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Exploring the Performance of Australian Construction Industry in a Recent Global Recession

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Abstract: ***Available data on the recent global financial crisis (GFC) show that it lasted between the second quarter (Q2) of 2007 and the fourth quarter (Q4) of 2009. Australia is one of the first economies to fully recover from this crisis. This study explores the role played by the Australian construction industry in stimulating economic growth during the recession. In order to investigate the macro-variability trend during the financial crisis, data were collected and analysed relating to the quarterly GDP of Australia and selected countries between Q1 2000 and Q4 2009. Specifically, changes in the construction industry's GDP were compared with aggregate GDP changes in Australian economy and similar indices in the 'Group of 7' (G7) countries and Organisation for Economic Co-operation and Development (OECD) countries. Moreover, specific attention was focused on Germany, France, Japan, United States of America (USA) and United Kingdom (UK). Graphical and Pearson's correlation methods were used to analyse the relationships between changes in construction GDP and Australia's overall economic growth during the recession. In addition, an attempt was made to develop a regression model for predicting economic growth during the recent recession using changes in gross fixed capital formation (GFCF), changes in construction GDP and the impact of these changes on national economy. Analysis shows a slight contraction in construction activities during the crisis; however construction triggered significant growth in the economy during the crisis period and afterwards. This appears to be the major difference between Australia and other major economies that have experienced a longer recession.***

Keywords: ***Economic stimulus (ES), fixed capital formation (FCF), gross domestic product (GDP), global financial crisis (GFC), mac ro-variability,***

I. BACKGROUND

The purpose of this research is to explore the role of the Australian construction industry in reviving the Australian economy during a recent global financial crisis (GFC). Most of the world largest economies started the 21st century with huge potential to thrive and sustain their growth for as long as possible. Covertly however, there were signs that some countries were likely to have potentially serious problems early in the century, and this would have an impact on world economy. Specifically, Summers (2000) argues that despite the posture of the United States of America as a potential dominant force in the world economy in the 21st Century, there were serious indications suggesting that a major economic crisis was imminent right from the beginning of the century. Apart from Summer's observations, other predictions have been based on Keynesian and Minsky's models to explain how the situation in the US could trigger serious economic contractions in different parts of the world (Keen, 2009). Vested opinions in literature on political economy have also argued that the GFC would quickly spread around the world through capitalists' concepts such as globalized trade liberalization and openness (Kyophilavong, 2009).

Surprisingly, at different summits during the crisis, world economic leaders denied the existence of any forecasts or tools to effect informed decisions regarding how the crisis could have been prevented from lingering longer than anticipated (Bezemer, 2009; Stevens, 2008).

Available evidence suggests that it is the worst economic meltdown for many nations in several decades. The International Monetary Fund (IMF) estimated that the world economy contracted by 0.3% in 2009. By the end of the first quarter of 2009, the annualized rate of decline in GDP was 14.4% in Germany, 15.2% in Japan, 7.4% in the UK, 18% in Latvia, 9.8% in the Euro area and 21.5% for Mexico. In a report by (Massa & Macias, 2009), it is estimated that matters will only be made worse in under-developed and developing countries in Africa, Asia, Europe, North and South America. This is because prior to the time tagged by global media as the GFC period; most of these countries were still grappling with serious economic issues like high unemployment rates, poverty, public health challenges, institutional issues and contractions of business horizons, among several other problems.

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Other facts have also continued to emerge from literature on tangible causes of the crisis. Vitally important among these are delinquencies in United States' subprime mortgage markets. An eloquent argument Crotty (2009) argues that this problem was fuelled by a weak financial regulatory system. In the period leading up to the crisis, the US economy benefitted immensely from the synergy between the housing market and financial institutions. Citing the Financial Times (2008), Crotty (2009) pointed out that over $2 Trillion was generated by financial institutions from mortgage securitization fees alone between 2003 and 2008. This can only represent a small fraction of the possible windows of opportunities through which other industries benefit from the construction economy. In particular, the construction industry has stimulated growth in national economies by spurring other industries to produce resources to service its needs, and as a result, has ended up generating gainful employment for human and material resources. Other impacts of the construction industry include contributions to the value of fixed capital assets. Through this, intangible benefits of built infrastructures have been promoted for the utilization of a teaming world population.

II. The Australian Economy, Construction Industry and the Recession

The global economic crisis became evident in the middle of 2007 when all major economies in the world showed negative growth. The immediate impact of this on the domestic economy included a horrendous rise in rates of unemployment, inflation, currency devaluation and foreclosures, while productivity in of the real sector of the economy was in a sharp decline. Available evidence from the Australian Bureau of Statistics (ABS) indicates that the national quarterly average rise in unemployment rose to a decade peak of 5.8% between Q3 2008 and Q1 2009. Remarkably, New South Wales recorded about 50% above national unemployment figures within this period. Consequently, development in many parts of Australia stalled as there were no answers as to when the GFC would end and when the economy would regain its strength. The Property Council of Australia warned that job losses in the construction industry alone could climb to a record 30% by the end of 2009. Resultant drop in government income was also expected to reduce incentives for public construction by 20%. Other indicators showed a steep decline in share market and real estate value (Alex, 2009). As public concern increased, global polity became pressurized to devise workable responses to the GFC challenge, and observers continued to show keen interest in the performance of each sector of the economy during this difficult time. On the other hand, observers' expectation has been made less attractive given the unusual fall in GDP growth, funding contractions and strategic disincentives to long-term investments in the real sector of the economy.

The construction industry is a major contributor to Australian economy. At the end of 2006 financial year, the industry had about 918 thousand employees (this is about 9% of Australian workforce). Further evidence from the Australian Bureau of Statistics suggests that, with total production worth over AU$60 Billion, construction contributed 6.4% of the total production of goods and services in the Australian economy GDP in 2005. Before the GFC, construction's share of Australian GDP was 7%. However, due to other reasons stated above and contraction in construction activities, Australian GDP plummeted from 1% annually adjusted growth in the first quarter of 2008 to -0.9% by the end of that year. At this point, like the rest of the world, a pertinent worry in Australian polity was to model a series of workable responses to stimulate growth against the GFC, and if possible, lead the world in doing this. At some stage, towards the end of the recession, when Australia's stimulation of the economy appeared to be generating positive outcomes, other economies were still experiencing significant falls.

According to Swan (2009), Australia's GFC-response model boosted the economy in at least four strategic directions. Firstly, economic growth was stimulated through incentives for construction and infrastructural development. In doing this, different levels of government incentivized the public with grants and free stamp duty on development applications. This was one of the steps taken by government to lessen the impact of the GFC on private spending. Secondly, some financial regulatory tools, which include interest rate cuts and wholesale fund guaranteeing, were introduced. Consequently, the cost of financing short, medium and long term projects was reduced. Thirdly, consumer spending was boosted through series of stimulus package payouts, and finally, new opportunities for boosting job creation and export were encouraged.

Emerging facts show that the Australian government responded swiftly to this challenge. More importantly, one of the first steps was to shield the local economy from external vulnerabilities. As initial jobless claims rose to a record high during the recession, government rolled out different stimulus packages to reduce speculation and friction in consumers' spending. These were in addition to other steps taken to restore public confidence in the local market. Specifically, in separate tranches, $10.4 billion and $42 billion were handed out before the end of 2009 as stimulus packages. Apart from these, other measures were also targeted at households and investment expenditure. Over $12.5 billion was handed out directly to groups, the most prominent being families and low- to medium-income earners. These and other packages were strategically distributed among short term (e.g. boosting consumer spending with series of payouts), medium term (e.g. home owner's grants and wholesale fund guarantees) and long term ends (e.g. new business allowance, national policy on nation building). Figure I below shows the immediate effect of the fiscal stimulus on the real GDP.

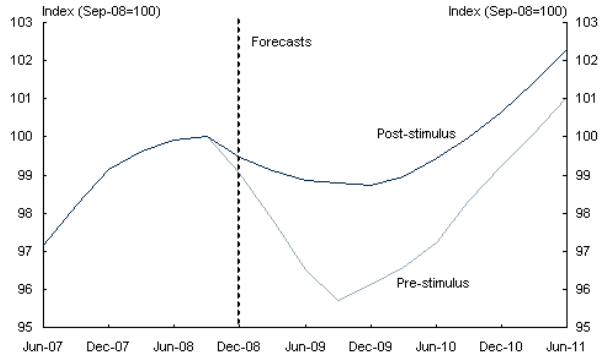

FIGURE I
EFFECT OF FISCAL STIMULUS ON REAL GDP
Source: (Australian Government, 2010)

According to the Australian Government (2010), without the stimulus package payouts, the Australian economy would have remained in recession deeper and longer than predicted. Evidence provided by the government did not only indicate how the fiscal stimulus contributed to the restoration of the economy during the recession, it also proves that it helped move the real GDP beyond its initial state before the GFC. However, (Makin, 2010) argued that stimulus packages came when the GFC was almost over and it is not convincing to conclude that only stimulus payouts were responsible for this remarkable achievement. Economic theorists have argued that the construction industry is a prime mover of economic growth in many parts of the world. These, according to Hillebrandt (2000) have been measured in terms of gross fixed capital formation, resource employment and an ability to spur other industries to produce. It also contributes to gross GDP growth as its GDP improves. The bottom line is that Australian government's responses to the GFC facilitated increases in liquidity in the economy. This was supported by a political will to drive growth through infrastructural development. For instance, apart from interest rate cuts to a record low of 3.75%, government made available $1.5 billion through home owners' grant. An estimated 150,000 people benefitted directly from this as development applications rose significantly during the crisis.

Moreover, when it was discovered that housing loans decreased by 25% in August of 2008, the government reinforced its commitment on the Bank Deposit Guarantee Scheme from which an estimated 13 million deposit holders in Australian banks, building societies and credit unions benefitted. Government's response also included $77 billion Nation Building for Recovery Plan (NBRP) to stimulate the economy by investing in nation building infrastructure. Apart from these fiscal measures, the government also implemented 50% investment allowance program to support investment decisions during the recession. The home insulation program is yet another program that was targeted at boosting economic growth. Other windows of opportunity include the $43 billion National Broadband Project. Additionally, State government, local councils and communities, agencies and private establishments also supported the government's fiscal stimulus plans both independently and or in collaboration with Federal government's short and medium-term action plans. Figure 2 shows the value of different categories of construction infrastructures in Australia between 2001 and 2009. It is evident from this demonstration that despite all odds, investments in construction grew throughout the period that global recession pressured the world economy.

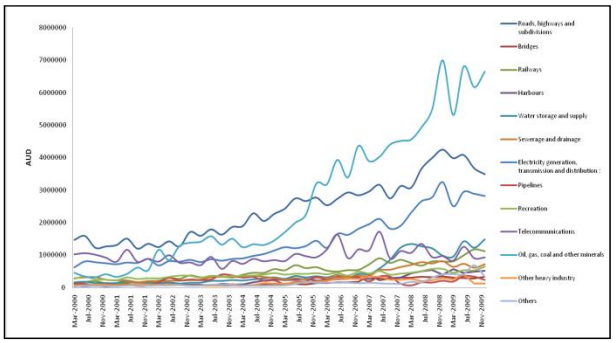

FIGURE II
VALUE OF DIFFERENT CLASSIFICATIONS OF INFRASTRUCTURE CONSTRUCTION IN AUSTRALIA BETWEEN 2000 AND 2009
Source: ABS – Engineering Construction Activity, Australia. Cat 8762.0, Table 06

III. RESEARCH RATIONALE AND APPROACH

The purpose of this study is to explore the performance of the Australian construction industry in stimulating economic growth during the global economic recession between 2007 and 2009. The study focuses on national economic data made available to the public by government agencies – i.e. as macro-variability indices already standardized, documented and deployed by relevant government agencies and international institutions for planning, controlling and managing public businesses. Since these data are computed at a macro-level, their exploration has been limited to appropriate quantitative techniques that stimulate valid and reliable outcomes. Specifically, a process outlined by Maddison (1987) was adopted in exploring all necessary data in preparation for analysis. This includes being conscious of consistency and seasonally adjusted data as published by local and international agencies. This is important in avoiding complexities due to differences in local sources and misleading arguments. Specifically, historical data were sourced from the Australian Bureau of Statistics (ABS), Organisation for Economic Co-operation and Development (OECD) and the International Monetary Fund (IMF).

The method described above has a number of limitations. They include how to minimize difficulties experienced when converting, revalidating, adjusting and investigating the accuracy of public data for research purposes.

Some of the reasons for this were argued by Ruddock (2000). Some data in the public domain were arrived at through complex computation which may not always agree with traditional research methods.

The quality of data used may require further clarifications regarding methodology, validity of sources and evaluation procedures. This limitation was minimized in this research: only sources and data with clearly defined methodologies were considered. To limit inconsistencies in how these data were released to the public, only latest forms of seasonally adjusted data for every quarter under consideration have been explored. This has some benefits: (1) a clearer picture of changes in economic activities is accessed (2) consolidation of data in an international perspective is explored, whilst (3) only consistent and standardized data have been used.

The focus of this research is on the trend of changes in construction GDP and the impact of these changes on total GDP changes in Australian economy. Rather than limiting the study to the recession period (2007 – 2009), historical data were collected to cover a whole decade (2000 – 2009) as detailed in Table 1 below. This approach provides a clear picture of the Australian economy in comparison with selected OECD and G7 countries, and allows evaluation of the performance of the construction industry, in relation to total economic changes during the whole recession decade. This will be used to predict similar trend of changes and associated effects in the future.

Additionally, correlation analysis has been conducted to explore the significance in the relationships between gross GDP growth, gross fixed capital formation, GDP changes in construction and the impact of changes in construction GDP on gross economic growth. Moreover, regression analysis was used to develop simple mathematical model for predicting how these variables trigger economic growth as. A similar model is nominated as equation 1 below:

$$Yo = a + x1b1 + x2b2 + xnbn \quad \ldots\ldots \text{Equation 1}$$

Where Yo is the dependent variable, a is constant, b values are coefficients of predictive indices x1-n

TABLE I
MACROVARIABILITY AND CONSTRUCTION IN AUSTRALIA

Period	GDP Growth Australia[a]	Changes in Gross Fixed Capital Formation (Australia)[a]	GDP Growth in Construction[b]	Changes in Construction's Contribution to GDP Growth[b]	GDP Growth UK[a]	GDP Growth US[a]	GDP Growth Japan[a]	GDP Growth France[a]	GDP Growth Germany[a]	GDP Growth OECD[a]	GDP Growth G7[a]
Q1-2000	1.1431	9.4312	3.0000	0.2000	1.1321	0.2606	1.8617	1.1881	1.1730	1.0247	0.8366
Q2-2000	0.9573	9.9871	2.8000	0.2000	0.9749	1.9515	0.1608	0.8125	1.1191	1.2658	1.3016
Q3-2000	0.1120	-2.8705	-13.0000	-0.8000	0.4851	0.0835	0.0761	0.3749	-0.0498	0.4118	0.2329
Q4-2000	-1.0461	-8.9694	-10.2000	-0.5000	0.4145	0.5911	1.0252	1.0731	0.0798	0.5389	0.6466
Q1-2001	1.5903	-11.1169	2.9000	0.1000	1.1670	-0.3291	0.4501	0.5511	1.0142	0.1674	0.2103
Q2-2001	1.1932	-10.2796	5.0000	0.2000	0.2282	0.6559	-0.5611	-0.0422	0.0789	0.2040	0.2280
Q3-2001	0.9582	-0.4472	2.0000	0.1000	0.4484	-0.2744	-1.2444	0.3031	-0.1775	-0.0689	-0.3109
Q4-2001	0.5284	9.2968	2.8000	0.1000	0.3346	0.3527	-0.3355	-0.4470	0.2469	0.1370	0.1681
Q1-2002	1.0463	12.1042	5.4000	0.3000	0.7773	0.8594	0.2632	0.7154	-0.4015	0.6953	0.5935
Q2-2002	1.8973	17.4285	9.0000	0.5000	0.3778	0.5306	0.8179	0.4905	0.2176	0.6852	0.5227
Q3-2002	0.3370	14.8693	0.3000	0.0000	0.6839	0.4992	0.7353	0.3452	0.3652	0.5599	0.5142
Q4-2002	0.2981	18.4878	8.4000	0.5000	0.5813	0.0207	0.1420	0.0081	-0.1869	0.2339	0.1035
Q1-2003	0.1721	15.7661	-3.5000	-0.2000	0.6152	0.4052	-0.4103	0.2948	-0.5518	0.1765	0.1475
Q2-2003	1.6495	7.3599	2.8000	0.2000	0.9237	0.7977	0.6474	-0.0855	-0.1486	0.4980	0.4990
Q3-2003	1.3839	8.7678	2.1000	0.1000	0.7260	1.6765	0.7151	0.7640	0.4862	1.0441	1.1164
Q4-2003	0.7351	7.2791	1.5000	0.1000	0.9348	0.8990	1.3803	0.6390	0.3654	0.9805	0.8680
Q1-2004	1.1601	8.3368	1.8000	0.1000	0.9533	0.7042	1.1840	0.4921	0.2755	0.8880	0.7281
Q2-2004	0.6707	7.8136	0.8000	0.0000	0.5663	0.7108	-0.3021	0.7266	0.0785	0.5898	0.4780
Q3-2004	0.3478	6.3501	0.1000	0.0000	0.0966	0.7344	0.6323	0.3409	-0.1471	0.5556	0.5409
Q4-2004	0.3759	5.5338	1.1000	0.1000	0.8087	0.8680	-0.4747	0.8319	-0.0098	0.5747	0.4911
Q1-2005	1.2790	3.9711	0.7000	0.0000	0.3317	0.9976	0.7860	0.2985	0.1375	0.7381	0.6799
Q2-2005	1.1032	10.2660	5.2000	0.3000	0.7209	0.4260	1.1202	0.2659	0.5785	0.6831	0.5810
Q3-2005	0.6179	11.5070	1.1000	0.1000	0.6207	0.7603	0.6834	0.6332	0.6922	0.8294	0.7115
Q4-2005	0.3576	9.5791	0.9000	0.1000	0.7043	0.5164	0.2564	0.5516	0.2130	0.6375	0.4659
Q1-2006	0.7342	10.3625	2.5000	0.2000	1.0799	1.3115	0.1037	0.6146	0.8502	0.9800	0.9542
Q2-2006	0.9048	3.9250	1.7000	0.1000	0.3636	0.3608	1.0504	1.0565	1.4754	0.8685	0.6413
Q3-2006	0.2457	2.9006	-2.2000	-0.1000	0.4874	0.0262	0.3948	0.0459	0.9158	0.3591	0.2417
Q4-2006	1.2071	1.6737	5.7000	0.4000	0.8391	0.7311	0.4754	0.6750	1.0010	0.7737	0.7268
Q1-2007	1.9889	6.4084	1.8000	0.1000	0.7089	0.3001	1.3671	0.7441	0.3242	0.7632	0.5506
Q2-2007	1.7175	10.5654	-1.0000	-0.1000	0.6390	0.7947	0.1103	0.3859	0.3232	0.6855	0.5712
Q3-2007	0.1770	9.6658	4.1000	0.3000	0.4976	0.8869	-0.0737	0.6711	0.8007	0.6104	0.6241
Q4-2007	0.3424	11.6516	-1.4000	-0.1000	0.5383	0.5262	0.2254	0.3225	0.1369	0.5634	0.3552
Q1-2008	0.9156	8.5678	1.2000	0.1000	0.7160	-0.1815	0.9421	0.4616	1.5887	0.5263	0.3201
Q2-2008	0.9050	10.9209	5.0000	0.3000	-0.0804	0.3621	-1.3330	-0.4414	-0.5654	-0.1729	-0.1495
Q3-2008	0.1829	12.1303	-0.6000	0.0000	-0.9293	-0.6761	-1.0975	-0.2345	-0.3159	-0.5832	-0.6611
Q4-2008	-0.8468	7.4632	1.4000	0.1000	-1.8021	-1.3711	-2.9744	-1.4536	-2.4448	-1.8834	-1.7814
Q1-2009	0.5645	1.0248	-4.4000	-0.3000	-2.5211	-1.6474	-3.2153	-1.3630	-3.5151	-2.1982	-2.1732
Q2-2009	0.7130	-3.0851	-0.8000	-0.1000	-0.6710	-0.1849	1.2799	0.3466	0.4425	0.1378	0.0471
Q3-2009	0.1685	-4.0358	2.2000	0.2000	-0.1614	0.5542	0.0079	0.1660	0.7279	0.5744	0.3913
Q4-2009					0.1001	1.4029	1.1400	0.5932	0.0094		

IV. Data Analysis (Graphical)

As evidenced in Figure 3 below, Australia's economic growth has been unique, especially when compared to o ther countries in the G7 and OECD. For instance, betwe en Q1 2001 and Q3 2009, about 80% of peak and trough s in OECD and G7 economies are relative to similar eco nomic changes in Australia within this period. The relati onships between growth changes in the US and UK eco nomies within the same period are far less relative when compared to gross movements in OECD and G7 econo mies during the same period. This phenomenon provide s preliminary confirmation of the contagion concept the orized by Summers (2000). However, this finding is con trary to popular claims that the US and UK economies would have been more dominant than Australia's in thes e trade organizations. Other OECD and G7 member eco nomies have experienced more staggered growth within the same period. As Figure 4 suggests, Australia's recess ion did not start at the same time as other economies. Fo r instance, whilst GDP growth from Q2 2008 to Q2 200 9 plummeted below zero in OECD and G7 countries, thi s phenomenon became evident in Australia only after Q 3 2008 to before Q1 2009. Other major economies exper ienced this for a longer period. In the US, it was from af ter Q2 2008 to after Q2 2009. In the UK, it was from Q2 2008 to shortly before Q4 2009. In France, it was from a fter Q1 2008 to before Q2 2009. In Japan, it is from afte r Q1 2008 to before Q2 2009. In Germany, it was from b efore Q2 2008 to before Q2 2009. Moreover, for all the countries under review, the OECD and G7 plunged deep er than Australia during the recession: Australia (-0.85%; Q4 2008); Germany (-3.5%; Q1 2009); Japan (-3.2%, Q 1 2009); UK (-2.5%, Q1 2009); US (-1.65%, Q1 2009); France (-1.4%, Q1 2009); OECD and G7 (-2.2%, Q1 20 09).

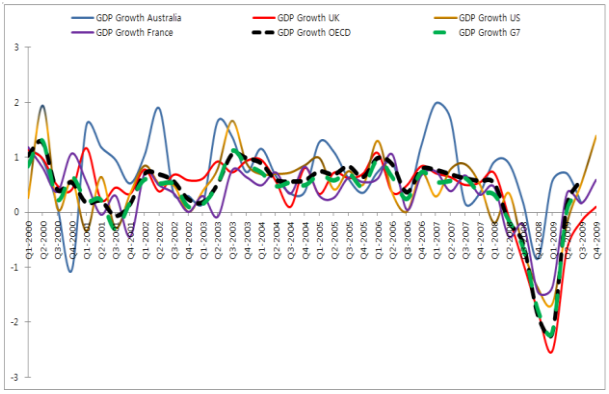

FIGURE III
CHANGES IN AUSTRALIA'S GDP IN PERSPECTIVE

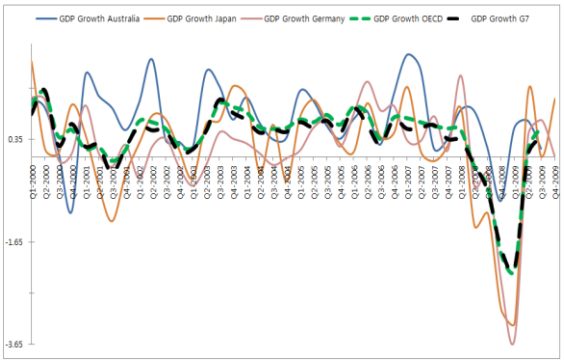

FIGURE IV
AUSTRALIA'S GDP AND THE RECESSION IN PERSPECTIVE

Arguably, different countries adopted different model s to deal with the recession at different times. These mo dels were also deployed in different ways as different ou tcomes were recorded. It is eloquently argued by Makin (2010) that stimulus packages came late, and thus contri buted far too little to Australia's quick avoidance of the GFC. All the countries under review also deploy similar methods, but the crisis lasted longer and bit deeper in th ese economies than Australia within the GFC period. M any reasons could be responsible for this. However, rega rdless of different economic structures in these countries, specific models for managing adaptive changes during economic slow-downs can make the difference. Whilst other countries concentrated on short-term fiscal stimulu s like Australia, Australia backed this up with short term and medium term measures to stimulate significant gro wth through infrastructure development. As pointed out in Figure 1, every part of infrastructure construction, bot h as public works and private infrastructures received a significant boost during the crisis.

V. Correlation and Regression Analyses

As evidenced in literature, the construction industry tr iggers growth in a wider economy through fixed capital formation, resource employment and explicit contributio ns to GDP growth. This has been argued extensively by Hillebrandt (2000). A correlation analysis was conducte d to establish the relationships between GDP changes in construction, changes in gross fixed capital formation an d the contributions of these changes to the changes in A ustralia's economic situation. The outcome of this analy sis is presented in Table 2. Analysis shows there is stron g relationship between GDP changes in Australia and G DP growth in construction.

This finding corresponds with facts that are reported i n (Hosein & Lewis, 2005) that show the reliability and p reference of construction as a GDP grower than some ot her indices of macro-variability. This phenomenon has a lso been explained further in recent research by Olatunji (2010): most volatile economies in the world have suffe red from excessive exposure to boom-and-burst pressure s of global commodities. Although, if they are rich in su ch commodities, and such commodities help resource th

eir economies, the implication of such contribution to lo cal economy may not always been positive. Most theori sts on the impact of global commodities on resource-ric h nations (e.g. Polterovich et al., (2010)) have argued th at while the construction industry grows the economy, o ther industries that contribute more to the economy can also be big spenders, thereby depleting the economy.

Moreover, there is also strong positive correlation bet ween Australian gross GDP, the impact of changes in co nstruction GDP and gross fixed capital formation. This f inding supports those of Bromilow (1981) and Hildebra ndt (2000) that fixed capital formation is indicative of e conomic growth in most parts of the world. Further to th e correlation analysis reported above, Table 1 was used t o develop a regression model based on growth in fixed c apital formation and construction GDP such that total ec onomic growth can be predicted. Equation 2 is the result of the regression analysis.

$$Yo = 0.677 - 0.004x1 + 0.421x2 - 5.815x3 \ldots\ldots\ldots$$

Equation II

Where Yo is the expected GDP growth; x1 is change i n gross fixed capital formation (GFCF); x2 is the GDP g rowth in construction (ΔGDPcons); x3 is the contributio n of construction GDP growth to national gross GDP (Δ GDPimcons).

According to (Murphy, 1982), predictive accuracy an d discriminant validity of regression models are measur ed by R, R2 and Adjusted R2 values. These coefficients measure the degree of fitness of the model and sufficien cy of variables that are explained in the model. The only significant explanatory attribute that was reported in the model summary is R value (0.64). This suggests the mo del is about 64% fit. Other predictors (R2 and Adjusted R2 values) are weak as their values were discovered as 0.41 and 0.40 respectively. This indicates only about 40% of variables that explain gross GDP growth is explained in this model. It appears that predicting gross GDP grow th is not as simple as relying on the impact of the numbe r of new infrastructure construction on construction GD P and Construction's contribution to gross national GDP growth. As an area for further studies, the author sugges ts using data over a wider range of time than that define d in the scope of this study. The recession only lasted be tween 2007 and 2009, but government intervention on c onstruction was targeted at going beyond this point, the impact of construction on Australian economy will conti nue many years after the recession. These effects are als o beyond the scope of this research.

Figure 5 compares the share of construction to gross e conomic growth in Australia with similar indices in Fran ce, the G7 and the UK. Vitally important evidence show s that since Q1 2000, construction has provided a major fulcrum of growth stimulation in the Australian econom y, and this explains the exceptional growth pattern in the economy when compared to other developed economies. Moreover, as Australian transforms into an infrastructur e-based economy, models being deployed in response to the GFC seem to have been uniquely targeted at absorbi ng short and long term shocks. These shocks are based o n uncertainties and allied challenges of leveraging the ec onomy against most meltdown patterns as experienced i n the last global economic meltdown.

TABLE II
CORRELATION ANALYSIS

		GDP Growth	Growth in Gross Fixed Capital Formation	GDP Growth in Construction	Impact of Growth in Construction on overall economy	GDP Growth in OECD	GDP Growth in G7
		Australia					
GDP Growth Australia	Pearson Correlation	1	.089	.507**	.431**	.381*	.358*
	Sig. (2-tailed)		.591	.001	.006	.017	.025
Growth in Gross Fixed Capital Formation (Australia)	Pearson Correlation	.089	1	.376*	.399*	.150	.130
	Sig. (2-tailed)	.591		.018	.012	.363	.432
GDP Growth in Australian Construction	Pearson Correlation	.507**	.376*	1	.985**	.195	.195
	Sig. (2-tailed)	.001	.018		.000	.235	.234
Impact of Growth in Construction on overall economy	Pearson Correlation	.431**	.399*	.985**	1	.227	.228
	Sig. (2-tailed)	.006	.012	.000		.165	.162
GDP Growth in OECD	Pearson Correlation	.381*	.150	.19 5	.227	1	.990**
	Sig. (2-tailed)	.017	.363	.235	.165		.000
GDP Growth in G7	Pearson Correlation	.358*	.130	.195	.228	.990**	1
	Sig. (2-tailed)	.025	.432	.234	.162	.000	

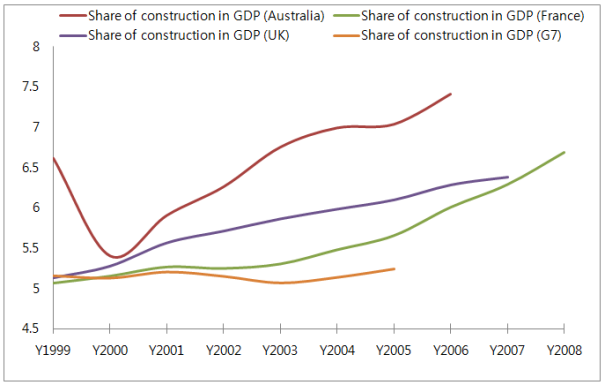

FIGURE V
CONSTRUCTION AND ECONOMIC GROWTH

VI. CONCLUSION

Construction is often used as a reliable barometer for measuring economic growth in many parts of the world. This study confirms this and underlines the strength of construction to trigger economic growth in recessions. This is convincingly shown in Australia's response to the recent global financial crisis – the crisis has had a shorter impact and was avoided quickly. Fiscal stimulus was helpful, but it came a little late when the impact of GFC was almost over. Construction stimulus was however targeted at short-term and long term growth. The economy responded quickly to these (see Figures 1 to 3) such that Australia avoided the recession and boosted its economy far beyond the recession. Specifically, the study has illustrated strong relationships between gross real capital formation, GDP growth in construction and growth in Australian economy. Hence, a model was developed for predicting gross GDP growth in an economy through construction indices such as gross fixed capital formation, GDP growth in construction, and the impact of this change on the whole economy. It is concluded that GDP growth is predicted by other factors not reported in this model and that a wider scope would improve the validity of the model. Overall, there are clear lessons for other countries regarding the strength of the construction industry to promote stronger and lasting growth, provided workable institutional frameworks are put in place. It is clear from Figure 5 that the huge investment in construction is a significant difference between Australia and other major economies which are reported in this study.

VII. INNOVATIONS

Apart from the theory of communication, which has focused on the clarity of expressions and readability of contract documents [11], the use of specifications in defusing innovations has been quoted by Emmitt and Yeomans [6] based on the works of Rogers [12]. This can be taken further in the possibility of encouraging innovations by the private sector in PFI housing schemes through the use of output specifications. It stems from the requirements that the private sector has to respond to the clients' needs through the submission of method statements after contract award, but this can be done earlier in the bid evaluation phase, which would enhance the bid competiveness. Throughout the life cycle of operation and maintenance, the private sector is also motivated to innovate on cost saving and efficiency measures, whilst still meeting the output requirements of the public sector clients. An example is the self-initiated use of more energy efficient installations during replacement cycles. This cannot be achieved by the prescriptive way of specifying.

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