329	1015.9	18713	22730	-2.25	5.20
2010	559553	18220	1019.0	19806	23801	5.68	4.60
2011	588297	18856	1133.6	20604	24527	3.95	3.00

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Table 2 Bivariate correlations between construction labour productivity and predictor variables in1970-2011 (N=42), 1975-1985(N=11), 1985-1998 (N=14) and 1998-2009 (N=12)

Predictor Variables	Construction labour productivity											
	1970-2011			1975-1985			1985-1998			1998-2009		
	r	sig	r^2	*r*	sig	r^2	*r*	sig	r^2	*r*	sig	r^2
GDP per capita	.094	.552	0.88%	.161	.637	.026%	.925	.000	85.56%	.791	.002	62.57%
GDP	.166	.295	2.76%	.095	.781	.009%	.898	.000	80.64%	.840	.001	70.56%
Population	.045	.778	0.20%	.044	.898	.002%	.831	.000	69.06%	.869	.000	75.52%
GDP in Construction	.123	.438	1.51%	.127	.845	.016%	.941	.000	88.55%	.990	.000	98.01%
Construction Employment	.065	.681	0.42%	-.067	.639	.004%	.893	.000	79.74%	.804	.002	64.64%

r = Pearson product-moment correlation coefficients; r^2 = coefficient of determination

Table 3 Bivariate and partial correlations between construction labour productivity and control variables in 1990-2011 (N=42), 1985-1998 (N=14) and 1998-2009 (N=12)

Control Variables	Construction labour productivity								
	1970-2011			1985-1998			1998-2009		
	r	Sig	r^2	*r*	Sig	r^2	*r*	Sig	r^2
	Bivariate correlation								
None	.094	.552	0.88%	.925	.000	85.56%	.791	.002	62.57%
	Partial correlation								
GDP	-.521	.000	27.14%	.914	.000	83.54%	-.916	.000	83.91%
Population	.437	.004	19.10%	.899	.000	80.82%	-.703	.016	49.42%
GDP in Construction	-.092	.568	0.85%	.089	.773	0.79%	.413	.207	17.06%
Construction Employment	.213	.180	4.54%	.534	.060	28.52%	.330	.322	10.89%

r = Pearson product-moment correlation coefficients; r^2= coefficient of determination

Table 4 Output of construction sector and sub-sectors in years 1996-2010

Sub-sectors	**1996**	**1998**	**2000**	**2002**	**2004**	**2005**	**2007**	**2009**	**2010**
	RM'000								
Civil engineering	18,246,974	5,093,620	14,458,624	16,038,340	16,845,227	18,393,324	21,181,560	19,700,417	24,852,448
Non-residential	11,210,408	9,920,092	9,935,896	9,248,146	10,086,790	10,800,321	13,334,093	19,159,651	27,046,849
Residential	7,125,505	7,671,132	8,688,417	9,935,288	11,367,577	14,634,386	14,882,306	17,399,613	20,362,175
Special trade	8,059,602	7,585,484	6,789,071	6,553,809	7,475,931	10,132,228	11,317,667	14,340,073	19,080,213
Construction sector	44,642,489	40,270,328	39,872,008	1,775,583	45,775,525	53,960,259	60,715,626	70,599,754	91,341,685
	Share of construction sector output (%)								
Civil engineering	40.87	37.48	36.26	38.39	36.80	34.09	34.89	27.90	27.21
Non-residential	25.11	24.63	24.92	22.14	22.04	20.02	21.96	27.14	29.61
Residential	15.96	19.05	21.79	23.78	24.83	27.12	24.51	24.65	22.29
Special trade	18.05	18.84	17.03	15.69	16.33	18.78	18.64	20.31	20.89
Construction sector	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: compiled from the reports of Annual Survey of Construction Industry by the Department of Statistics from 1998 to 2011

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Table 5Average annual growth rates of GDP, construction, construction employment, GDP per capita and construction productivity (1970-2011)

Year	GDP	Population	GDP per capita	Construction	Construction employment	Construction productivity
1970-2011	6.53	2.39	3.88	5.80	6.65	0.00
1975-1998	6.36	2.48	3.65	7.79	10.65	-2.62
1985-1998	6.38	2.72	3.38	5.19	4.41	-0.01
1998-2009	3.91	2.13	1.65	-0.47	2.21	0.35

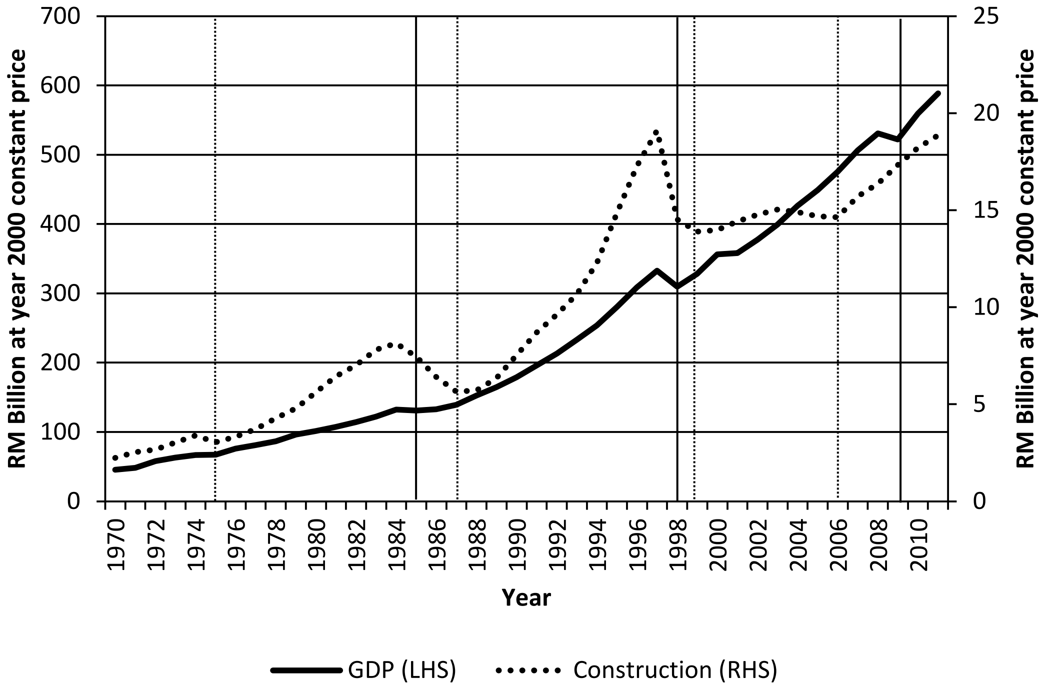

Fig 1 GDP and construction activity of Malaysia (1970-2011)

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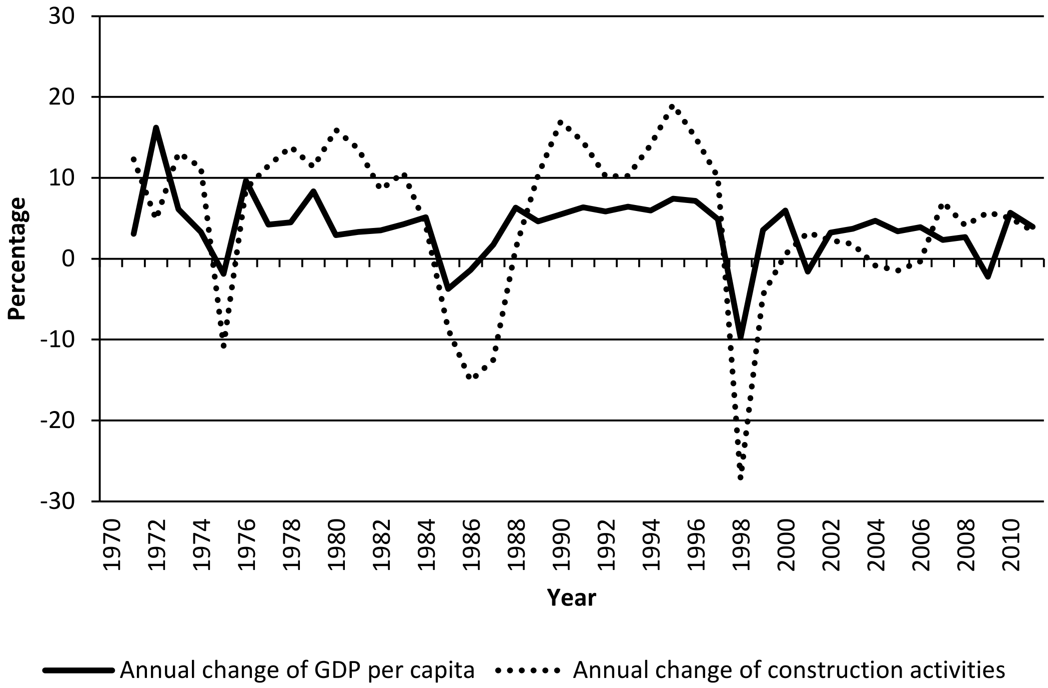

Fig. 2 Annual change of GDP per capita and construction activities in Malaysia (1970-2011)

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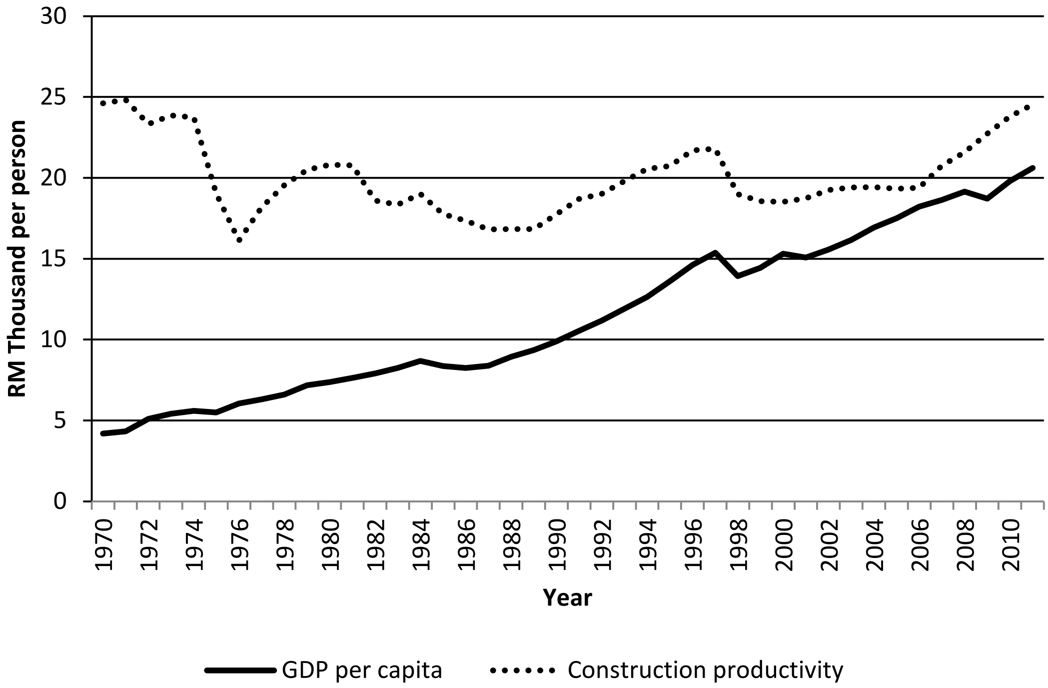

Fig. 3 GDP per capita and construction productivity in Malaysia (1970-2011)

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