Habitat International 46 (2015) 1–12

Contents lists available at ScienceDirect

Habitat International

journal homepage: www.elsevier.com/locate/habitatint

Causal relationship between construction activities, employment and GDP: The case of Hong Kong

Y.H. Chiang, Li Tao*, Francis K.W. Wong

Department of Building and Real Estate, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

A R T I C L E I N F O

Article history:
Available online 8 November 2014

Keywords:
Construction sectors
Economic development
Granger causal relationship
Hong Kong

A B S T R A C T

The causal relationship between construction activities and economic development has been extensively studied worldwide. However, the results of these studies are generally inconclusive. Thus, sub-sectors of the construction industry and variances across different periods require further examination. Accordingly, this study aims to fill the knowledge gap. In the case of Hong Kong and with a longer time series, bi-directional causality links between gross domestic product (GDP) and construction activities are found. The correlations of employment with GDP and construction also suggest that employment can be a medium or a mediating or intervening factor of GDP growth. Different causal relationships are observed between the various sub-sectors of the construction industry and GDP in different periods. Bon's inverted U-shaped relationship between the contribution of construction activities to GDP and economic development is supported by our case analysis of Hong Kong. With a long timeframe, our study draws statistically significant conclusions on the contribution of construction activities to the economy. The results of this study may inform the formulation of long-term public policies for sustainable industrial development.

Introduction

The construction industry is a vital sector of an economy not only because of the housing and infrastructure it produces to supply shelter and other economic needs but also because of its "pull" and "push" multiplier effects on other economic sectors. The relationship between the construction industry and the economy is complex. It varies with different stages of economic development, with various construction sub-sectors, and with different government policies. The relationship is also shaped by various geographical sizes and natural resources of different economies. Since the seminal work of D. A. Turin in the 1960s, many studies have analyzed this relationship, as suggested by Dang and Low (2011).

Frequently examined issues include 1) the causal links between construction outputs and economic growth, 2) the multiplier effects of the construction industry and its linkages with other sectors, and 3) the contribution of construction activities to the economy. Therefore, the scenario can be further examined from two perspectives: 1) economies at different developmental stages, namely, least developed countries (LDC), newly industrialized countries (NIC), and advanced industrial countries (AIC); and 2) different construction sub-sectors, namely, residential versus non-residential sectors and public versus private sectors. Among all the sub-sectors of the construction industry, infrastructure has received the most attention (Dang & Low, 2011; Wong, Chiang, & Ng, 2008). Infrastructure is important in economic growth because of its large multipliers, particularly in less developed and developing economies (Sahoo & Dash, 2009, 2012). However, overexpansion may cause negative effects not only on the economic development but also on the environment (Dang & Low, 2011).

Cross-sectional and longitudinal analyses have been conducted to explore the aforesaid relationship. Earlier research usually employed the former method to compare the relationship between construction activities and economic growth among various economies. However, cross-sectional analysis has limitations. For example, it cannot control the variances among different economies and development periods; these variances include built environment, geographical factors, and culture (Wong et al., 2008; Yiu, Lu, Leung, & Jin, 2004). Many recent studies have employed longitudinal analysis to explore the relationship in a single economy during a certain period. With longitudinal analyses, the variances among different economies can be controlled, and different development periods can be accounted for. The validity of the study can be guaranteed. Thus, longitudinal analysis is employed in this study.

In this case study of Hong Kong, we have used data spanning from the first quarter of 1983 to the fourth quarter of 2013. The time series is longer than that of any other previous study (e.g., Tse &

* Corresponding author. Tel.: +852 3400 8125.
E-mail addresses: chiang.yat-hung@polyu.edu.hk (Y.H. Chiang), lisa.tao@connect.polyu.hk (L. Tao), francis.wong@polyu.edu.hk (F.K.W. Wong).

http://dx.doi.org/10.1016/j.habitatint.2014.10.016
0197-3975/

Ganesan, 1997; Wong et al., 2008; Yiu et al., 2004). Furthermore, the upswing and downswing periods of construction works can be compared because Hong Kong has gone through different stages of economic development and construction cycles during the period. Upswing and downswing are characterized by increasing and decreasing trends of gross value of construction works (GVCW) in our context, respectively. In our case, the demarcation line is the Asian financial turmoil that started in Thailand in 1997. Asset prices and construction activities began to plunge in 1998 after peaking in 1997. The changing role of the construction industry can thus be determined. This case study of Hong Kong aims to enhance our understanding of the relationship between construction activities and economic development at the metropolis level.

The construction industry is known for generating intensive employment. The income from increased employment in turn is spent on other economic sectors, stimulating the demand in those sectors and eventually boosting the general economy. In Hong Kong, the proportion of employment in the services industry increased from 55% in 1983 to 87% in 2013 (see Fig. 6), making Hong Kong one of the most service-oriented economies in the world. Thus, both construction and services employment are included in the analysis, together with total employment.

This study has two objectives:

1) to establish the causal relationship, if any, between construction activities and gross domestic product (GDP) growth in Hong Kong during different periods; and
2) to examine whether or not employment (in the services and construction sectors) plays an intervening role on the causal relationship between construction activities and economic growth.

The remainder of this paper is organized as follows. The next section presents a literature review to identify knowledge gaps and then formulates hypotheses. Data and research methods section elaborates on research methods and data. Results and discussion section presents and discusses the results. Conclusions are provided in the final section.

Literature review

Share of the construction industry in the economy

Many studies have investigated the contributions of construction activities to GDP. Bon (1992) introduced the inverted U curve to depict the evolving role of the construction industry in the economy as it develops from LDC to NIC to AIC. Rameezdeen and Ramachandra (2008) discovered that the contribution of construction to gross national product (GNP) and national income (NI) was lower in Sri Lanka than in developed countries, which would serve as an example of the "Bon curve". Using data from 1973 to 2002, Gundes (2011) also found a strong correlation between construction activities and economic development in Turkey although the GNP share of the construction industry had been declining since the 1990s. To verify the Bon curve, Ruddock and Lopes (2006) employed the data of 75 countries from 1994 to 2000. They also examined the contribution of construction activities to GDP and the "volume follows share" proposition in these countries. They found that the proposition was in general not supported despite recognizing the roles of the repair and maintenance sub-sector. Choy (2011) revisited the Bon curve using the data of 205 economies from 1970 to 2009. Using ANOVA, post-hoc tests, and quadratic regression, the researcher found that the inverted U-shaped relationship between construction activities and economic development could be observed mainly in developed economies. In addition, the proposition of "volume follows share" was not supported. Lopes, Ruddock, and Ribeiro (2002) argued for the existence of a positive correlation between construction share in GDP and the level of NI by employing the data of 15 countries in Sub-Saharan Africa for 22 years. A critical level of construction value added in GDP (at 4–5%) was determined, below which a relative decrease in construction volume corresponded to a decreasing growth in GDP per capita. Above that level, an increasing growth in GDP per capita did not necessarily correspond to a relative increase in construction volume.

Causality links between the construction industry and the economy

Previous studies that employed Granger causality test reported conflicting results (Anaman & Osei-Amponsah, 2007; Dang & Low, 2011; Lean, 2001; Tse & Ganesan, 1997; Wong et al., 2008; Yiu et al., 2004). Some researchers argued that economic growth leads to construction development, whereas others reported the opposite or bi-directional causality result. Lean (2001) observed two-way causality links between construction activities and general economic growth in Singapore using data from 1986 to 1999. This researcher also found two-way causality links between the construction industry and other economic sectors. Anaman and Osei-Amponsah (2007) found that construction growth Granger caused economic growth in Ghana with a three-year lag using data from 1968 to 2004.

Some researchers analyzed the causality links between construction sub-sectors (i.e., public versus private, and residential versus non-residential) and the economy. Using data of the United States from 1959 to 1992, Green (1997) found that residential investment Granger caused GDP, while non-residential investment was Granger caused by GDP. Ozkan, Ozkan, and Gunduz (2012) examined the causal relationship between construction growth (in infrastructure investment as well as in building and residential investment in both public and private sectors) and GDP growth in Turkey using data from 1987 to 2008. They found a bi-directional Granger causality between infrastructure investment and GDP growth as well as between public building and residential investments and GDP growth.

The case of Hong Kong

Many researchers have examined the relationship between construction output and economic growth in Hong Kong. Employing longitudinal data of Hong Kong from 1984 to 2002, Yiu et al. (2004) found that GDP growth Granger caused construction output, and not vice versa. Their findings agreed with those of Tse and Ganesan (1997), who found that the growth rate of the construction output marginally diminished as the growth rate of GDP increased. In addition, the effects of real interest rate and property price on construction output were not significant. However, Wong et al. (2008) reported opposite findings. By employing longitudinal data from 1983 to 2006, they found that construction output, particularly infrastructure sector output, Granger caused economic growth and not vice versa. This result refuted Bon's "volume follows share" proposition. However, the relationship between construction activity and GDP was consistent with Bon's inverted U-shaped curve when 1983–2006 was considered as the period when Hong Kong's economy transited from NIC to AIC status.

Regarding construction employment, Wong, Hui, Wong, and Wan (2010) estimated labor demands arising from urban renewal in Hong Kong. They contended that urban renewal was important in boosting the labor market and stabilizing the economy. Rehabilitation works created more job opportunities than new development or redevelopment works. Ng, Fan, and Wong (2011)