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ECONOMIC ANALYSIS OF BUILDING AND CONSTRUCTION INDUSTRY PRODUCTIVITY: 2008 REPORT

This report was prepared for the
Office of the Australian Building and Construction Commissioner
by Econtech Pty Ltd.

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Introduction

In 2007, the Office of the Australian Building and Construction Commissioner (ABCC) commissioned Econtech to prepare a report on the economic effects of the ABCC's activities. The 2007 Econtech Report estimated the effects of the ABCC (and its predecessor the Building Industry Taskforce) on productivity in the building and construction industry and the flow-on effects to the wider economy. This 2008 Econtech Report updates the economic analysis conducted in the 2007 Econtech Report for new developments over the last year.

By way of background, the Building Industry Taskforce (the Taskforce) was established on 1 October 2002, following the Cole Royal Commission's findings that the building and construction industry was characterised by a widespread disregard for the law. The Taskforce was established as an interim body to secure the law in the industry prior to the establishment of a national agency.

The Taskforce operated for three years, until the establishment of the Office of the ABCC on 1 October 2005. Since its launch, the ABCC has established itself as an active regulator of the building and construction industry.

One year on from the 2007 Econtech Report, it is timely to take into account a number of developments. Another year of data is now available and there have been other studies done in the area. Thus, this 2008 Econtech Report updates the economic analysis in the 2007 Econtech Report to incorporate all the new data and to take into account the other new studies.

This 2008 Econtech Report fully updates, and therefore supersedes, the economic analysis in the 2007 Econtech Report. Importantly, this updating process confirms our original estimate that the activities of the Taskforce and ABCC, in conjunction with industrial relations reforms, have added about 10 per cent to productivity in the construction industry.

Methodology

This study ("2008 Econtech Report") provides an up-to-date assessment of the productivity gains that can be attributed to the activities of the Taskforce and the ABCC. In doing so, it performs the same three types of productivity comparisons as in the original 2007 Econtech Report, but using the latest information.

- **Year-to-year** comparisons of construction industry productivity are made using Econtech analysis of the latest data from the Australian Bureau of Statistics (ABS), a Productivity Commission productivity report, and a recent construction industry report by the Allen Consulting Group.
- Comparisons of productivity for the **non-residential versus residential** sides of the industry are made using Rawlinson's data on construction costs. The ABCC's mandate is for the higher-cost, non-residential side of the industry.
- Comparisons of **individual projects** undertaken before and after workplace reforms include case studies undertaken by Econtech and an engineering construction study by Ken Phillips.

These updated comparisons show recent improvements in construction industry productivity of around 10 per cent, consistent with the findings in the 2007 Econtech Report.

This report also examines the timing of the recent construction industry productivity improvements. It compares these with the timing and nature of changes in industrial relations policies and the timing and nature of the operations of the ABCC and the Taskforce. This comparison also supports the conclusions in the 2007 Econtech Report – that the ABCC has played an essential role, but its effectiveness has depended on industrial relations reforms.

The productivity improvements are then introduced into Econtech's MM600+ economy-wide model to estimate the impacts of the ABCC activities on the construction industry and the Australian economy as a whole. This modelling provides estimates of the permanent long-term gains in activity in the construction industry and other industries from having a more productive construction industry. It also estimates the permanent long-term flow-on benefits to consumers in the form of lower prices.

The ABCC's Impact on Construction Industry Productivity

The latest information supports the conclusion in the 2007 Econtech Report that there has been a construction industry gain in productivity of about 10 per cent due to the ABCC (and its predecessor the Building Industry Taskforce) in conjunction with the related industrial relations reforms. This conclusion is based on the three types of productivity comparisons - year-to-year, residential versus non-residential and individual projects.

<u>Year-to-Year Comparisons</u>

- ABS data shows that, by 2007, construction industry labour productivity outperformed predictions based on its relative historical performance to 2002 by **10.5 per cent**.
- The Productivity Commission[1] found that multifactor productivity in the construction industry was no higher in 2000/01 than 20 years earlier, but rose by **13.6 per cent** in the four years to 2005/06.
- The Allen Consulting Group, in a report to the Australian Constructors Association, found a gain in non-residential construction industry multifactor productivity of **12.2 per cent** in the five years to 2007.[2]

<u>Non-residential versus residential</u>

- Using Rawlinson's data to 2008, the cost penalty for completing the same tasks in the same regions for non-residential construction compared with residential construction has shrunk. This implies a relative productivity gain for non-residential construction conservatively estimated at **7.3 per cent**. The ABCC's mandate is for non-residential construction.

[1] Productivity Commission, *Productivity Estimates to 2005-06*, December 2006.
[2] The Allen Consulting Group, The Economic Importance of the Construction Industry in Australia, 2007, p18.

Individual Projects

- Case studies undertaken as part of Econtech's report found that the ABCC and the IR reforms have lead to:
  - significant reduction in days lost due to industrial action;
  - less abuse and proper management of OH&S issues;
  - proper management of inclement weather procedures;
  - improvement in rostering arrangements; and
  - cost savings from the prohibition on pattern bargaining.
- A study by Ken Phillips (2006) found a $295 million "advantage to EastLink by operating under the post-WorkChoices/ABCC environments" representing "**11.8 per cent** of the total construction cost"[3].

All of this evidence supports the conclusion that there has been a significant gain in construction industry productivity. The question then becomes to what extent the ABCC contributed to this improvement.

The Taskforce was established in October 2002 but it lacked enforcement powers. The ABCC was established in October 2005 and WorkChoices was implemented on 27 March 2006.

Significant industrial relations reforms to encourage enterprise bargaining were introduced in 1993. Further changes were introduced in 1996 to reinforce the incentive for enterprise bargaining as well as reduce the scope for industrial action. These industrial relations reforms provided a more productivity-friendly environment.

However, these changes did not appear to have any effect in terms of improving construction industry productivity until after the Taskforce was put in place in October 2002. The data sources above indicate that the significant productivity gains in construction industry productivity appear around 2002/03. This supports the interpretation that it was the activities of the Taskforce and more importantly the ABCC (given its enforcement powers) when it was established in October 2005 that made a major difference.

Thus, the productivity and cost difference data suggest that effective monitoring and enforcement of the general industrial relations reforms and those that related specifically to the building and construction sector were necessary before the reforms could lead to labour productivity improvements. As such, it is considered that the most appropriate conclusion is that separate attribution of labour productivity improvements to the ABCC and industrial relations reforms is not possible because to be effective they both need to operate together.
The latest evidence points to a significant productivity gain in the construction industry due to the ABCC (and its predecessor the Building Industry Taskforce) in conjunction with the related industrial relations reforms. As reported above, the estimated gain ranges between 7.3 and 13.6 per cent, depending on the measure and the source of information that is used. While not all of these measures are strictly comparable, on balance it is reasonable to conclude the latest evidence indicates that the ABCC and related industrial relations reforms have added about 10 per cent to labour productivity in the construction industry.

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[3] Ken Phillips, *Industrial Relations and the struggle to build Victoria*, Institute of Public Affairs, Briefing Paper, November 2006.

This is consistent with the 2007 Econtech Report, which used a gain of 9.4 per cent. Hence this report also assumes an ABCC-related gain in construction industry labour productivity of 9.4 per cent for the purposes of economy-wide modelling.

Economic Impact of Improving Productivity in the Building and Construction Industry

Econtech used its highly detailed MM600+ model of the Australian economy to model the long-term economy-wide impact of the activities of the ABCC. This was done by estimating the differences between the following two scenarios:

- a "Baseline Scenario" where the ABCC does not exist; and
- an "ABCC Scenario" which reflects a situation where the ABCC does exist.

The key aggregate long-term economic effects under the ABCC scenario, when compared to the Baseline Scenario, are shown in Table 1.

Table 1
Summary of Economy-Wide Effects of the Impact of ABCC

	ABCC Scenario
Consumer Price Index (CPI)	-1.2%
Real Consumption	0.8%
Annual Economic Welfare Gain ($billion, 2006/07 terms)	5.1
GDP	1.5%
GNP	0.9%

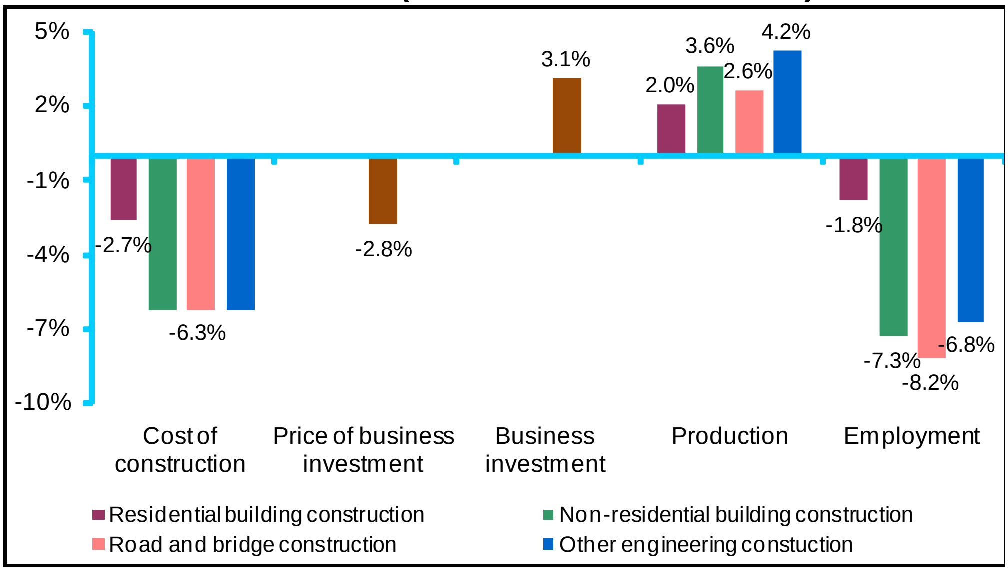
Source: Econtech MM600+ simulation
Note: The above results refer to permanent effects on the levels, not growth rates, of indicators relative to what they otherwise would be. For example, ABCC Scenario shows a gain of 1.5% in the level of GDP relative to what it would otherwise be, and not its annual growth rate.

The modelling results suggest that the improvements in labour productivity outlined in the ABCC Scenario have lowered construction costs, relative to what they would otherwise be. This has in turn reduced business costs across the economy, as all industries are significant users of commercial building or engineering construction. Lower business costs mean lower consumer prices. As shown in Table 1, the Consumer Price Index is an estimated 1.2 per cent lower than what it would otherwise be under the Baseline Scenario. Furthermore, as shown in Table 1, due to the ABCC activities, consumers are better off by $5.1 billion on an annual basis, in 2006/07 terms.

The ABCC scenario confirms that higher productivity in the construction industry has lowered its costs, leading to lower prices for new construction. This has stimulated demand for new construction, leading to a significant permanent gain in construction activity of 2.6 per cent. This comprises a gain of 2.0 per cent for residential construction and 2.9 per cent for non-residential construction (road & bridge, non-residential building and other engineering).

Higher productivity has boosted activity in the main categories of non-residential construction relative to the situation in the absence of the reforms. The long-term gains range from 2.6 per cent for roads and bridges to 3.6 per cent for non-residential building and 4.2 per cent for other engineering. The gain in non-residential construction underpins a long-term lift in business investment of 3.1 per cent. Chart 1 summarises these effects.

Chart 1
Effect of Increased Efficiency on Residential and Other (Non-Residential) Construction (% deviation from baseline)

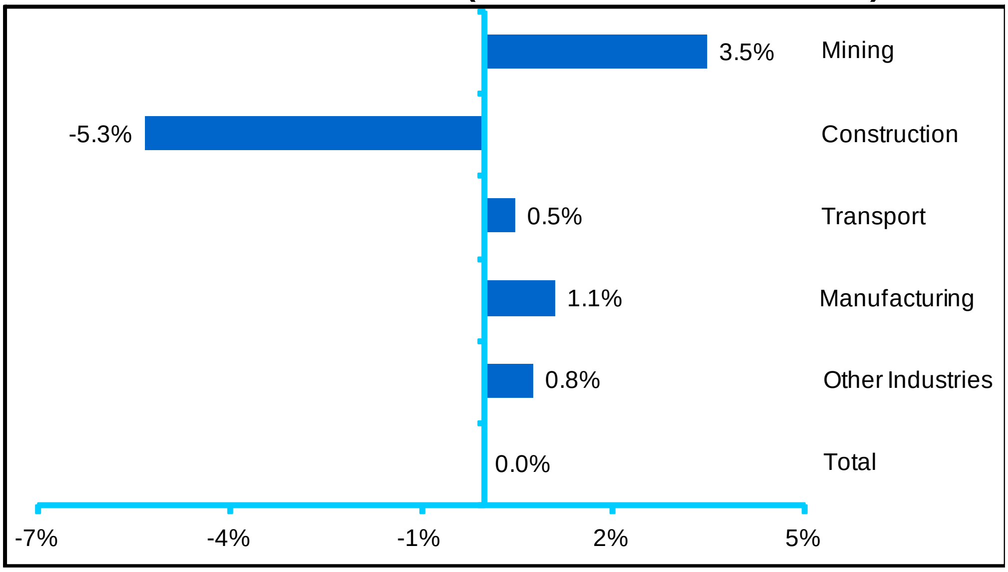


Source: Econtech MM600+ simulation

At the same time, the reforms cause some shifting of jobs away from construction and towards other industries compared to the situation in the absence of the reforms. Higher labour productivity reduces labour demand in construction and this effect is only partly offset by an increase in labour demand from higher construction activity. Overall, as shown in Chart 2, employment in construction is estimated to be 5.3 per cent lower than in the baseline. However, this loss in employment in construction is fully offset by gains in employment in other industries. Further, this loss is relative to a baseline scenario without reform and does not mean that there is a fall in construction employment from one year to the next. Indeed, construction employment has actually grown strongly in every year from 2001-02 onwards during the reform process.

This reallocation of employment means a more efficient allocation of labour between industries, underpinning the permanent gains to consumers from the activities of the ABCC. The modelling assumes that the number of people employed in Australia is unchanged by the reforms in the long term. While the modelling results show no change in the overall level of employment, this is conservative. In fact, the activities of the ABCC have the potential to reduce unemployment and raise employment on a permanent basis, by adding to the flexibility of the construction labour market.

Chart 2
Effect of Increased Efficiency in the Construction Industry on Employment In Selected Industries (% deviation from baseline)



Source: Econtech MM600+ simulation

1. Introduction

The Building Industry Taskforce was established on 1 October 2002, following the Cole Royal Commission's findings that the building and construction industry was characterised by a widespread disregard for the law. The Building Industry Taskforce (the Taskforce) was established as an interim body to secure the law in the industry prior to the establishment of a national agency. The Taskforce operated for three years, until the Office of the Australian Building and Construction Commissioner (ABCC) was established on 1 October 2005.

The ABCC's role is to ensure workplace relations laws are enforced in building and construction industry workplaces. To promote proper conduct, the ABCC also educates industry participants on their rights and obligations. In broad terms, the jurisdiction of the ABCC includes all of the construction industry, as defined by the ABS, except for domestic housing and mining.

Since its launch, the ABCC has established itself as an active regulator of the building and construction industry. The ABCC's Commissioner, John Lloyd, noted a number of ways that the organisation has already improved the workplace relations framework of the building and construction industry in the ABCC's first annual report.[4] These include:

- investigating possible contraventions of relevant laws, the National Code of Practice and industrial instruments;
- instituting proceedings against those who contravene the law;
- promoting appropriate standards of conduct; and
- providing advice and assistance to building and construction industry participants.

In 2007, the ABCC commissioned Econtech to assess the ABCC's impact on the construction industry. To this end, Econtech undertook a study which examined the change in building and construction industry productivity since the ABCC (including the interim Building Industry Taskforce) was established. The 2007 Econtech Report found that there had been a gain in construction industry productivity of about 10 per cent due to the ABCC (and its predecessor the Building Industry Taskforce) in conjunction with related industrial relations reforms.

This gain in construction industry productivity was then used in Econtech's MM600+ economy-wide model to estimate the impacts of the changes on the Australian economy as a whole. The modelling results suggest that the improvements in labour productivity have lowered construction costs, relative to what they would otherwise have been. This has in turn reduced business costs across the economy, as all industries are significant users of commercial building or engineering construction. Lower business costs mean lower consumer prices, with the Consumer Price Index estimated at 1.2 per cent lower than what it would otherwise have been. Furthermore, due to the ABCC activities, consumers are better off by about $5 billion on an annual basis.

One year on, it is timely to update the economic analysis in the 2007 Econtech Report for a number of developments. Another year of data is now available and there have been other studies done in the area. Thus, this report updates the economic analysis in the 2007 Econtech Report to incorporate the new developments. The analysis in this 2008 Econtech

[4] ABCC Media Statement, *ABCC's first annual report tabled in Parliament today*, 19 October 2006.

Report fully updates, and therefore supersedes, the economic analysis in the 2007 Econtech Report.

The specific new developments factored into this 2008 Econtech Report include the following.

- In August 2007 the Australian Constructors Association released a report from the Allen Consulting Group showing that productivity in non-residential construction has increased substantially in recent years.
- In February 2008 Rawlinsons released its Australian Construction Handbook 2008, containing January 2008 data on comparative costs for the same tasks on the residential and non-residential sides of the construction industry. Econtech has incorporated this additional data into its analysis; adjusted the base year to remove the effects of an apparent break in some of the data series; refined the list of tasks to only include those that are important on both sides of the construction industry; and reviewed its previous use of the Rawlinsons data to remove anomalies.
- In March 2008 the ABS released national accounts and employment data showing that the strong growth of recent years in construction industry productivity continued in 2007.
- In March 2008 the Australian Bureau of Statistics (ABS) also released data showing that in 2007 a record low of less than 7,000 working days was lost from industrial disputes in the construction industry.

This report is structured as follows.

- Section 2 analyses productivity in the construction industry by undertaking a range of productivity comparisons. It compares construction industry productivity between different years, between the non-residential and residential sides of the industry and between individual projects undertaken before and after the establishment of the ABCC. It then assesses the extent to which productivity changes are attributable to the role of the ABCC and the Taskforce.
- Section 3 describes the MM600+ model, its main assumptions, and the scenarios that are modelled.
- Section 4 presents and explains the results of modelling the impact of productivity gains in the building and construction industry, attributable to ABCC and the Taskforce, on the Australian economy.

While all care, skill and consideration has been used in the preparation of this report, the findings refer to the terms of reference of the ABCC and are designed to be used only for the specific purpose set out below. If you believe that your terms of reference are different from those set out below, or you wish to use this report or information contained within it for another purpose, please contact us.

The specific purpose of this 2008 Econtech Report is to update the economic analysis performed in the 2007 Econtech Report for new developments over the last year.

The findings in this report are subject to unavoidable statistical variation. While all care has been taken to ensure that the statistical variation is kept to a minimum, care should be taken whenever using this information. This report only takes into account information available to Econtech up to the date of this report and so its findings may be affected by new information. Should you require clarification of any material, please contact us.

2. Productivity Comparisons in the Construction Industry

This study provides an up-to-date assessment of the productivity gains that can be attributed to the activities of the Taskforce and the ABCC. In doing so, it performs the same three types of productivity comparisons as in the original 2007 Econtech Report, but using the latest information.

- **Year-to-year** comparisons of construction industry productivity are made using Econtech analysis of the latest data from the Australian Bureau of Statistics (ABS), a Productivity Commission productivity report, and a recent construction industry report by the Allen Consulting Group. Our interest is in whether there was any shift in construction industry productivity following the establishment of the Taskforce and the ABCC.
- Comparisons of productivity for the **non-residential versus residential** sides of the industry are made using Rawlinson's data on construction costs. The Taskforce and the ABCC have largely operated on the more regulated, non-residential side of the construction industry. Our focus is on whether this has resulted in any improvement in productivity compared with the residential side of the industry.
- Comparisons of **individual projects** undertaken before and after workplace reforms include case studies undertaken by Econtech and an engineering construction study by Ken Phillips.

This section first provides an explanation of differences in productivity measures. Following this explanation, each of the three types of productivity comparisons (listed above) is then discussed in turn. That is, subsection 2.1 examines year-to-year comparisons, subsection 2.2 compares residential and non-residential construction productivity, and subsection 2.3 looks at productivity across different projects.

The findings from the three types of productivity comparisons are then used to assess the extent to which productivity improvements are attributable to the ABCC and its precursor the Taskforce. In subsection 2.4, productivity gains related to the ABCC's activities are identified.

Differences in Productivity Measures

There are a number of alternative approaches to measuring an industry's productivity. The most common measures are labour productivity, capital productivity, multifactor productivity and total factor productivity. Each one of these measures is briefly described below.

- *Labour Productivity.* Labour productivity is the ratio of real output produced to the quantity of labour employed. Labour productivity is typically measured as output per person employed or per hour worked. Changes in labour productivity can be attributed to labour where they reflect improvements in education levels, labour efficiency or technology that makes labour more productive. Changes in labour productivity can also reflect changes in capital and intermediate inputs, in technical and organisational efficiency, as well as the influence of economies of scale and varying degrees of capacity utilisation.
- *Capital Productivity.* Capital productivity is measured as output per unit of capital. This ratio shows the time profile of how productively capital is used to generate output.

Capital productivity reflects the joint influence of capital, labour, intermediate inputs, technical change, efficiency change, economies of scale and capacity utilisation.

- *Multifactor Productivity (MFP).* MFP is defined as the ratio of output to combined inputs of labour and capital. In principle, MFP is a more comprehensive productivity measure because it identifies the contribution of both capital and labour to output. In practice, labour input can be measured more accurately than capital input. Reflecting these competing considerations, both labour productivity and MFP continue to be used as measures of productivity.

- *Total Factor Productivity (TFP).* TFP is the ratio of output to the combined inputs of labour, capital and intermediate inputs (such as fuel, electricity and other material purchases). While this measure is the most comprehensive, often it cannot be calculated because there is insufficient data.

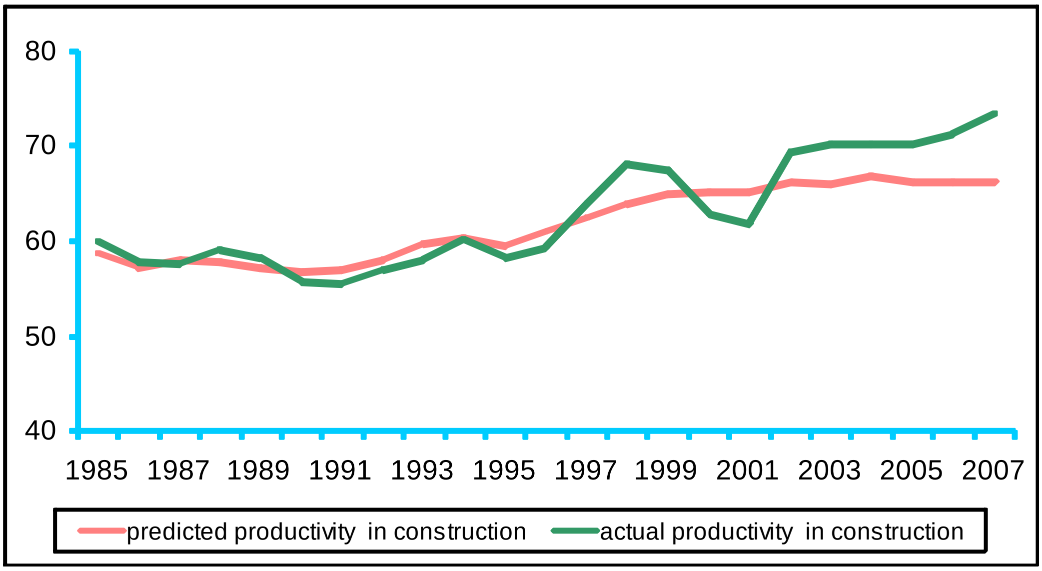
2.1 Year-to-year Comparisons

This section reviews trends in productivity in the construction industry over a number of years. It begins by analysing the aggregate construction industry labour productivity data from the ABS. The section then reviews an analysis of productivity trends in the construction industry undertaken by the Productivity Commission. Finally, a recent report on productivity in the non-residential construction industry by Allen Consulting Group is discussed.

Econtech Analysis of Latest ABS Data

Econtech has analysed the latest ABS data on the construction industry to make year-to-year comparisons of construction industry productivity. Chart 2.1 shows actual productivity in the construction industry compared to predictions based on historical performance.

Chart 2.1
Construction Industry Labour Productivity compared with a Prediction based on an Historical Benchmark



Source: Econtech estimates based on ABS data

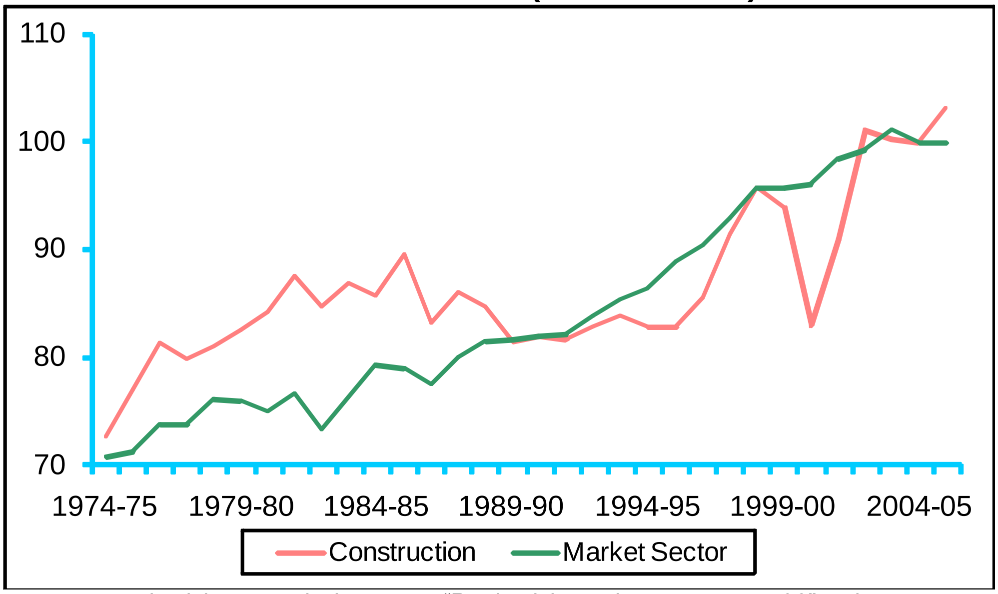
The historical productivity performance of the construction industry is assessed using data for the period prior to the establishment of the Taskforce/ABCC - from 1985 to 2002. For this period, regression analysis was used to establish the trend in productivity in the construction industry, relative to the trend in productivity for the economy as a whole.

As can be seen in Chart 2.1, since 2002 actual construction industry labour productivity has consistently outperformed predictions based on past trends. The latest reading, for 2007, shows that construction industry productivity was 10.5 per cent higher than predictions based on its relative historical performance.

Productivity Commission Report

This section examines changes in multi-factor productivity (MFP) in the construction industry using aggregate data from the Productivity Commission (PC). The PC calculates indexes of productivity in 12 industry sectors. These PC estimates are based on unpublished data provided by the ABS. Chart 2.2 compares this MFP in the construction industry with MFP in the market sector as a whole from 1974-75 to 2005-06.

Chart 2.2
Construction Sector Multifactor Productivity, 1974-75 to 2005-06 (2004-05 = 100)



Source: Productivity Commission 2006, *"Productivity Estimates to 2005-06"* and ABS *"Australian System of National Accounts 2005-06"*.

While productivity in the market sector has followed a fairly steady upward trend, productivity in the construction industry was fairly flat through the 1980s and 1990s. In fact, the Productivity Commission[5] found that multifactor productivity in the construction industry was no higher in 2000-01 than 20 years earlier.

However, construction industry productivity then strengthened considerably to achieve a higher level for the four years from 2002-03 to 2005-06. The Productivity Commission data shows construction industry productivity rose by 13.6 per cent in the four years to 2005/06. This confirms the strong construction industry productivity performance of recent years already seen using labour productivity in Chart 2.1.

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[5] Productivity Commission, *Productivity Estimates to 2005-06*, December 2006.

Allen Consulting Group Report

Following on from the Productivity Commission 2006 report, the Allen Consulting Group produced a report in August 2007, which examined multifactor productivity in the non-residential construction industry.

This report, commissioned by the Australian Constructors Association, found that there had been a gain in non-residential construction industry multifactor productivity of 12.2 per cent in the five years to 2007.[6]

The report notes that for the non-residential construction industry, the "more harmonious industrial relations environment has been conducive to greater productivity of both labour and capital and hence multi-factor productivity has grown quickly".[7]

The study notes the declining trend in the number of industrial disputes in the industry.[8] With the establishment of the ABCC in October 2005, the number of working days lost in the construction industry has plummeted from 120 thousand in 2005 to 15 thousand in 2006. It fell further in 2007 to only 7 thousand.

All three analyses of year-to-year movements in construction industry productivity – the Econtech analysis of the latest ABS data, the Productivity Commission data and the Allen Consulting Group study – point to similar conclusions. That is, there has been a recent uplift above the historical trend for productivity in the construction industry of around 10 per cent. This is consistent with the hypothesis that the Taskforce and the ABCC, together with industrial relations reforms, have generated a major lift in productivity.

2.2 Commercial versus Domestic Residential Comparisons

The ABCC and supporting industrial relations reforms are expected to have their main impact on the non-house building side of the construction industry, rather than on the house building side. This is because the ABCC's jurisdiction does not cover housing construction of four dwellings or less (as well as the extraction of minerals, oil and gas).

The ABCC's mandate is on the non-house building side of this industry because this is where, traditionally, there were more industrial disputes and higher costs for specific tasks. The house building side, on the other hand, is considered to be more flexible reflecting the involvement of many small, independent operators and the extensive use of piece rates for work performed.

So another way of testing the impact of the ABCC is examining whether it has led to any improvement in productivity on the non-house building side of the industry compared with the house building side. This can be assessed at a detailed level by comparing how the ABCC has affected the relative performance of the two sides of the industry in undertaking the same tasks.

Changes in the relative performance of the two sides of the industry can be assessed using

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[6] The Allen Consulting Group, *The Economic Importance of the Construction Industry in Australia*, 2007, p19
[7] Ibid, p8
[8] Ibid, p14

quantity surveyors data. This data is used to investigate how the ABCC has affected the cost comparison between the two sides of the industry for the same building tasks in the same locations. It updates the 2007 Econtech Report by including the latest (January 2008) data available from Rawlinsons. It also reviews the historical data and methodology used in the analysis in light of subsequent work by Mitchell (2007)[9].

The cost comparison involves the following analysis. The Rawlinsons data is used to investigate movements in recent years in the cost comparison between commercial building and domestic residential building for the same building tasks in the same locations.

In making this comparison, the first point to clarify is the definitions of the two sides of the industry that are used in the Rawlinsons data. Commercial building includes larger-multi-unit dwellings, offices, retail, industrial and other buildings besides domestic residential buildings. It excludes engineering construction (roads, bridges, rail, telecommunications and other infrastructure). Domestic residential building includes all dwellings except larger multi-unit dwellings.

The building tasks used in this cost comparison of commercial building with domestic residential building are as follows:

- concrete to suspended slab;
- formwork to suspended slab;
- 10mm plasterboard wall;
- painting (sealer and two coats);
- hollow core door; and
- carpentry wall.

Table 2.1 shows the cost penalties for commercial building compared with domestic residential building for completing the same tasks in the same states for each year.

Table 2.1
Cost Differences between Commercial Building and Domestic Residential Building for the Same Tasks in the Same State, 2004 – 2007 (per cent)

	2004	2005	2006	2007	2008	Change since 2004
SA	9.2	7.3	6.6	6.6	6.1	-3.1
Qld	23.9	20.8	21.7	22.4	22.7	-1.1
Vic.	22.7	24.0	21.8	15.1	15.7	-6.9
WA	15.5	11.3	10.4	10.5	12.0	-3.5
NSW	16.2	14.7	12.6	12.4	12.3	-3.8
Aust. Average	19.0	17.5	16.3	14.8	15.2	-3.9

Source: Rawlinsons Australian Construction Handbook, 1994 – 2008[10]
Notes: (1) Aust. Average is weighted according to turnover on a state-by-state basis.
(2) Dates indicate beginning of each calendar year, for example 2004 refers to January 2004.

[9] Mitchell, *An examination of the cost differentials methodology used in 'Economic Analysis of Building and Construction Industry Productivity' – the Econtech Report*, August 2007.
[10] Rawlinsons is a construction cost consultancy in Australia and New Zealand. The Rawlinsons Australian Construction Handbook is the leading authority on construction costs in Australia.

As outlined in the introduction, there are four main areas of change in updating this analysis. In particular, Econtech has incorporated the latest data (for 2008); adjusted the base year to remove the effects of an apparent break in some of the data series; refined the list of tasks to only include those that are important on both sides of the construction industry; and reviewed its previous use of the Rawlinsons data to remove anomalies. Each of these changes is now discussed in turn.

First, this updated analysis includes recently-released 2008 Rawlinsons data. This report uses this data to compare cost gaps in 2008 with cost gaps in 2004 (survey data refers to January of the year of each survey). This may yield insights into the economic effects of the activities of the Taskforce (established in October 2002) and its successor the ABCC (established in October 2005).

Second, this updated analysis adjusts the base year to remove the effects of an apparent break in some of the data series from 2003 to 2004. For example, in Queensland at the time of this apparent series break, the reported unit cost of formwork to a suspended slab spiked from \$53.25 to \$97, which is out of character with the historical behaviour of this time series, which shows steady, moderate increases. More generally, there appears to be a discontinuity in some of the data collected up to 2003 and the data collected from 2004 onwards. To remove this discontinuity or series break, this updated analysis uses 2004 as the base year.

Third, Econtech has reviewed its previous use of the Rawlinsons data to remove anomalies. For the original 2007 Econtech Report, some data was inadvertently juxtaposed in manually extracting it from Rawlinson's annual hard copy publications. The use of all Rawlinsons data has been carefully checked and is now correct.

Fourth, we agree with Mitchell (2007) that corrugated zinc roof and single skin face brick walls are best excluded from the estimation, because they are not as important to the commercial sector as the six remaining tasks. Similar to our original analysis, the remaining six tasks are combined with assumed equal cost weights. This is the best assumption available in the absence of other information.

In comparison, for his 'rough guide' composite unit, Mitchell combined tasks by adding together their per unit costs - even though the physical units are not comparable across tasks (a point Econtech has confirmed with Rawlinsons). For example, producing such a composite unit for commercial construction (in NSW in 2007) would involve adding the cost of a cubic metre of concrete to suspended slab (\$233) to the cost of a square metre of painting (\$11.55) and a square metre of formwork to suspended slab (\$72). Such a composition is arbitrarily affected by the units of measurement for the cost of each task, and does not reflect their contributions to total costs.

Table 2.1 confirms that, similar to the 2007 Econtech report findings, the average costs of completing the same tasks in the same states have been generally higher in the commercial building sector than in the domestic residential building sector. However, our interest is in whether this cost penalty for commercial building has shrunk under the watch of the Taskforce/ABCC.

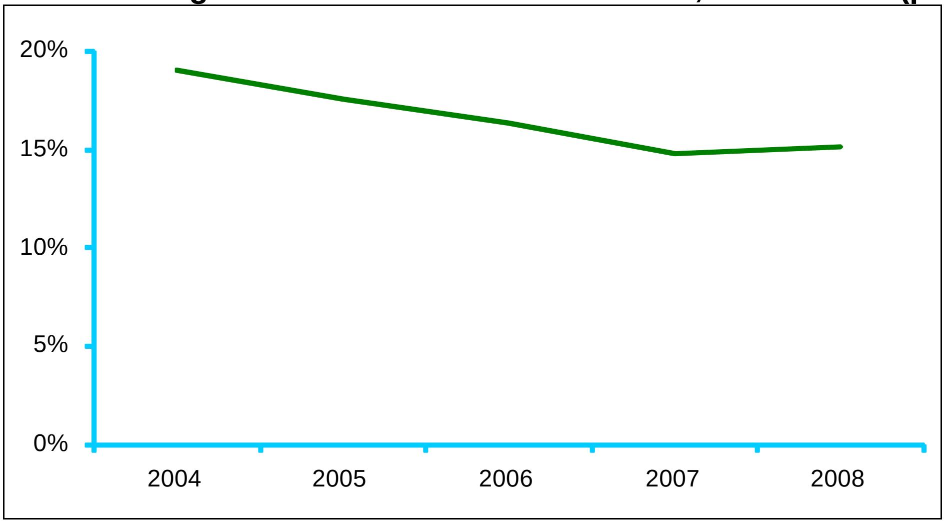
The final column of Table 2.1 shows that the cost penalty for commercial building compared with domestic residential building has fallen in all mainland states, suggesting that the

ABCC has been effective. The biggest fall is in Victoria, where it is down from about 23 per cent to about 16 per cent. Victoria is the state where restrictive work practices in commercial building were generally acknowledged to be most pervasive. Similarly, the smallest fall is in Queensland, where restrictive work practices in commercial building were generally acknowledged to be less pervasive.

Table 2.1 also presents cost penalties for Australia as a whole, calculated as weighted averages of the cost penalties for individual states. These Australian cost penalties are also displayed in Chart 2.3.

Table 2.1 and Chart 2.3 show that, since the introduction of the Taskforce[11], across Australia the cost penalty for commercial building compared with domestic residential building has fallen. The cost penalty was around 19 per cent in 2004, but has declined over the past four years to be 15 per cent in 2008, or a fall of 3.9 percentage points.

Chart 2.3
Average Cost Differences between Commercial Building and Domestic Residential Building for the Same Tasks for 5 States, 2004 – 2007 (per cent)



Source: Econtech estimates.

Many possible explanations for the fall in the cost penalty are ruled out by the close nature of the comparison used in estimating the penalty. In particular, the cost penalty is calculated for performing the same building tasks in the same locations. The only major aspect that is varied in the calculation is whether a task is undertaken as part of a commercial building project or as part of a domestic residential building project. Both types of projects pay similar costs for materials.

This leaves a fall in the labour cost penalty (for commercial building) as the most plausible explanation for the fall in the total cost penalty. On this interpretation, Table 2.2 uses the fall in the total cost penalty for commercial building to estimate the fall in the labour cost penalty. It does this conversion using the average share of labour in total costs for the six building tasks. The result is an estimated fall from 2004 to 2008 in the labour cost penalty for commercial building of 7.3 percentage points.

[11] The Taskforce was established in October 2002 but it is reasonable to expect a lag before its activities started to make an impact. The data also relate to January of each year so that for 2004, the data relates to January 2004.

Table 2.2
Average Labour Cost Differences between Commercial Building and Domestic Residential Building, 2004-2007 (per cent or percentage points)

	2004	2008	Change
Total Cost Gap	19.0	15.2	3.9
Labour Cost Gap	35.9	28.6	7.3

Source: Econtech estimates
Notes: (1) The Labour cost gap uses an estimate from the Rawlinson's handbook showing labour costs for the six tasks account for 53 per cent of total costs for those tasks.
(2) Excludes Site & Other Allowances.

In principle, this fall in the labour cost penalty for commercial building compared with domestic residential building could be due either to movements in relative productivity or wages between the two sectors. These two possible explanations are considered in turn.

Relative wages in commercial building compared with domestic residential building could have moved for two reasons. First, site allowances associated with non-residential construction have been restricted by the ABCC. However, site allowances are not included in the data for the costs of building tasks and so do not explain the fall in the cost penalty. Second, enterprise bargaining may have affected relative wages. However, enterprise bargaining easily predates our cost comparison, which begins in 2004.

This leaves post-2004 improvements in labour productivity in commercial building compared with domestic residential building as the most likely explanation for the fall in the commercial building labour cost penalty. This coincides with the activities of the Taskforce/ABCC in improving work practices in commercial building.

This leaves the conclusion that there has been a recent improvement in labour productivity in commercial building compared with domestic residential building of 7.3 per cent. However, as Mitchell points out in his comment on the 2007 Econtech Report[12], using the Rawlinson's domestic construction data "blurs the distinction [between commercial building and domestic construction categories] by including small-scale construction within domestic construction". To the extent that the classification blurs the desired distinction in categories, the cost gap and its movements will be understated. This means that 7.3 per cent is a conservative estimate of the recent gain in productivity for commercial building relative to domestic residential building from the ABCC and the related industrial relations reforms.

Domestic residential building is less useful as a cost benchmark for engineering construction, which largely involves other, unrelated tasks. However, a recent study by Ken Phillips (2006) showed a significant "advantage to EastLink by operating under the post-WorkChoices/ABCC environments" of 11.8 per cent (see sub-section 5.4 for more details). Thus it is reasonable to assume that the engineering cost improvement is likely to be at least equal to Econtech's estimate of the improvement in commercial building costs (of 7.3 per cent).[13]

Hence, based on the evidence above, the relative labour productivity gain for the non-residential construction sector as a whole is conservatively estimated at 7.3 per cent.

[12] Mitchell, "An examination of the cost differentials methodology used in 'Economic Analysis of Building and Construction Industry Productivity' – the Econtech Report", August 2007.
[13] This is slightly lower than the engineering cost improvement used in the Econtech 2007 report (8.8 per cent).

2.3 Individual Project Comparisons

Econtech Case Studies

So far in this section it has been established that labour productivity in commercial construction has increased in recent years, both relative to its historical trend and relative to domestic residential construction.

To help understand the sources of the recent productivity gains, Econtech undertook a number of case studies. The case studies allow an examination of particular experiences across different companies in the construction industry.

The aim of this analysis was to examine different projects before and after the existence of the Taskforce and the ABCC in two different areas of the construction industry. These areas are office building and high density residential construction.

The information for the case studies was provided by two leading construction companies. For confidentiality reasons, these companies are referred to in this report as Company 1 and Company 2. A general description of each of these companies is presented below.

- **Company 1** is a construction company that offers services such as (but not limited to) building construction, commercial construction and tower building construction.
- **Company 2** is a large construction company that offers diverse construction services across the building and engineering sectors. It has an operating turnover in excess of $7 billion and more than 20,000 employees.

The following summarises the case studies that have been undertaken for this report.

- 2 high density residential projects in Queensland, 1 pre-ABCC activity and 1 post-ABCC activity.
- 2 office projects in Victoria, one pre-ABCC project and one post-ABCC project.

A brief general description of each of the projects is presented in Table 2.4. For confidentiality reasons, the projects are referred to in this report as Project 1, Project 2, etc.

Table 2.4
General Description of Case Studies Projects

	Construction Industry Area	Approximate size of the project	Approximate Cost of the project	Location
Project 1	Office building	40,000 m^2 office space + retail space + car parks	+$300 million	Victoria
Project 2	Office building	2 office towers + retail space	+$500 million	Victoria
Project 3	High Density Residential	112 residential units+ common areas + car parks	+$45 million	Queensland
Project 4	High Density Residential	258 residential units + common areas+ retail space+ car parks	+$40 million	Queensland

Source: Information provided by Companies 1 and 2.

The analysis of the case studies is divided in two parts. The first part of the analysis provides a summary of the views of the construction companies interviewed with respect to the influence that the ABCC and the industrial relations reforms have had in the construction industry, and in the performance of their companies. The second part of the analysis provides some general indicators of how the ABCC has influenced the individual performance of different construction projects.

Perceived Influence of the ABCC and the Industrial Relations Reforms on the Construction Industry

After meeting with representatives of four construction companies, Econtech identified some of the main impacts that these companies believe the ABCC and the industrial relations reforms have had on the construction industry. Whilst being as comprehensive as possible, the list of impacts contained in this report is by no means exhaustive. However, the impacts presented in this section represent the issues that were most commonly raised by the people interviewed. These impacts are outlined below.

- Significant reduction in days lost in the industry due to industrial action.
- Less abuse of OH&S issues for industrial purposes.
- Proper management of OH&S issues.
- Proper management of inclement weather procedures.
- Improvement of rostering arrangements (additional flexibility in rostering has effectively increased the number of working days per annum).
- Cost savings stemming from the prohibition on pattern bargaining.

Generally, the people interviewed suggested that there have been three main streams of influence in the construction industry:

- the BCII Act which establishes various prohibitions;
- the ABCC's extensive powers of investigation and prosecution; and
- the National Code of Practice for the Construction Industry, which provides a powerful commercial incentive to comply with the principles of freedom of association.

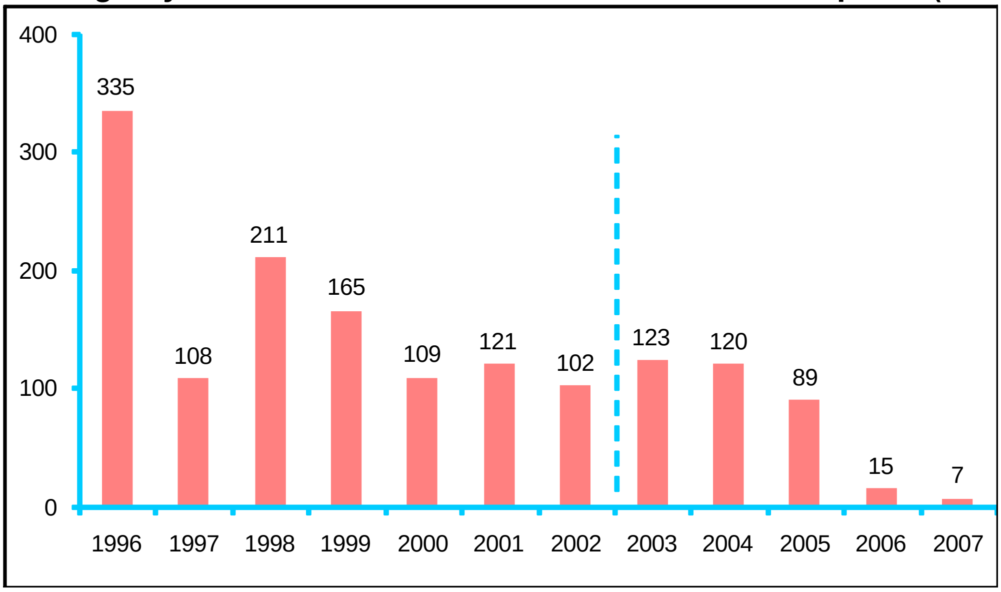
The interviewees suggested that this framework has produced significant improvements in productivity in the industry. Furthermore, all the people interviewed for this report believe that both the ABCC and the current construction industry regulatory framework are critically important components for construction industry productivity.

Influence of the ABCC on the Performance of Selected Construction Projects

This part of the analysis provides some general indicators of how the ABCC has influenced the individual performance of different construction projects. The calculations presented in this section are prepared using data provided by Companies 1 and 2.

The first indication of the influence of the ABCC, across the construction industry as a whole, is a considerable decrease in the number of days lost due to industrial action. This improvement can be shown at two different levels, using aggregate ABS data and using individual project data. Chart 2.4 shows ABS data on the number of working days lost in the construction industry due to industrial disputes. The average number of working days lost each year for the period 1996 to 2002 was 164,000. In contrast, the chart shows that since 2003 the number of days lost in the industry has been decreasing. 2003 was the full first year of operation of the Taskforce, which started operations in October 2002. The ABCC started its operations in October 2005. After just over two years of operation of the ABCC, the annual number of working days lost in the industry was down to only 7,000.

Chart 2.4
Working Days Lost in Construction due to Industrial Disputes ('000)



Source: Industrial Disputes, Australia, ABS (Cat. 6321.0.55.001).

This information is further supported by individual project data. Table 2.5 shows the average project days lost per year in the four different projects. This table shows that projects undertaken post-ABCC activity had considerable fewer project days lost per year than the projects undertaken pre-ABCC activity. Note that Table 2.5 refers to project days while Chart 2.5 refers to working days.

Table 2.5
Lost Time in Case Studies' Projects Due to Industrial Action

	Type of Project	Pre/Post ABCC?	Av. Days Lost (per year)
Project 1	Office building	Post	1.1
Project 2	Office building	Pre	20.7
Project 3	High Density Residential	Post	1.7
Project 4	High Density Residential	Pre	29.4

Source: Information provided by Companies 1 and 2.
Notes: Assumes 1 day= 8 hours.

Furthermore, additional information provided for Projects 3 and 4 shows that the additional cost of Project 4 due to lost days, compared to project 3, is $2.71 million. This figure includes additional site overheads and the liquidated damages and lost income for late performance.

Ken Phillips Study: Impact of Reforms on the Costs of Eastlink

An additional comparison of two major construction projects in Victoria further demonstrates how the industrial arrangements and behaviours that preceded the ABCC adversely impacted the construction industry. A study by Phillips (2006) of the Institute of Public Affairs (IPA)[14] estimated the **additional costs of the Eastlink[15] project** if this project had been constructed under industrial agreements outside the ABCC and the WorkChoices environment. The study found significant cost differentials, amounting to **$295 million** in direct costs and toll revenue losses by not opening on time. This estimate was calculated by considering the industrial relations costs that were imposed on the CityLink[16] project, which were not imposed on EastLink. The estimate was found to represent about 11.8 per cent of the total construction cost.

CityLink was constructed entirely before the federal reforms to industrial relations occurred and suffered significant industrial relations problems, particularly as a result of spurious OH&S campaigning by unions. In contrast, EastLink was constructed using industrial agreements and laws arising from, or influenced by, WorkChoices together with the enforcement powers of the ABCC. EastLink was completed ahead of schedule. This is considered to be mainly the result of industrial relations peace.[17]

Importantly, the $295 million cost differential between CityLink (pre-ABCC/BuildingCode/ WorkChoices) and EastLink (post-ABCC/Building Code/WorkChoices) estimated by Phillips includes the following components.

- Cost of union delegates employed but not working: $58.5 million. This figure includes union delegate's direct wages, site overheads, forgone toll revenue and direct wages of additional employees.
- Cost of non-working and non-productive days: $184 million. This figure includes costs of pre-ABCC rostering arrangements and forgone toll revenue. Additional overheads are not included in this figure.
- Cost of disruption due to agreement renewal: $9.2 million. This figure includes the forgone toll revenue for late completion, caused by production disruption during the period of agreement renewal. Additional overheads are not included in this figure.
- Cost of spurious OH&S claims: $31 million. This figure includes additional direct labour costs and forgone toll revenue for late completion of the project. Additional overheads are not included in this figure.
- Cost of misuse of allegations of inclement weather: $12.3 million. This figure includes additional direct labour costs and forgone toll revenue for late completion of the project. Additional overheads are not included in this figure.

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[14] Phillips, Ken (2006), "Industrial Relations and the Struggle to Build in Victoria", *Institute of Public Affairs Briefing Paper*, November 2006.

[15] The EastLink project is a 40 kms road construction project linking Mitcham and Frankston and the Eastern, Monash and Mornington Peninsula Freeways in Victoria. This is a $2.5 billion project (2004 figures) that is expected to take four years to complete.

[16] CityLink was one of the largest infrastructure projects undertaken in Australia. It covers 22 kms of road, tunnel and bridge works linking the north-western and south-eastern suburbs of Melbourne. Construction commenced in April 1996 and CityLink became fully operational in December 2001. The estimated total cost of the project was $2 billion.

[17] The Age, 11/7/06.

In conclusion the case study findings support the findings from the other subsections that the existence of the ABCC and the supporting regulatory framework has led to significant improvements in labour productivity.

2.4 Summary – The ABCC's Impact on Construction Industry Productivity

Each of the previous sub-sections finds significant improvements in labour productivity since the introduction of the ABCC (in conjunction with the supporting regulatory framework).

- ABS data shows that by 2007, construction industry labour productivity outperformed predictions based on its relative historical performance to 2002 by **10.5 per cent**[18].
- The Productivity Commission[19] found that multifactor productivity in the construction industry was no higher in 2000/01 than 20 years earlier, but rose by **13.6 per cent** in the four years to 2005/06.
- The Allen Consulting Group, in a report to the Australian Constructors Association, found a gain in non-residential construction industry multifactor productivity of **12.2 per cent** in the five years to 2007.[20]
- Using Rawlinson's data to 2008 on the evolution of the cost gap between non-residential and residential building for the same building tasks, the relative productivity gain for non-residential construction is conservatively estimated at **7.3 per cent**.
- Case studies undertaken as part of Econtech's report found that the ABCC and the IR reforms have lead to:
  - significant reduction in days lost due to industrial action;
  - less abuse and proper management of OH&S issues;
  - proper management of inclement weather procedures;
  - improvement in rostering arrangements; and
  - cost savings from the prohibition on pattern bargaining.
- A study by Ken Phillips (2006) found a $295 million "advantage to EastLink by operating under the post-WorkChoices/ABCC environments" representing "**11.8 per cent** of the total construction cost"[21].

All of this evidence supports the conclusion that there has been a significant gain in construction industry productivity. The question then becomes to what extent the ABCC contributed to this improvement.

The Taskforce was established in October 2002 but it lacked enforcement powers. The ABCC was established in October 2005 and WorkChoices was implemented on the 27 March 2006.

Significant industrial relations reforms to encourage enterprise bargaining were introduced in 1993. Further changes were introduced in 1996 to reinforce the incentive for enterprise

[18] Econtech, Economic Analysis of Building and Construction Industry Productivity, July 2007, p 33.
[19] Productivity Commission, *Productivity Estimates to 2005-06*, December 2006.
[20] The Allen Consulting Group, The Economic Importance of the Construction Industry in Australia, 2007, p18
[21] Ken Phillips, *Industrial Relations and the struggle to build Victoria*, Institute of Public Affairs, Briefing Paper, November 2006.

bargaining as well as reduce the scope for industrial action. These industrial relations reforms provided a more productivity-friendly environment.

However, these changes did not appear to have any effect in terms of improving construction industry productivity until after the Taskforce was put in place in October 2002. The data sources above indicate that the significant productivity gains in construction industry productivity appear around 2002/03. This supports the interpretation that it was the activities of the Taskforce and more importantly the ABCC (given its enforcement powers) when it was established in October 2005 that made a major difference.

Thus, the productivity and cost difference data suggest that effective monitoring and enforcement of the general industrial relations reforms and those that related specifically to the building and construction sector were necessary before the reforms could lead to labour productivity improvements. As such, it is considered that the most appropriate conclusion is that separate attribution of labour productivity improvements to the ABCC and industrial relations reforms is not possible because to be effective they both need to operate together.

The latest evidence points to a significant productivity gain in the construction industry due to the ABCC (and its predecessor the Building Industry Taskforce) in conjunction with the related industrial relations reforms. As reported above, the estimated gain ranges between 7.3 and 13.6 per cent, depending on the measure and the source of information that is used. While not all of these measures are strictly comparable, on balance it is reasonable to conclude the latest evidence indicates that the ABCC and related industrial relations reforms have added about 10 per cent to labour productivity in the construction industry.

This is consistent with the 2007 Econtech Report, which used a gain of 9.4 per cent. Hence this report also assumes an ABCC-related gain in construction industry labour productivity of 9.4 per cent for the purposes of economy-wide modelling that is report in sections 3 and 4.

3. Modelling the Impacts of the ABCC

This section provides details of the modelling approach used to estimate the economy-wide impacts of the activities of the ABCC. The section is structured as follows. Section 3.1 summarises Econtech's previous studies in this area. Section 3.2 outlines the scenarios that are simulated using MM600+ to quantify the economic contribution of the activities of the ABCC. Section 3.3 outlines the main data inputs that Econtech uses to build the alternative scenario and describes how these inputs are derived. Section 3.4 discusses the main features of the economic model (MM600+) that is used to estimate the economic contribution of the activities of the ABCC.

3.1 Previous studies

In 2003, Econtech prepared a study for the Department of Employment and Workplace Relations (DEWR) that analysed the cost differences for the same standard building tasks between commercial buildings and domestic residential buildings ('2003 Econtech Report'). Using Rawlinson's authoritative quantity surveyor data, Econtech found that building tasks such as laying a concrete slab, building a brick wall, painting and carpentry work cost an average of 10 per cent more for commercial buildings than domestic residential housing. This difference was mainly attributed to differences in work practices between the commercial and domestic residential building sectors. The 2003 Econtech Report went on to model the economy-wide benefits of reducing the cost gap through reform to work practices in the commercial building sector.

While the 2003 Econtech Report estimated the *potential* productivity gains from workplace reform in the construction industry, by 2007 the reform process was well established. Hence in 2007 the ABCC commissioned Econtech to estimate the *actual* productivity gains that can be attributed to the activities of the ABCC and its predecessor the Taskforce.

The resulting 2007 Econtech Report found that there had been a gain in construction industry productivity of about 10 per cent due to the activities of the Taskforce and the ABCC in conjunction with related industrial relations reforms. Similar to the 2003 Econtech Report, the 2007 Econtech Report modelled the economy-wide benefits of this gain in construction industry productivity from workplace reform.

The 2007 Econtech Report considered the impact of workplace reform on construction industry productivity from three different angles. It compared construction industry productivity between different years, between the non-residential and residential sides of the industry and between individual projects undertaken before and after the establishment of the ABCC.

One year on, it is timely to update the 2007 Econtech Report for a number of developments. Another year of data is now available and there have been other studies done in the area. Thus, this report updates the economic analysis in the 2007 Econtech Report to incorporate the new developments. This 2008 Econtech Report fully updates, and therefore supersedes, the economic analysis undertaken in the 2007 Econtech Report.

This section presents the methodology that is used in this 2008 Econtech Report to model the economic impacts of the activities of the ABCC. This same model was used in the two earlier reports.

3.2 Scenarios

To simulate the economic impacts of the activities of the ABCC, the following two scenarios are modelled:

- a "Baseline Scenario" where the ABCC does not exist; and
- an "ABCC Scenario" which reflects a situation where the ABCC does exist.

Differences in economic outcomes between the ABCC Scenario and the Baseline Scenario are calculated to determine the economic contribution of the activities of the ABCC.

The main inputs for each of the scenarios are discussed in detail below.

3.3 Model Inputs

As explained in Section 2, the latest evidence points to a significant productivity gain in the construction industry due to the ABCC (and its predecessor the Building Industry Taskforce) in conjunction with the related industrial relations reforms. This evidence was consistent with the 2007 Econtech Report, which used a productivity gain of 9.4 per cent. Hence this report also assumes an ABCC-related gain in construction industry labour productivity of 9.4 per cent for the purposes of the economy-wide modelling.

The estimated ABCC-related gains in labour productivity for the various sectors of the building and construction industry are shown in Table 3.1. The assumption used in attributing the ABCC-related productivity gain between the sectors of the construction industry was that it arose in the sectors where the ABCC has jurisdiction. Hence, the productivity gain was assumed to be zero for domestic residential building, implying a productivity gain of 13.2 per cent elsewhere in the construction industry.

Table 3.1
Simulated Gains in Labour Productivity (per cent)

	Scenario 1
Total non-residential construction	13.2
Total residential building	4.0
Domestic residential building	*0.0*
Multi-unit residential building	*13.2*
Total construction	**9.4**

Source: Econtech estimates based on total estimated productivity improvements and current relativities between the construction sectors.

3.4 MM600+ Model

The economy-wide contributions of the activities of the ABCC and of the industrial relations reforms were estimated using the MM600+ model.

MM600+ is a long-term computable general equilibrium (CGE) model of the Australian economy that models a long-run equilibrium (approximately 5 to 10 years). It distinguishes 108 industries that produce 672 products, making it six times more detailed than any comparable model. In particular, the model contains two construction industries producing eight products. The eight construction products in the model are:

1. residential building construction;
2. repair and maintenance of residential buildings;
3. non-residential building construction;
4. repair and maintenance of non-residential buildings;
5. road and bridge construction;
6. repair and maintenance of roads and bridges;
7. engineering construction other than roads and bridges; and
8. repair and maintenance of engineering construction other than roads and bridges.

The model has many other features that make it well suited for this analysis. Some of these features are detailed below.

- It estimates the effects of productivity changes on key macroeconomic aggregates such as GDP, exports, imports, consumption and investment.
- It breaks down the effects of productivity changes into 108 industries and 672 products. This means that the model is able to estimate the impacts of productivity gains in the building and construction industry and other industries and products.
- For each industry and product, it produces comprehensive results including for production, employment, consumption, trade flows and prices.
- It provides valid measures of changes in consumer welfare or living standards based on compensating and equivalent variations so that policy changes can be correctly evaluated in terms of the public interest.

The alternative scenarios modelled in this report are based on the standard long-run closure of the MM600+ model. Thus, the long-run closure shows the long-term effects of policy changes, after the economy has fully responded. This is fitting because economic policies should be judged against their lasting effects on the economy, not just their effects in the first one or two years. Some of the assumptions underlying the MM600+ long-term closure are as follows.

- Profit maximisation: the representative business in each industry chooses inputs and outputs to maximise profit subject to prices and a production function exhibiting constant returns to scale.
- Labour market equilibrium: in the long run the labour market is assumed to attain equilibrium, so that an economic shock has no lasting effect on total employment.

- External trade balance: in the long run, external balance is assumed to be achieved, so that trade shocks have no lasting effect on the trade balance.
- Budget balance: in the long run fiscal policy must be sustainable, and in MM600+ this is achieved by assuming budget balance.
- Private saving: in the long run the level of private sector saving and associated asset accumulation must be sustainable.

More detailed information about MM600+ is presented in Attachment A.

4. Economic Impact of the Activities of the ABCC

The previous section described the scenarios that were simulated using MM600+, outlined the main data inputs that Econtech used to build the scenarios and described how these inputs were derived. This section provides the results of modelling the economic impacts of the activities of the ABCC at three different levels, as follows.

- Section 4.1 describes the detailed economic impacts on the building and construction industry.
- Section 4.2 describes the wider industry impacts of the activities of the ABCC.
- Section 4.3 presents the economy-wide impacts of the activities of the ABCC.

Importantly, the results presented in this section refer to permanent effects on the levels, not growth rates, of indicators relative to what they otherwise would be. This means, for example, that a gain of 1.5 per cent in the level of GDP is interpreted as the increase in GDP relative to what it would otherwise be, and not the annual growth rate.

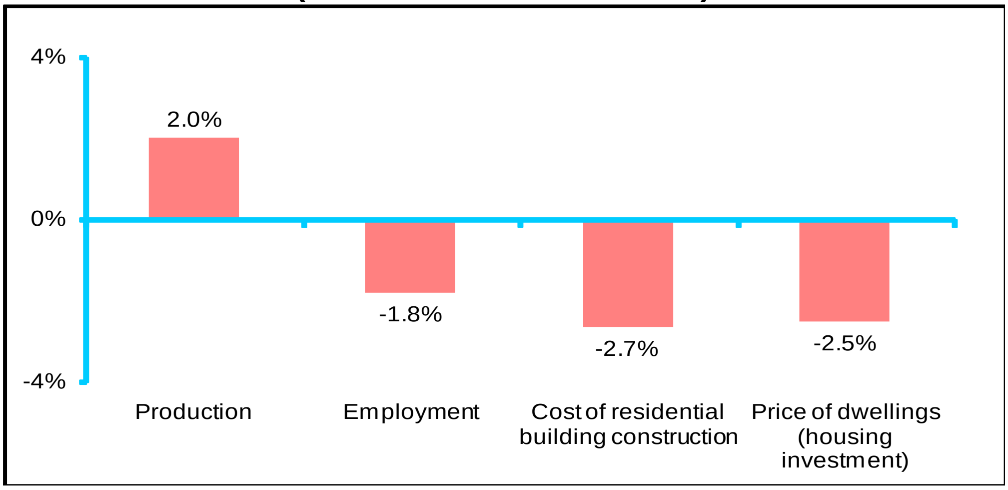
4.1 Building and Construction Industry Effects

This section presents the economic impacts on the building and construction industry of increased labour productivity in the industry stemming from the activities of the ABCC.

In considering the effects on the construction industry itself of higher construction productivity due to the ABCC activities, it is important to distinguish between residential construction and non-residential construction.

Chart 4.1 shows the estimated long-term effects on residential construction. These effects are driven mainly by the assumed increase in labour productivity in residential construction of 4.0 per cent which is solely attributable to increased labour productivity in the multi-unit component of the residential construction sector.

Chart 4.1
Effect of Increased Efficiency on Residential Construction
(% deviation from baseline)



Source: Econtech MM600+ simulation

The boost in labour efficiency in the residential construction sector reduces the costs of production in this sector relative to what they would otherwise be. While labour efficiency rises by 4.0 per cent, there is no change in the efficiency of the other inputs of capital and materials, leading to an overall cost reduction of 2.7 per cent, as shown in Chart 4.1. The price of dwellings falls by a similar percentage.

Lower prices lead to an increase in the demand for residential building construction. This, in turn, boosts construction activity in this industry. Indeed, Chart 4.1 shows a long-term increase in construction activity of 2.0 per cent in this sector relative to what it would otherwise be.

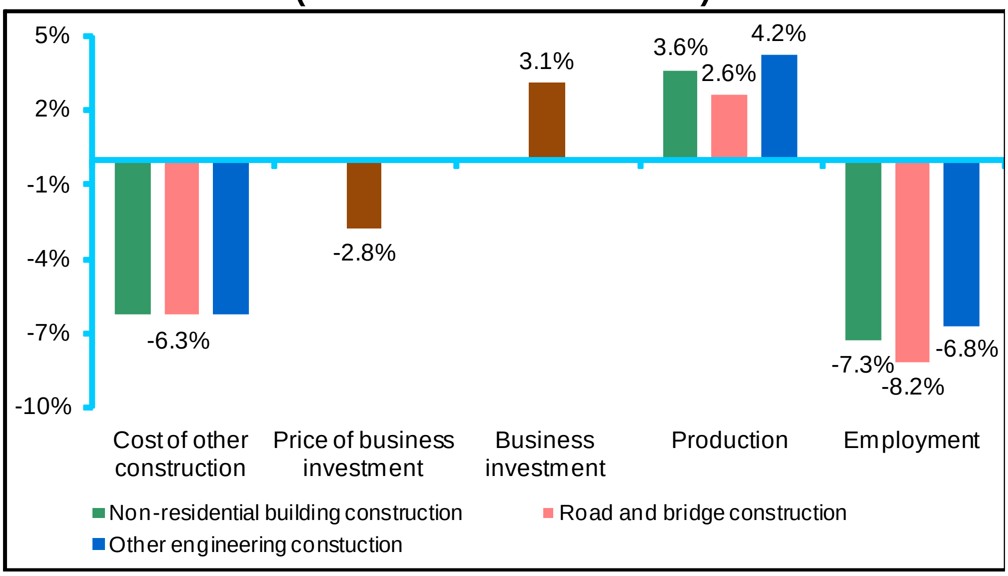
Employment in residential construction is affected by three separate factors.

- The assumed gain in labour efficiency of 4.0 per cent reduces employment by a similar percentage, for an unchanged level of activity ("labour saving effect").
- The rise in activity of 2.0 per cent adds a similar percentage to employment ("output effect").
- The gain in labour efficiency makes labour cheaper, inducing some substitution of labour for capital ("substitution effect").

The negative effect on employment of the labour saving effect dominates the positive effects of the output and substitution effects, leaving a net loss of 1.8 per cent in residential building employment in the long-term. However, there is no net impact on national employment, which is assumed to be unchanged as a standard long-run assumption of the model, as explained in section 3.4. Therefore, there are short-term adjustment costs from job shifting from construction to other industries, but there is no long-term loss in national employment.

The effects on the non-residential side of the construction industry are shown in Chart 4.2. As shown in Table 3.1, these effects are based mainly on assumed increases in labour efficiency of 13.2 per cent for non-residential construction in the long-term relative to the situation in the absence of the reforms.

Chart 4.2
Effect of Increased Efficiency on Other (Non-Residential) Construction
(% deviation from baseline)



Source: Econtech MM600+ simulation

Because of its larger assumed gain in labour efficiency, the cost reduction for non-residential construction is larger than for residential building construction. Because construction represents a major part of business investment, this flows through to a significant fall of 2.8 per cent in the overall cost of business investment, as seen in Chart 4.2.

Cheaper business investment stimulates a lift in the overall level of business investment of 3.1 per cent, which includes a rise in construction. Cheaper construction provides a further boost to construction activity, by shifting the composition of business investment in favour of construction. The resulting long-term gains in construction activity range from 2.6 per cent for roads and bridges to 3.6 per cent for non-residential building and 4.2 per cent for other engineering, as shown in Chart 4.2.

Similar to residential construction, the increase in labour efficiency in non-residential construction affects employment in three separate ways. Again, only about one-half of the negative labour saving effect is offset by positive output and substitution effects. This leaves net employment losses in non-residential construction of around 7 per cent. As with residential construction, there is no net impact on national employment, which is assumed to be unchanged as a standard long-run assumption of MM600+. Rather, there are short-term adjustment costs from job shifting from construction to other industries.

Overall, the results presented in this section show that the increase in productivity stemming from the activities of the ABCC has provided significant permanent gains to the construction industry. These gains range from 2.0 per cent for residential building to 2.6 per cent for road and bridge construction, 3.6 per cent for non-residential building and 4.2 per cent for other engineering construction. At the same time, these permanent long-term gains in construction activity have been accompanied by short-term adjustment costs due to job shifting from construction to other industries.

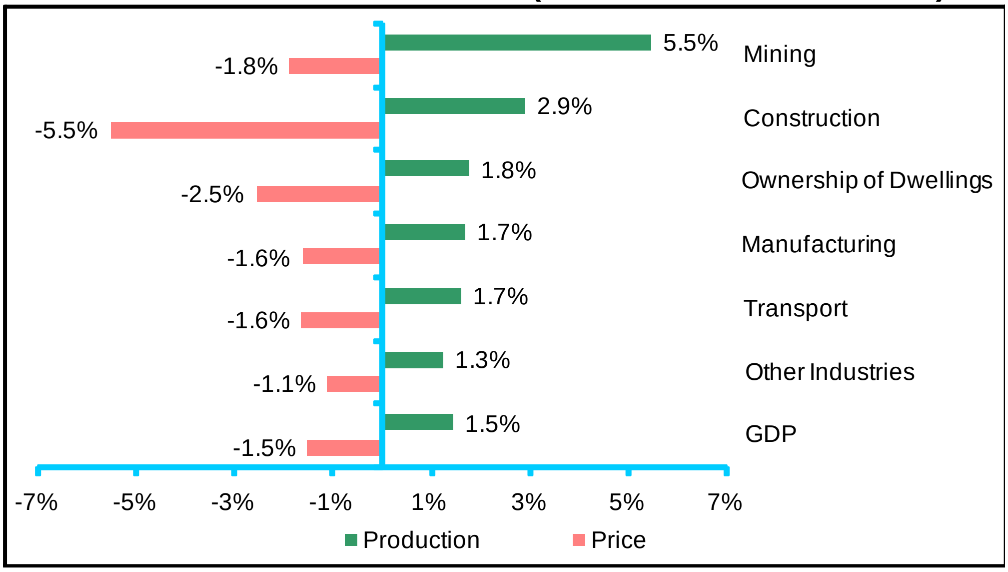
Note that the loss in construction industry employment is relative to a baseline scenario without reform and does not mean that there is a fall in construction employment from one year to the next. Indeed, construction employment has actually grown strongly in every year from 2001-02 onwards during the reform process.

4.2 Wider Industry Effects

The change in activity in the building and construction industry is expected to affect activity in other industries. This section outlines the simulated wider industry production impacts of the activities of the ABCC on other industries. These effects are presented in Chart 4.3.

As discussed in Section 4.1, higher labour productivity reduces the price of dwellings by around 2.5 per cent (also shown in Chart 4.3), which flows through to a similar fall in the cost of housing services. This stimulates a long-term rise in demand for housing services ("ownership of dwellings") of 1.8 per cent, relative to what it otherwise would be, as shown in Chart 4.3.

Chart 4.3
Effect of Increased Efficiency in the Construction Industry on Production in Other Industries (% deviation from baseline)



Source: Econtech MM600+ simulation

The detailed effects within the construction industry itself were discussed in Section 4.1. These effects add up to an average fall in construction costs of 5.5 per cent and a rise in construction activity of 2.9 per cent, as shown in Chart 4.3. These are average effects only. As explained before, the production gains are lower for residential building and road and bridge construction, and higher for non-residential building and other engineering.

As discussed in the previous section, the price falls for construction flowing from productivity gains reduce the overall cost of new business investment by 2.8 per cent. This is of particular benefit to relatively capital intensive sectors. Chart 4.3 shows that mining and transport receive cost savings that reduce prices by 1.8 and 1.6 per cent respectively. Because of the price-sensitive nature of demand for these industries' products, these price reductions lead to significant production gains.

For the economy as a whole, production costs are down 1.5 per cent, while production volumes are up 1.5 per cent, relative to what they would otherwise be. The long-term production gains are widespread but are largest in the mining industry and the construction industry itself.

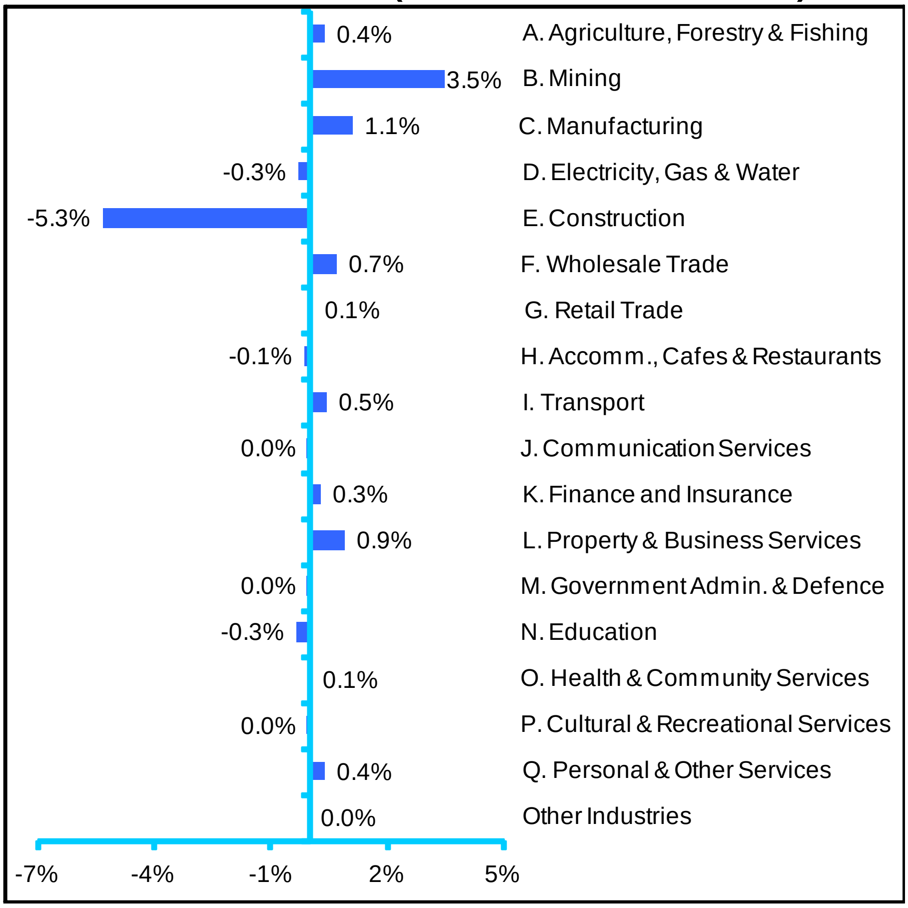
Chart 4.4 shows the pattern of industry job shifting induced by higher productivity in the construction sector. While employment in construction is down, the effect of this on national employment is fully offset by employment gains in other industries.

The biggest employment gain is in the mining industry, where it rises by 3.5 per cent. This is a direct effect of the gains in production discussed above. The second highest percentage gain is a 1.1 per cent rise in employment in the manufacturing industry, which is also a result of the boost in production in this industry shown in Chart 4.3 above.

As discussed in Section 4.1, employment in the construction industry itself is expected to be lower than otherwise, with the negative labour saving effect only partly offset by the positive output and substitution effects in this industry. Minor reductions are also expected in employment in some of the other industries. These reductions are the result of labour moving away from these industries and towards the industries that achieve greater production gains as a result of the cheaper business investment.

Chart 4.4 also shows that, overall, there is no change in the level of employment in the economy. As explained in Section 3.4, national employment is assumed to be unchanged as a long-term modelling assumption. This is a conservative assumption. In fact, the activities of the ABCC have the potential to reduce unemployment and raise employment on a permanent basis, by adding to the flexibility of the construction labour market.

Chart 4.4
Effect of Increased Efficiency in the Construction Industry on Employment in Other Industries (% deviation from baseline)



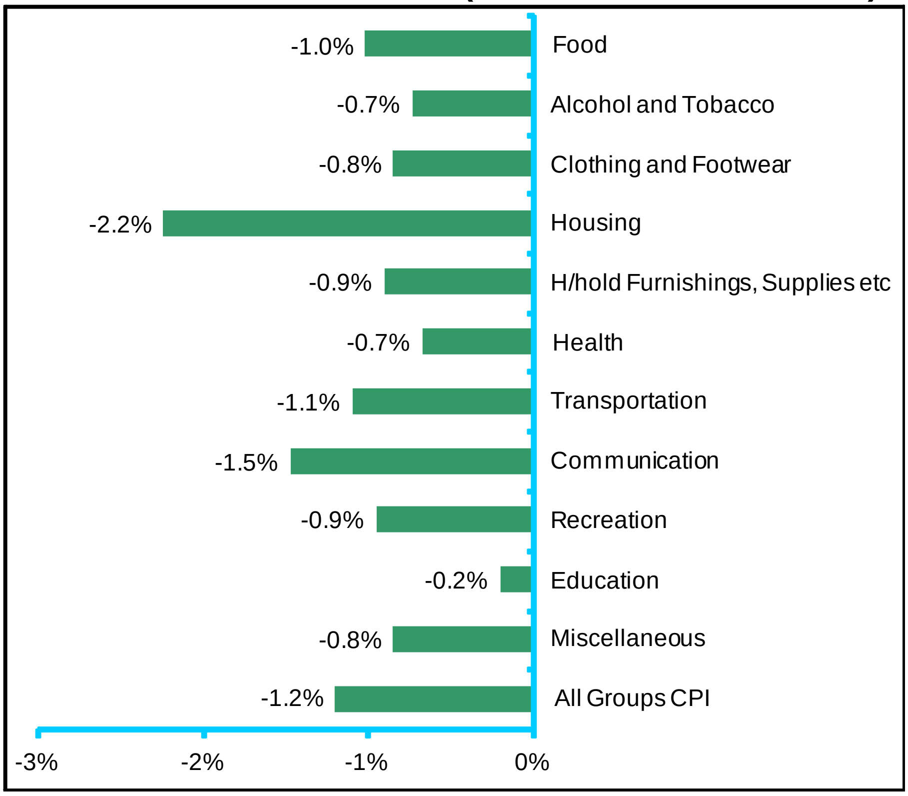
Source: Econtech MM600+ simulation

4.3 National Macroeconomic Effects

As explained in the previous sections, higher construction productivity leads to lower construction prices. This flows through to savings in production costs across the economy, because all industries are reliant on construction to some extent as part of their business investment. As shown in Chart 4.3, the average saving in production costs is reflected in a reduction in prices of 1.5 per cent.

This flows through to similar savings in consumer prices. Chart 4.5 shows a fall in the Consumer Price Index (CPI) of 1.2 per cent, resulting from the gains in construction productivity. It also shows the long-term price falls for each of the groups that make up the CPI.

Chart 4.5
Effects on Consumer Prices (% deviation from baseline)



Source: Econtech MM600+ simulation

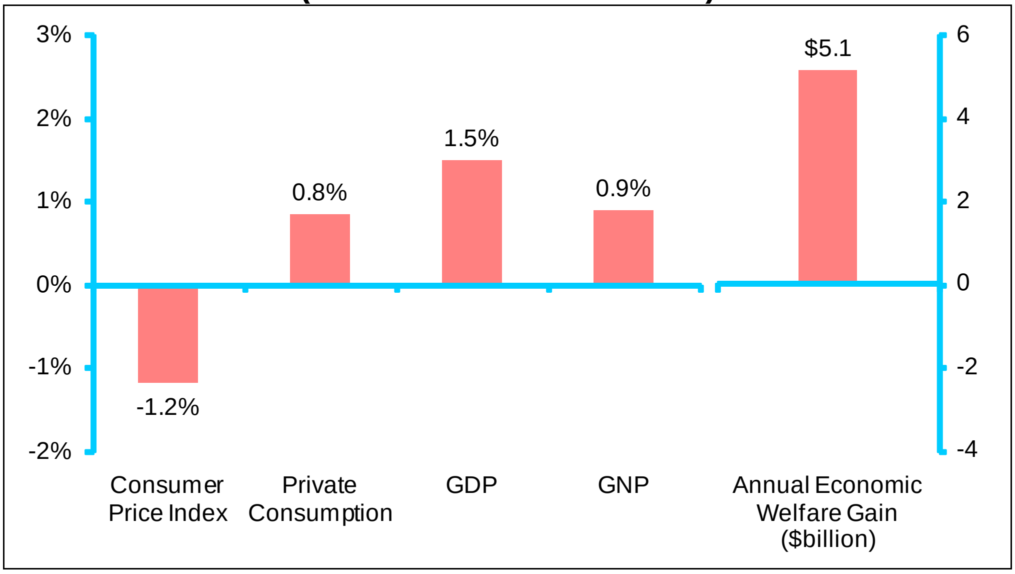
The biggest saving is in the price of housing services, which falls by 2.2 per cent in the long-term. This is a direct effect of gains in labour productivity on the multi-unit side of the residential construction industry. The second biggest saving is a fall of 1.5 per cent in the communication services group of the CPI. Construction costs, including laying telecommunications cables and building mobile phone towers, account for a large share of the cost of providing communication services.

There are also price falls for every component group of the CPI. The smallest fall, of 0.2 per cent, is for education services. This is because education services are generally produced using methods that are labour-intensive rather than capital-intensive.

Chart 4.6 shows the effects of higher construction productivity on other economy-wide indicators. The fall of 1.2 per cent in the CPI leads to a gain in real private consumption of 0.8 per cent. That is, lower living costs lead to higher living standards.

This gain in living standards is more rigorously measured as an annual gain in consumer welfare. MM600+ provides estimates of the change in annual economic welfare by using the compensating variation and equivalent variation methodology from welfare economics. These are alternative measures of the gain in real consumption. Chart 4.6 shows the higher construction productivity leads to an increase in consumer living standards (the annual economic welfare gain) of $5.1 billion in 2006/07 terms[22].

Chart 4.6
National Macro-economic Effects
(% deviation from baseline)



Source: Econtech MM600+ simulation

Chart 4.6 also shows a 1.5 per cent increase in the level of GDP in the long-term, relative to what it otherwise would have been in the absence of the reforms. This gain was reported earlier in Chart 4.3 as the gain in production for all industries added together. Production gains for individual industries can be seen in the same chart. Real GNP is estimated to rise by a little less at about 0.9 per cent.

[22] In the 2007 Econtech Report, the gain in annual economic welfare was expressed in 1998/99 terms, giving a gain of $3.1 billion. Here the gain is expressed on a more up-to-date basis in 2006/07 terms, giving the gain reported in the text of $5.1 billion.

Attachment A – A Guide to Econtech's Murphy Model 600 Plus (MM600+)

This Appendix provides a guide to Murphy Model 600 Plus (MM600+).

Type of Model

MM600+ can be compared with MM2, Econtech's economic forecasting model. Econtech first forecasting model was MM, developed in 1987/88, followed by two versions of MM2, the first in 1994 and the second in 1996. These models are based on quarterly data. Comprehensive dynamic structures are used in generating quarter-by-quarter forecasts of the economy extending nine years into the future. Econtech distributes MM2 in MM Simulator for Windows software, which is widely used by businesses and governments to produce their own forecasts and scenarios for the Australian economy.

Econtech's first industry model, MM303, was developed in 1997/98. It was then upgraded to MM600+ in 1999/00 under a contract to the Australian Competition and Consumer Commission. These models are based on a very detailed picture of the industrial structure of the economy that can only be found in the input-output tables published by the ABS. MM600+ uses the unpublished version of these tables to distinguish the production of 672 products by 108 industries. MM600+ is currently implemented in Excel and is used by Econtech in project consulting engagements for businesses and governments.

In developing two different types of economic models for forecasting and industry work, Econtech has followed a "horses for courses" approach. The forecasting model, MM2, provides quarter-by-quarter results but only distinguishes 18 industries. The industry model, MM600+, distinguishes 672 products, but only provides short-term and long-term results. It is not practicable to integrate both models into a single "super" model that provides quarter-by-quarter results for 672 products because quarterly ABS data are not available at that fine level of product detail.

MM600+ can be compared with other industry models such as the PRISMOD model of the Department of the Treasury and the Monash Model of the Centre of Policy Studies at Monash University in three key areas:

- detail;
- coverage; and
- time dimension.

MM600+ has a high level of <u>detail</u> in terms of both products and indirect taxes.

In MM600+, 108 industries produce 672 products. The other two models distinguish about 110 products.

MM600+ distinguishes 24 types of existing indirect taxes plus a GST of any design. This is similar to PRISMOD, while Monash has less tax detail with three types of existing indirect taxes and no GST.

Turning to economic <u>coverage</u>, MM600+, like Monash, is a computable general equilibrium (CGE) model, giving it wide coverage of the Australian economy. While PRISMOD covers only industry costs and prices, MM600+ and Monash also cover industry production and employment.

The third and final area of model comparison is the time dimension. As explained in sections 6 and 7, MM600+ provides estimates of both short-term and long-term effects. By comparison, PRISMOD provides estimates of long-term effects only. While Monash does not provide estimates of long-term effects, it does provide estimates of year-by-year effects.

Table A.1
Model Comparison

Model	MM600+	PRISMOD	Monash
Products	672	107	about 110
Indirect taxes	25	similar	3
Coverage	prices, production	prices	prices, production
Time dimension	short & long term	long-term	annual

CGE modelling is well-established in Australia due mainly to the pioneering work of Peter Dixon in developing the ORANI model and then the Monash Model.

While some Australian CGE models are adaptations of Dixon's ORANI model, MM303/MM600+ was developed from scratch. At the same time, there are similarities between the models.

This is partly because ORANI and MM600+ are both in the CGE family, and therefore model computable, market-clearing outcomes under optimising behaviour. Similarly they both inevitably rely on input-output tables published by the ABS.

It is also because Dixon's work, as reported in Dixon, Parmenter, Sutton and Vincent (1982) and Dixon, Parmenter, Powell and Wilcoxen (1992), was an important source of ideas for MM600+ such as:

- import demand for each commodity is modelled in three categories: intermediate goods, consumption goods, and investment goods; and
- there is a detailed treatment of distribution margins.

The ORANI model also has some ideas not found in MM600+, including some refinements specific to agriculture. Equally, MM600+ has some ideas not found in ORANI/Monash, including an extended range of economic choices or behavioural responses.

Beyond these similarities and differences in ideas, the main differences between the two models are in the areas of detail and time dimension, as already summarised in Table A.1.

Implementation of Model

Implementing MM600+ involved constructing a database, choosing a software environment, setting up a baseline simulation, and then putting the model into action performing simulations of actual or proposed economic shocks.

Econtech obtained a special series of the input-output tables from the ABS. In these unpublished tables, 107 industries produce about 1,000 products, compared with the published tables which only distinguish 107 products i.e. one product per industry. The unpublished tables also include a series of special tables containing extra detail on indirect taxes.
In constructing the database for MM600+, the ABS input-output data were manipulated to

give an exactly-balanced, economically meaningful database. This included the following adjustments:

- aggregating from about 1,000 products to 672 products;
- treating "Sales by Final Buyers" as sales of used cars;
- constructing a travel composite commodity, used in modelling export demand for inbound travel in Australia;
- identifying household and business import demand for Australian travel overseas.
- balancing industry usage with product supply;
- imputing labour income to employers and self-employed; and
- allocating inventory investment.

Turning to the topic of software environment, MM600+ is implemented in Excel. The database is constructed in a series of workbooks linked backed to raw ABS data, which is also in the form of Excel workbooks. This implementation gives easy access to all model inputs, outputs and equations. Thus all inputs and equations can be altered and all outputs can be viewed.

MM600+ is specified in levels as a non-linear system, not in changes as a linear system, so model solutions are always exact. It is solved iteratively in Excel using Excel's standard iterative method for resolving "circular references". A model simulation in Excel under a very tight convergence criterion[23] takes about 10 minutes and involves about 500 iterations of the model.

Simulations of economic shocks involve varying the values of one or more model inputs relative to their baseline values. With open access to all model inputs, a wide variety of shocks can be conducted. These can involve virtually any shift in technology, tastes, foreign demand or taxation.

To enable more sophisticated analysis of the welfare effects of taxation and other reforms, the model provides for positive/negative externalities in consumption for each product, the values for which can be set by the model user.

Product Detail

As noted in the previous section, in the input-output tables published by the ABS, 107 industries produce 107 products.

In building MM600+, Econtech decided to incorporate a higher level of product detail than found in the published input-output tables. This is available in unpublished input-output tables that we obtained in electronic form from the ABS. The ABS derives the published tables by aggregating from these more detailed unpublished tables.

While the unpublished tables include about 1,000 detailed products, some aggregation was necessary because some data for detailed products are censored by the ABS to protect the confidentiality of individual companies. However, aggregation was kept to a minimum.

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[23] For example, for convergence, annual GDP, which is about $1 trillion, can change by no more than $1,000 from the previous iteration, implying a precision of 1 in 1 billion.

This gave the 672 products that appear in MM600+ .This is the maximum achievable level of product detail.

The high level of product detail in MM600+ has many advantages. In commissioning MM600+ as a further development of Econtech's earlier CGE model, MM303, the ACCC requested the high level of product detail so that model estimates could serve as a more useful point of comparison in the ACCC's price monitoring work.

The high level of product detail also means that many policy changes can be analysed without the need for further disaggregation. For example, petrol and diesel are distinguished from other petroleum products, making it easier to accurately model the changes in fuel taxation under the New Tax System, as these tax changes are different for petrol, diesel and other fuels.

It also means that the gains from some micro-economic reforms can be more fully captured. For example, a finer level of disaggregation better reveals the diversity in rates of customs duty, leading to more reliable estimates of the gains from tariff reforms that produce benefits by reducing this diversity.

Tax Detail

The treatment of taxation is particularly detailed in MM600+. The model distinguishes 24 different indirect taxes on industry production and products, as listed below. These can each be varied either universally, or as they apply to each industry or product or end purchaser. In addition, MM600+ provides for a GST, under which each product/industry can be classified as taxable, input-taxed or GST-free.

Production Taxes	Product Taxes
Land Tax	GST
LGA Rates	Sales tax
Liquor & Gambling Taxes	Stamp Duty
Payroll Tax	Gambling Taxes; Former State Licence Fees
Taxes on Insurance	Primary Production Taxes
Motor Vehicle Taxes	Regulatory Service Fees
Stamp Duties	Excise Taxes
Taxes on use of goods etc	Motor Vehicle Taxes
Fringe Benefits Taxes	Financial Institution Duties
Departure Tax	Customs Duty on Exports
Other Indirect Taxes nec	Other Commodity Taxes
Total Subsidies	Commodity subsidies
	Customs Duty on Imports

This high level of indirect tax detail is only possible because MM600+ uses the unpublished input-output tables. While these unpublished tables distinguish 24 categories of indirect taxes, the published tables distinguish only three categories.

In modelling the changeover to the New Tax System, it was important to accurately represent the application to industries and products of sales tax, GST and fuel taxes.

The ABS input-output tables have significant shortcomings in their application of sales tax to products. For example, they do not allow for the "aids to manufacture" exemption on sales tax on inputs into the agriculture, mining, manufacturing and utilities industries. They also overstate sales tax collections on motor vehicles.

Also, obviously the input-output tables do not incorporate the just-introduced GST.

To address these sales tax and GST areas, Econtech commissioned a review by KPMG of the wholesale sales tax and GST treatments of each of the 672 products appearing in the model. We also built in the "aids to manufacture" exemption from sales tax. These tax assumptions were in turn reviewed by the ACCC in conjunction with the ATO.

The remaining significant complication in accurately modelling the changeover to the New Tax System is the complex nature of the changes to fuel taxation. MM600+ takes into account that changes in diesel fuel tax are different in each on the following areas:

- qualifying road use;
- non-qualifying road use;
- rail and marine transport;
- agriculture and fishing use;
- mining use; and
- other non-transport use.

MM600+ also takes into account that *ANTS* does not include any cuts to taxation of fuel used in air transport, including both aviation turbine fuel and aviation gasoline.

Economic Choices and Elasticities

MM600+ models how changes in relative prices affect economic choices, leading to changes in the industry pattern of production and employment. The main price-sensitive choices in the model involve:

- business choice between labour and capital;
- business choice between different types of capital;
- business choice between different forms of energy;
- business choice between road and rail freight transport;
- business choice of its size;
- choice between import and local sources of supply;
- business choice between local and export destinations for sales;
- consumer choice between broad commodity groups;
- consumer choice within broad commodity groups; and
- demand for Australian exports.

In modelling economic choices, values need to be assigned to the elasticities that govern the sensitivity of each choice to changes in relative prices. The following explains each of the economic choices listed above in more detail and also gives the associated values for the elasticities. The only elasticities not presented below are trade elasticities.

Substitution between labour and capital

The elasticity of substitution between labour and capital in production in each of the 108 industries is set to 0.75 in MM600+, consistent with Econtech's econometric research for MM2.

Substitution between different types of capital inputs

MM600+ provides for substitution between different types of business capital e.g. motor vehicles, computers, buildings etc. Business holdings of motor vehicles and computers are price sensitive, making it important to allow for substitution between different forms of business capital.

In MM600+ the elasticity of substitution between different forms of business capital is set at 0.5. In modelling this substitution, the user cost of each form of capital is calculated by applying a required rate of return plus a depreciation rate to the price of new investment, where both the depreciation rate and the price of new investment vary from one form of capital to the next.

Substitution between different forms of energy

MM600+ allows for substitution by business between different forms of primary energy, including black coal, brown coal, LPG and natural gas. Allowing for these substitution possibilities is vital when assessing the economic effects of energy development projects, or in examining greenhouse gas emission issues.

For most industries, the elasticity of substitution between forms of primary energy is set to 4.5. The exception is the electricity industry, where the elasticity has been set to 6, to reflect the high sensitivity of the choice of type of electricity generation to the relative cost of different forms of energy.

Substitution between road and rail freight transport

MM600+ allows for substitution by industry between road and rail freight transport. It does this by drawing on earlier work by the Industry Commission, incorporated in the ORANI-HILMER model, on the elasticity of substitution between road and rail freight transport. For most products this elasticity is set to 2, but lower values are used for some products. Substitution between freight transport modes is modelled both for transport from business to business (or importer to business) and from business to export wharves.

Business choice of its size

In MM600+, the representative business in each industry selects its size to minimise unit costs. The small business exemption from payroll tax distorts this choice so that in each industry the selected size is less than the technically efficient size.

In modelling the technically efficient size, it is assumed that for the representative business in each industry the need for primary factors (i.e. capital and labour), F, depends on its level of output, Q, according to the following equation.

$F = Q + a.(QC–Q) + a.Q.\ln(Q/QC)$

For technical efficiency, Q=QC. The sensitivity of efficiency to variations in Q away from QC is given by the parameter a. Fuss and Gupta, analysed 91 Canadian manufacturing industries and found that there was an average loss of efficiency of about 4 per cent from operating at one-half of the technically efficient scale. Using that result, in MM600+ the parameter a has been set to equal 0.13 in each industry.

In most states, payroll tax is calculated by applying the payroll tax rate to the business wage bill net of a tax-free threshold. This threshold provides a larger reduction in unit cost for smaller businesses than for larger businesses, distorting the choice of business size.

The technically efficient business size, QC, was then set separately for each industry so that the model correctly predicts industry payroll tax collections. This involves using the corollary of the fact that industries dominated by small businesses do not pay much payroll tax because of the tax-free threshold.

The model has been used to examine the distorting effect of the small business exemption from payroll tax on business size in an Econtech report of 23 June 1998 for the Australian Chamber of Commerce & Industry on "Payroll Tax: Is it as Good as a VAT or as bad as sales tax?".

Substitution between imports and local supply

As in the Monash Model, allowance is made for substitution between imported and local sources of supply for each importable commodity for each of three categories of end use. The categories of end use are: recurrent inputs; business investment; and other components of final demand. The values of the Armington elasticities governing this substitution were originally based on those used in the Monash Model in 1997, but some have been modified in the light of experience with MM600+.

Substitution of local producers between supplying the export and home markets

In modelling export supply, MM600+ distinguishes between the production of a commodity for the home market and production for the export market. For each commodity, an elasticity of transformation links production for the two markets.

To the extent that a commodity's transformation elasticity is set to less than infinity (the value implicit in the ORANI model), an allowance if made for some friction in switching supply between the two markets. This friction may arise because some exported commodities are tailor made for export, or are more narrowly defined than the corresponding home commodity e.g. Australian consumers may eat all types of apples while we may only export Fuji apples to Japan — this affects the ability to switch supply between the two markets.

Based on model simulation experiments, the exports elasticity of transformation has been set to 0.5 for water transport and black coal, 1.5 for other minerals, and 2.5 for all other exports.

Substitution between broad consumption groups

Substitution between broad consumption groups is modelled in a linear expenditure system of consumer demand. The parameters of this system were estimated by Econtech using quarterly national accounts data extending from 1974-75 to 1996-97 and are set out in Table A.2. Implied price and income elasticities are also presented in Table A.2.

As expected, consumer demand for the following groups is income inelastic: food; cigarettes & tobacco; gas, electricity & fuel; fares; and operation of motor vehicles. Equally, consumer demand for the following groups is income elastic: financial services; other services; and personal travel imports (i.e. overseas holidays);

Table A.2
Consumption Group Parameters and Elasticities
Estimation Period: 1974.3-1997.2

		β	γ	Budget share	Income elast.	Price elas.	ν
A	Food	0.078	1320	14.5%	0.54	-0.34	-1.0
B	Cigarettes and tobacco	0.011	164	1.9%	0.57	-0.39	-0.5
C	Alcoholic drinks	0.040	187	4.1%	0.97	-0.65	-1.0
D	Clothing, fabrics and footwear	0.041	342	5.2%	0.78	-0.52	-0.5
E	Household appliances	0.031	93	2.9%	1.10	-0.73	-0.5
F	Other household durables	0.032	233	3.8%	0.83	-0.55	-0.5
G	Health	0.084	268	7.8%	1.08	-0.68	-0.5
H	Dwelling rent	0.208	531	18.4%	1.13	-0.62	-0.5
I	Gas, electricity and fuel	0.012	205	2.2%	0.52	-0.36	-1.0
J	Fares	0.010	160	1.8%	0.54	-0.37	-1.0
K	Purchase of motor vehicles	0.042	119	3.8%	1.11	-0.73	-0.5
L	Operation of motor vehicles	0.045	440	6.2%	0.72	-0.48	-0.1
M	Postal and telephone services	0.019	72	1.8%	1.03	-0.70	-0.5
N	Entertainment and recreation	0.038	314	4.9%	0.79	-0.52	-0.75
O	Financial services	0.054	1	3.9%	1.40	-0.92	-0.5
P	Other goods	0.093	67	7.1%	1.31	-0.82	-0.5
Q	Other services	0.130	-161	8.2%	1.59	-0.96	-0.5
R	Personal Travel Imports	0.032	-103	1.6%	2.03	-1.36	-0.5

Substitution within broad consumption groups

MM600+ also allows for substitution within broad consumption groups. Alcoholic drinks serve as an example. Clements et al. conclude that "the price elasticity of alcohol as a whole is about -1/2" (p.77). However, because of substitution between different forms of alcohol, price elasticities for individual alcoholic beverages are larger at –0.8, –0.7 and –1.9 for beer, wine and spirits respectively (p. 78). Thus it is important to allow not only for substitution between broad consumption groups, but also for substitution within consumption groups.

To allow for substitution within consumption groups, the consumer demand system in MM600+ is derived from a generalisation of the indirect utility function associated with the linear expenditure system. In this two-level generalisation, an intra-group substitution parameter, ν, appears which can take different values for different groups, as shown in the last column of Table A.2. This parameter is set to –0.5 for most groups (zero equates to no intra-group substitution, as in the Monash model). This value implies that the price elasticity for an individual consumption commodity is up to 1.5 times the size of the price elasticity for the consumption group in which it belongs.

Under this approach, consumer demand for consumption of commodity *k* in group *i* is given by the following equation.

$X_{ik} = \alpha_{ik}.\gamma_i + \phi_{ik}.(\beta_i/P_{ik}).(C - \Sigma P_j.\gamma_j).(Q_i/P_{ik})^{-vi}$

where:

$P_i = \Sigma \alpha_{il}.P_{il}$ for all i

$Q_i = [\Sigma \phi i_l.P_{il}^{vi}]^{1/vi}$ for all i

$\Sigma \alpha_{il} = 1$ for all i

$\Sigma \phi_{il} = 1$ for all i

$\Sigma \beta_i = 1$

Export demand

Export demand elasticities in MM600+ range from -4 for wool, where Australia has market power, and tourism, where product differentiation is important, to -12 for a broad range of exports. The pattern of elasticities for minerals and minerals processing were developed in 1998 in consultation with Malcolm Gray, a commodities consultant engaged by the Minerals Council of Australia.

Long-term Closure

MM600+ has two different closures frames — a short-term closure and a long-term closure — so that it can provide results from an economic shock for two different time frames. The long-term closure is described in this section while the short-term closure is described in the next section.

The long-term closure models a long-run equilibrium. For most economic shocks, the long run is likely to be attained in five to ten years.

In the long-run, economic agents optimise, all markets are in equilibrium, and assets and liabilities follow sustainable paths. Some of the key assumptions involved are:

- *profit maximisation*: the representative business in each industry chooses inputs and outputs to maximise profit subject to prices and a production function exhibiting constant returns to scale. This involves choosing inputs of capital and labour and outputs for the local and export markets;

- *labour market equilibrium*: in the long-run the labour market is assumed to attain equilibrium, so that an economic shock has no lasting effect on total employment. This assumption is implemented by fixing the level of total employment;

- *external balance*: in the long-run net liabilities to the foreign sector must follow a sustainable path. This assumption is implemented by setting the trade balance equal to the cost of servicing payments on foreign-owned capital — the real exchange rate needed to achieve this outcome is determined by the model;

- *budget balance*: in the long-run the budget balance must be sustainable. Specifically, in MM600+ the government budget is assumed to be in balance. It is necessary to designate a swing fiscal policy instrument to achieve that outcome. Generally, the rate of tax on labour income is used as the swing fiscal policy instrument; and

- *private saving*: in the long-run the level of private sector saving and associated asset accumulation must be sustainable. Further, one potential problem with long-run models is that saving (i.e. sacrificing present consumption for future consumption) can appear artificially attractive, because the model results show the gain in future consumption but not the sacrifice of present consumption. To address both of these issues, saving is held constant in MM600+ by fixing the quantity of capital that is owned locally.

MM600+ pays particular attention to the correct measurement of changes in national economic welfare. It uses the compensating variation and equivalent variation from welfare economics. These are alternative measures of the gain in real consumer spending.

More specifically, under a linear expenditure system model of consumer demand, these measures of welfare change virtually equate with changes in real supernumerary (or non-essential) consumption. Real supernumerary consumption is calculated by subtracting nominal “essential” consumption from nominal total consumption to obtain nominal supernumerary consumption, before deflating using the ideal price index for supernumerary consumption.

In MM600+ effects on vertical equity can also be measured. This is done by calculating movements in real supernumerary consumption for consumers at different income levels. In the results, the benefits of an economic reform are tilted towards low-income earners if the ideal price index for essential consumption falls by more than the ideal price index for supernumerary consumption.

Applications

MM303/MM600+ has been used in modelling the changeover to the New Tax System as well as many other applications.

The changeover to the New Tax System has been modelled for:

- companies
- industry associations
- governments; and
- the ACCC.

Companies

MM303/MM600+ is the most widely used model for estimating the effects of the New Tax

System on company costs. MM600+ services have been supplied to companies by Econtech itself as well as through Ernst & Young, KPMG and Firmstone & Feil. These taxation services have been used by major companies in each of the following industries.

- mining
- pharmaceuticals
- other manufacturing
- media
- water
- retailing
- hotels
- road transport
- rail transport
- communications
- banking
- insurance
- professional services

Industry Associations

Econtech has used MM303/MM600+ to analyse the effects of the New Tax System for the following industry associations.

- Australian Automobile Association
- Australian Chamber of Commerce & Industry
- Australian Bankers Association
- Australian Hotels Association
- Australian Pharmaceutical Manufacturers Association
- Distilled Spirits Industry Council of Australia
- Housing Industry Association
- Master Builders Australia
- Minerals Council of Australia
- Plastics and Chemicals Industry Association
- Printing Industry Association of Australia
- Water Services Association of Australia

Governments

Econtech developed the Econtech ANTS Savings Calculator, which has been used by the following governments for estimating the effects of the New Tax System on the costs of their agencies.

- Commonwealth Government
- New South Wales Government
- Victorian Government
- Queensland Government
- WA Government
- SA Government
- Tasmanian Government
- ACT Government
- NT Government

ACCC

- Under contract to the ACCC, Econtech further developed its MM303 model to produce MM600+.

- The ACCC has used the results from MM600+, together with industry information, in its Shopping Guide covering the likely effects of ANTS on about 200 consumer prices.
- The ACCC Small Business Cost Savings Estimator - a tool to help small business comply with the ACCC price exploitation guidelines - was developed for the ACCC by Econtech.

Other Applications

MM303/MM600+ was also used in the following industry policy consultancies.

- a study for Chevron of its proposed natural gas pipeline from PNG to Gladstone
- a study for a major corporation of a proposed shale oil project
- a study for an oil company of a possible business decision with major implications for the oil industry
- a study for the Australian Greenhouse Office on National Average Fuel Consumption
- a study for two oil companies of a proposed merger of their oil refining operations.