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# Regional Macroeconomic Outcomes Under Alternative Arrangements for the Financing of Urban Infrastructure

by

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# Regional Macroeconomic Outcomes Under Alternative Arrangements for the Financing of Urban Infrastructure

ABSTRACT: Many studies have found that the economic benefits from investment in urban infrastructure are substantial. In Australia, much of the responsibility for the provision of urban infrastructure rests with regional governments. Throughout the1990's many of these governments embarked on a program of fiscal restraint, seeking to restore financial positions weakened by exposure to failed government enterprises. A large proportion of this fiscal adjustment appears to have been borne by spending on public infrastructure. Today, regional government policy attention is again focussing on public infrastructure. In spite of the now robust fiscal positions of Australia's regional governments, they remain reluctant to finance infrastructure through debt, and raising the rates of existing taxes is perceived as politically unpopular. Instead, governments are exploring alternative financing instruments, such as developer charges and public-private partnerships. This paper uses a dynamic multi-regional CGE model (MMRF) to evaluate the regional macroeconomic consequences of four methods of financing a program of regional government infrastructure provision. The methods are developer charges, debt, payroll tax and residential rates. We demonstrate that the net gains from a program of urban infrastructure development are quite sensitive to the chosen financing means. The net gains tend to be greatest under rates and debt financing, and least under developer charges.

**JEL Classification:** D58, R13, R51, R53

**Key words:** multi-regional CGE, dynamic CGE, infrastructure finance, regional policy

# 1. INTRODUCTION

Many studies have found that the economic benefits from investment in urban infrastructure are substantial. However the nature of this infrastructure is often such that it is under-provided by the private sector. In Australia, much of the responsibility for the provision of urban infrastructure rests with state and local government. Throughout the 1990's, Australia's state governments embarked on a period of fiscal restraint, seeking to improve financial positions weakened by exposure to the failed state government enterprises of the early 1990's. A large proportion of this fiscal adjustment appears to have been borne by spending on public infrastructure (ACG 2003). Today, policy attention at the state government level is again focussing on public infrastructure. In spite of the now robust fiscal positions of Australia's state governments, they remain reluctant to finance public infrastructure through debt, and raising taxes is perceived as politically unpopular. Instead, governments are exploring alternative financing instruments, such as developer charges and public-private partnerships.

This paper uses MMRF, a dynamic multi-regional CGE model, to evaluate the regional macroeconomic consequences of a program of additional spending on urban infrastructure. We use MMRF to investigate the regional macroeconomic consequences of both the construction of the infrastructure and the on-going benefits that the infrastructure provides. We examine four financing methods: developer charges, payroll tax, debt and residential rates. The paper demonstrates that the total gains from urban infrastructure are quite sensitive to the finance method. We find that the total gains are greatest under rates and debt financing, and least when infrastructure spending is financed by developer charges.

MMRF is a bottom-up multi-regional model of the Australian economy, featuring modelling of economic agents within each of Australia's eight states and territories. We choose one of these eight regions, the state of New South Wales (NSW), for our case study. NSW accounts for approximately 35 per cent of national GDP and about 33 per cent of national population. We assume that the NSW state government embarks on a program of additional infrastructure construction financed through one of four instruments. The benefits of the new infrastructure are assumed to accrue to economic agents within NSW.

That the provision of public infrastructure should provide a gross benefit is uncontroversial. Spending on infrastructure services such as roads, rail, airports, port facilities, water and sewerage, waste collection and disposal, and communications networks provides ongoing benefits in the form of faster, safer and more reliable transport services; better communications services; improvements in public health; and improvements in public amenity. However we must turn to the empirical literature to answer the question of whether public infrastructure provides a net benefit, in the form of an acceptable rate of return on additions to the stock of public capital. The available evidence suggests that the returns from public infrastructure are substantial. For example, the World Bank (1994) surveyed empirical studies of the link between public capital and economic growth. They found that the range of the rates of return on public infrastructure implied by the elasticities in these studies was between 5 and 96 per cent, with an average of 48 per cent and a median of 57 per

cent. Otto and Voss (1994), investigating the link between public capital and private production in Australia, find an output elasticity for public capital for Australia of about 0.4, a figure they conclude is very similar to that found for the United States by Aschauer (1989). The rate of return on public capital implied by Aschauer's elasticity of 0.4 was 60 per cent (World Bank, 1994). Assuming a roughly similar ratio between the stock of public capital and GDP in Australia as in the US, a similarly high rate of return for the Australian case would be implied by the findings of Otto and Voss. As we discuss in Section 3.6, it is not the purpose of this paper to present new evidence on the link between public capital and economic growth. Nevertheless, we require a plausible assumption about this link in order to illustrate the impact of alternative infrastructure financing arrangements. In Section 3.6 we choose a relatively conservative (compared with the estimates summarised in World Bank 1994) rate of return assumption.

The remainder of this paper is structured as follows. In Section 2 we provide an overview of the MMRF model. Section 3 discusses the simulation results. We divide the simulations into three components: a component relating to the financing impacts only (Sections 3.2 to 3.4); one relating to the construction phase only (Section 3.5); and one relating to the flow of infrastructure benefits only (Section 3.6). We then combine these components in Section 3.7. This allows us to compare paths for selected regional macroeconomic variables under four alternative arrangements for the financing of a program of infrastructure spending. Section 3.8 concludes the paper.

## 2. THE MODEL

The simulations presented in Section 3 were undertaken with the Monash Multi-Regional Forecasting (MMRF) model of the Australian economy. MMRF is detailed, making it impractical to provide a full description here. However the discussion of results in Section 3 relies on familiar economic mechanisms, so that the reader need not know details of the model to understand the simulation results. The remainder of this section provides an overview of MMRF. The reader is referred to Naqvi and Peter (1996) and Peter et al. (1996) for a detailed discussion of the model.

MMRF is a dynamic multi-regional computable general equilibrium model. It explicitly models the behaviour of economic agents within each of Australia's 8 states and territories. The model features detailed sectoral disaggregation, with the version employed in this paper containing 38 industries and commodities. Familiar neoclassical assumptions govern the behaviour of the model's economic agents. Each of the 38 representative industries operating within each of the 8 regions is assumed to minimise costs subject to constant returns to scale production technologies and given input prices. A representative utility-maximising household resides in each of the model's 8 regions. Investors allocate new capital to industries on the basis of expected rates of return. Units of new capital are assumed to be a cost-minimising combination of inputs sourced from each of the model's 9 sources of supply (the 8 domestic regions plus imports). Imperfect substitutability between the imported and 8 domestic sources of supply for each commodity are modelled using the CES assumption of Armington. In general, markets are assumed to clear and to be competitive. Purchaser's prices differ from basic prices by the value of a variety of indirect taxes

and margin services. Taxes and margins can differ across commodity, user, region of source and region of destination. Foreign demands for each of the 38 commodities from each of the 8 regions are modelled as being inversely related to their foreign currency prices. The details of the taxing, spending and transfer powers of two levels of government are modelled: a regional government operating within each region, and a federal government operating Australia-wide. Inter-governmental transfer payments and personal transfer payments to households are also modelled. Dynamic equations describe stock-flow relationships, such as those between regional industry capital stocks and regional industry investment levels. Dynamic adjustment equations allow for the gradual movement of a number of variables towards their long-run values. For example, the national real wage is assumed to be sticky in the short-run, adjusting over a period of about five years to return the level of national employment to its base-case level following some economic shock. Equality of deviations in regional real consumer wages across regions is maintained through movements in labour between regions. Regional economic linkages arise from inter-regional trade, factor mobility, the taxing and spending activities of the federal government, and long-run economy-wide employment and balance of trade constraints. The model also evaluates a full set of national and regional income accounts, and associated deflators. The model is solved with the GEMPACK economic modelling software (Harrison and Pearson, 1996).

## 3. THE SIMULATIONS

### 3.1 Introduction

We examine four alternative scenarios. In each scenario, annual spending on infrastructure by the NSW government is $1 b above its basecase level. We view this additional spending as being on what Aschauer (1989) calls "core infrastructure" – roads, highways, public transport systems, airports, and utilities. Consistent with the findings of Aschauer (1989) we assume that this spending will generate ongoing benefits to the residents of NSW. We model these benefits in each scenario via an improvement in regional total factor productivity. The four scenarios are distinguished from each other by the government's choice of funding instrument. We evaluate the regional effects of the infrastructure program under three "up-front" financing methods (developer charges, payroll tax, and residential rates) and one deferred financing method (debt).

In analysing the four alternative scenarios, it will prove helpful to divide the economic effects of each into three components:

(a) The impact of the additional construction activity generated by the $1 b. increase in the NSW government's annual infrastructure investment budget. We assume that the details of the expenditure program are independent of the financing instrument. Hence the economic effects of the additional construction activity will be largely the same irrespective of which funding instrument is chosen.
(b) The impact of the improvement in regional productivity that is assumed to arise from the new infrastructure. Again, since these impacts will be determined by the details of the expenditure program, they will be largely the same across the alternative funding instruments.

(c) The impact of the funding instrument chosen to raise the required $1 billion. These impacts will differ across each of the alternative funding mechanisms.

These three components lead naturally to ten MMRF simulations, results from which are reported in Appendix E, in tables E1 – E10:

Table E1: The economic effects of the developer charge, in isolation.
Table E2: The economic effects of the payroll tax, in isolation.
Table E3: The economic effects of residential rates, in isolation.
Table E4. The economic effects of debt, in isolation.
Table E5. The economic effects of the infrastructure spending program, in isolation.
Table E6. The economic effects of the benefits of the new infrastructure, in isolation.
Table E7: The combined economic effects of the developer charge, the spending program and infrastructure benefits.
Table E8: The combined economic effects of the payroll tax, the spending program and infrastructure benefits.
Table E9: The combined economic effects of residential rates, the spending program and infrastructure benefits.
Table E10. The combined economic effects of debt, the spending program and infrastructure benefits.

Since the economic effects of both the investment expenditure and the productivity improvement (*a* and *b* above) should not differ materially across the alternative financing instruments, we begin our explanation in Sections 3.2 through to 3.4 by considering the funding impacts in isolation. In Section 3.5 we consider the expenditure impacts in isolation. Then in Section 3.6 we consider the productivity impacts in isolation. Finally, in Section 3.7 we combine the financing, expenditure and productivity impacts. In each of these sections we use a simple stylised model (hereafter the BOTE, or "back of the envelope" model) to illustrate the main economic mechanisms in MMRF that account for the results reported in Tables E1 through to E10 and Charts 1 through to 4. The results in these tables and charts are reported as percentage deviations away from their "basecase" values. Prior to undertaking the three sets of simulations (*a*) – (*c*) outlined above we first undertook a simulation with MMRF in which we create a no-policy-change "basecase". This basecase is a forecast for the economies of Australia and its eight states and territories excluding the effects of shocks (*a*) – (*c*) above.

### 3.2 A short-run "back-of-the-envelope" (BOTE) model of MMRF

We use a simple BOTE model to explain the main economic mechanisms that account for the MMRF simulation results. The aim of the BOTE model will be to explain the short-run employment results in terms of the three alternative tax instruments. We focus on explaining the MMRF employment result with the BOTE model because explanations for the remaining short-run regional macroeconomic effects in MMRF tend to follow from the short-run regional employment effects. The BOTE model is comprised of the following:

1 region, NSW. While the MMRF model contains 8 regions, we find that the inter-regional linkages operating in this particular application of MMRF can be

adequately represented in a single region BOTE model through appropriate assumptions regarding the closure of NSW factor markets. Since all the variables and equations of the BOTE model relate to the regional economy of NSW, to avoid notational clutter we suppress the regional (NSW) index on all BOTE variables.

3 commodities: *c1*, representing dwellings services; *c2*, representing a domestically produced traded good; and *c3*, representing a competing import.

2 domestic industries: *i1*, using sector-specific capital (dwellings, $K_1$) to produce *c1*; and *i2* using labour ($L_2$) and sector-specific capital ($K_2$) as inputs to a Cobb-Douglas production function, to produce units of *c2*.

A household, which maximises (subject to a given budget and given commodity prices) a Cobb-Douglas utility function by purchasing commodities *c1*, *c2*, and *c3*.

An investor, who uses *c2* to produce units of sector-specific capital for industries *i1* and *i2*. The investor's desire to install units of capital is positively related to sector-specific rates of return on capital.

Two primary factors: labour and capital.

To facilitate the use of the BOTE model in explaining MMRF results, we have added equations to MMRF which aggregate key results for the model's 38 industries into results for two broad sectors: *dwellings services* and *non-dwellings*. These sectors correspond to industries *i1* and *i2* of the BOTE model. The MMRF results for variables describing key economic outcomes for these two sectors are included in Tables E1 – E10.

We model developer charges as an impost on the cost of constructing dwellings. Developer charges do not (directly) affect NSW wages in the short-run. They do however increase the cost of constructing dwellings. This reduces rates of return on new dwellings. In our simplified BOTE representation of investor behaviour in MMRF, investors calculate the post-tax rate of return in industry *i* ($R_i$) as the post-tax rental price of capital ($Q_i$) divided by the cost of a new unit of sector-specific capital ($P_2\ T_i^K$):

$$R_i = Q_i / P_2\, T_i^K \qquad \text{(E1)}$$

where

$R_i$ is the post-tax rate of return in industry *i* ;

$P_2$ is the basic price of the domestic commodity, *c2*;

$T_i^K$ is the power of the tax (ie. 1 plus the rate of tax) levied on purchases of units of capital for installation in industry *i*; and

$Q_i$ is the post-tax rental price of capital in industry *i*.

For our BOTE explanation, we will only be concerned with that part of (E1) that relates to *i1*. The percentage change expression for the rate of return in *i1* is:

(E2) $r_1 = q_1 - p_2 - t_1^K$

where lower-case variables represent the percentage changes in the corresponding (upper-case) levels of the variables.

In MMRF the output of the dwellings sector is sold entirely to households, and the market for dwellings services is assumed to clear. We explain the percentage change in household demand for dwellings services in the BOTE model with the partially reduced form equation (E3):

(E3) $x_1 = -\eta_1 p_1 + \psi_1 l_2$

where:

$x_1$ is the percentage change in household demand for dwelling services;

$p_1$ is the percentage change in the price of dwelling services;

$l_2$ is the percentage change in NSW employment;

$\eta_1$ is the price elasticity of demand for dwelling services; and

$\psi_1$ is the elasticity of demand for dwelling services to NSW employment.

Since sector 1 uses only sector-specific capital to produce dwelling services, the percentage change in the supply of dwelling services ( $x_1$ ) is equal to the percentage change in the supply of sector 1's capital ( $k_1$ ). In the short-run $k_1$ = 0, hence we can write (E3) as:

(E4) $p_1 = \left(\psi_1 / \eta_1\right) l_2$

Sector 2 is assumed to maximise profits within a competitive product market. Specifically, it is assumed to face the short-run profit maximisation problem

maximise: $P_2\ X_2 - W\ T_w\ L_2 - Q_2\ T_2^Q\ K_2$

(E5) by choosing: $L_2$

subject to: the Cobb-Douglas production technology $X_2 = L_2^{\beta_1}\ K_2^{\beta_2}$, and given values for $P_2$ and $K_2$

where

$P_2$ is the price of *c2*;

$X_2$ is the output of *c2*;

$W$ is the nominal take-home wage;

$T_w$ is the power (one plus the rate) of the state payroll tax;

$L_2$ is employment in NSW;

$T_i^Q$ is the power of the income tax on net (after tax) capital income in sector *i*;

$K_2$ is the capital stock in *i2*, assumed to be given in the short run;

$\beta_1$ is the share of payments to labour in *i2*'s total costs; and

$\beta_2$ is the share of payments to capital in *i2*'s total costs.

(E5) gives rise to the first order condition:

(E6) $\beta_1 P_2 \ L_2^{\beta_1 - 1} K_2^{\beta_2} = W \ T_w$

The percentage change form for (E6) is:

(E7) $(\beta_1 - 1)\ l_2 = w \ + t_w - p_2$

The percentage change in the output of *c2* is given by the linearised optimised Cobb-Douglas production function for *i2*:

(E8) $x_2 = \beta_1 \ l_2$

We express the MMRF theory governing demand for non-dwelling commodities in partially reduced form in the BOTE model via (E9). This equation assumes that demand for *c2* is related to three factors: the price of *c2* relative to the price of the competing import, *c3*; real NSW consumption spending; and real NSW investment spending:

(E9) $x_2 = -\eta_2 (p_2 - p_3) + \psi_{21} \ l_2 + \psi_{22} \ r_1$

where

$x_2$ is the percentage change in demand for *c2*;

$\eta_2$ is the elasticity of demand for *c2* with respect to the price of *c2* relative to the price of the competing import *c3*.

$p_2$ is the percentage change in the price of *c2*;

$p_3$ is the percentage change in the price of *c3*;

$\psi_{21}$ is the elasticity of demand for *c2* with respect to employment in NSW;

$l_2$ is the percentage change in employment in NSW;

$\psi_{22}$ is the elasticity of demand for *c2* with respect to the rate of return on capital in *i1*;

$r_1$ is the percentage change in the rate of return on capital in *i1*.

The price paid by households for dwelling services is equal to the pre-tax rental price of capital in *i1*:

(E10) $P_1 = Q_1 \ T_1^Q$

The percentage change expression for (E10) is:

(E11) $p_1 = q_1 + t_1^Q$

In MMRF, the real consumer wage at the regional level (that is, the nominal post-tax regional consumer wage $W$, deflated by the regional consumer price index, $P_C$) is assumed to be equal to the national real consumer wage, $\Gamma$:

(E12) $W / P_C = \Gamma$

The percentage change expression for (E12) is:

(E13) $w - p_C = \lambda$

In the short run, $\Gamma$ is assumed to be sticky, with national and regional unemployment endogenous. In the long-run, national employment is exogenous, with equality of national labour demand and national labour supply achieved via movements in $\Gamma$. Labour is assumed to be mobile between regions in the long run, with regional real consumer wages continuing to be determined by (E12). An important outcome of this treatment of the regional labour market is that, even for a relatively large region such as NSW, as a first approximation the regional real consumer wage can be viewed as exogenous to the regional economy in both the short-run and long-run.

(E12) introduces the regional consumer price index, $P_C$. We define the percentage change in $P_C$ as the budget-share weighted sum of the percentage changes in the prices of *c1*, *c2* and *c3*:

(E14) $p_C = \alpha_1 p_1 + \alpha_2 p_2 + \alpha_3 p_3$

where $\alpha_c$ is the share of household spending on commodity *c* in total NSW private consumption.

The short-run BOTE model consists of the eight equations (E2), (E4), (E7), (E8), (E9), (E11), (E13), and (E14). Together these eight equations determine $r_1$, $q_1$, $p_1$, $p_2$, $x_2$, $l_2$, $w$, and $p_C$. This leaves $p_3$, $\lambda$, $t_1^K$, $t_w$, and $t_1^Q$ to be determined exogenously. Of these exogenous variables, only $t_1^K$, $t_w$, and $t_1^Q$ will be shocked. Import prices and the real wage are assumed to be determined independently of $t_1^K$, $t_w$, and $t_1^Q$, that is: $p_3 = \lambda = 0$.

We can summarise the short-run macroeconomic effects of the three instruments using the BOTE model by finding an expression for $l_2$ as a function of the three financing instruments[1]:

[1] See Appendix A for the derivation of (E15).

(E15) $\Phi_3\ l_2 = \Phi_4\Phi_2\ t_w + \Phi_5\ t_1^Q + \Phi_5 t_1^K$

where:

$$\Phi_1 = (\alpha_1\psi_1 + \eta_1\beta_2)/\eta_1(1-\alpha_2)$$
$$\Phi_2 = 1/(1-\alpha_2)$$
$$\Phi_3 = \beta_1 + (\eta_2 + \psi_{22})\Phi_1 - \psi_{21} - \psi_{22}(\psi_1/\eta_1)$$
$$\Phi_4 = -\eta_2 - \psi_{22}$$
$$\Phi_5 = -\psi_{22}$$

The impacts of the three financing instruments on employment depend on both the percentage changes in the powers of the taxes (the *t*'s) and the elasticities (the $\Phi$'s). Since the purpose of the BOTE model is to be illustrative of the economic mechanisms operating in MMRF, we use MMRF data to parameterise the BOTE elasticities and to calculate the movements in the BOTE taxes. Starting with the elasticities, we have[2]:

| | |
|---|---|
| $\alpha_1 = 0.24$ | *share of dwelling services in regional household budget* |
| $\alpha_2 = 0.55$ | *share of regional (non-dwellings) goods in regional household budget* |
| $\alpha_3 = 0.21$ | *share of imported goods in regional household budget* |
| $\psi_1 = 0.83$ | *elasticity of dwelling services demand with respect to employment* |
| $\psi_{21} = 0.31$ | *elasticity of demand for non-dwellings with respect to employment* |
| $\psi_{22} = 0.10$ | *elasticity of demand for non-dwellings with respect to rates of return* |
| $\eta_1 = 0.56$ | *household own-price elasticity of demand for dwelling services* |
| $\eta_2 = 1.40$ | *economy-wide own-price elasticity of demand for non-dwellings* |
| $\beta_1 = 0.73$ | *share of labour costs in non-dwellings sector of regional economy* |
| $\beta_2 = 0.27$ | *share of capital costs in non-dwellings sector of regional economy.* |

Hence, $\Phi_1 = 1.4$, $\Phi_2 = 2.2$, $\Phi_3 = 2.4$, $\Phi_4 = -1.5$, and $\Phi_5 = -0.1$. These coefficients allow us to evaluate the three BOTE employment elasticities:

(i) elasticity of employment with respect to payroll tax ($t_w$) = $\Phi_4\ \Phi_2/\Phi_3 = -1.4$

(ii) elasticity of employment with respect to rates ($t_1^Q$) = $\Phi_5/\Phi_3 = -0.04$

(iii) elasticity of employment with respect to developer charge ($t_1^K$) = $\Phi_5/\Phi_3 = -0.04$

For a given percentage point change in the tax rate, payroll taxes clearly have the biggest impact on the short-run size of the regional macroeconomy, while developer charges and rates have lesser (and equal) impacts. However the impacts of raising $1b. with each instrument will depend on the values for the *t*'s, and these in turn depend on tax bases.

[2] See Appendix D for the calculation of the elasticities from the MMRF database.

Starting with $t_w$, we note that in MMRF the average rate of payroll tax in NSW is initially about 2.7 per cent. Hence the initial value for $T_W$ is 1.027. The initial value of payroll tax receipts by the NSW government is approximately \$4 b. Hence the requirement to raise an additional \$1 b. in revenue via the payroll tax instrument requires that $T_W$ increase by 0.7 per cent, from 1.027 to 1.034. That is, $t_w$ = +0.7 under payroll financing. In the BOTE model this causes employment to fall by 0.7 x –1.40 = –1.0 per cent.

We also use the payroll tax instrument to raise the principal and interest required under debt financing. In this simulation the NSW government borrows an additional \$1 b. each year to finance the additional spending on infrastructure. The NSW government is assumed to repay each tranche of debt over a period of twenty years. At an interest rate of 5.5 per cent[3], this requires annual payments of \$84 m. Under this option, the NSW government gradually raises payroll taxes to pay the ever-increasing interest and principal bill: \$83.7 m. in 2004, \$167.4 m. in 2005, \$251.1 m. in 2006, and so on. To raise \$84 m. in year 1, $T_W$ must increase from 1.0270 to 1.0276, an increase of 0.06 per cent. Hence the BOTE estimate of the short-run impact on employment of debt financing is +0.06 x –1.4 = –0.1 per cent.

Turning to developer charges ($t_1^K$) we note that in MMRF, the 2004 value for investment in dwellings in NSW in the basecase simulation is \$15.6 b. In the BOTE model the initial value for $T_1^K$ is 1. Hence to raise \$1 b. annually to finance additional infrastructure spending via a developer charge, the value of $T_1^K$ in the BOTE model must rise from 1.0 to 1.064. That is, $t_1^K$ = 6.4. In the BOTE model this causes employment to fall by 6.4 x –0.04 = –0.3 per cent.

Finally, in MMRF the average income tax rate on capital income in the NSW dwellings sector in 2004 is about 0.2. In the BOTE model, this is represented by setting the initial value of $T_Q^1$ at 1.25. In MMRF, this tax is initially raising approximately \$5.7 b. from the \$28.6 b. of gross capital income in the NSW dwellings sector. Under the residential rates financing option, total collections of capital income taxes from the dwellings sector must rise by \$1b., to \$6.7 b. This requires the rate of the tax to increase from 0.20 to 0.23. In the BOTE model, this is represented by a 3.5 per cent increase in the value of $T_Q^1$, from 1.25 to 1.29. That is, $t_1^Q$ = 3.5. Hence our BOTE estimate of the employment impact of rates financing is +3.5 x –0.04 = –0.1 per cent.

Table 1 compares the MMRF results with the results from our BOTE explanation. While the BOTE model's ranking of the instruments is the same as MMRF's, the estimates from the BOTE model are close to the MMRF results only for developer charges and rates financing. For payroll financing and debt financing (both of which rely on changes in the payroll tax instrument, which directly affect the producer price of labour) the BOTE estimates are approximately twice the MMRF results. This

[3] Approximately the 10 year NSW government bond rate at the time of writing. We assume that this rate is not affected over the period of the simulation by the increase in NSW net liabilities arising from our debt funding assumption.

reflects our choice of functional form for the BOTE production function. The BOTE model assumes a Cobb-Douglas production structure, implying a substitution elasticity between labour and capital of –1. MMRF assumes CES substitution possibilities between labour and capital, with an average elasticity of –0.5. Hence, relative to MMRF, short-run employment in the BOTE model is about twice as responsive to a change in the wage / rental ratio.

***Table 1: Ranking of short-run employment impacts, financing shocks only***

| Instrument | BOTE estimate | MMRF result |
|---|---|---|
| Payroll | –1.0 | –0.51 |
| Developer charge | –0.3 | –0.26 |
| Rates | –0.1 | –0.12 |
| Debt | –0.1 | –0.05 |

### 3.3 The short-run BOTE model used to explain the short-run MMRF results

#### *3.3.1 Payroll tax financing has the largest impact on short-run employment, because it directly affects short-run producer wages.*

Relative to developer charges and rates, payroll taxes have a larger short-run impact on employment because they directly affect producer wages in the short-run. Via (E6) and (E7) we can see that the short-run (direct) effect of the imposition of the payroll tax is an increase in the marginal product of labour. With capital stocks fixed in the short-run, this requires employment in the non-dwellings sector to fall. Consistent with the BOTE model, MMRF projects a fall (0.51 per cent) in non-dwellings sector employment (row 19). As discussed above, this is approximately half the employment contraction anticipated by the BOTE model, because the elasticity of substitution between labour and capital in MMRF is about half that of the BOTE model. With capital stocks initially fixed, the fall in employment in sector 2 requires output of sector 2 to contract (E8 of the BOTE model). This accounts for the 0.37 per cent fall in sector 2 output in MMRF (row 21 of Table E2). This causes NSW real GDP at factor cost (row 10) to fall by 0.32 per cent, since activity in the non-dwellings sector accounts for approximately 85 per cent of NSW GDP at factor cost. With employment in the non-dwellings sector lower, the marginal product of the sector's capital must also fall (not shown in the BOTE model). This causes the sector's rental rate of capital to fall. Since investment is modelled as an increasing function of rates of return in MMRF, investment in the sector falls. Investment in the dwellings sector also falls (row 17). This is because, with employment lower, so too is real household consumption (row 1). This causes household demand for dwellings to decline. This mechanism is captured by the $\psi_1 l_2$ term in (E3) of the BOTE model. Via (E3) the reduction in household consumption causes the rental price of dwellings ($p_1$ of the BOTE model, row 22 of Table 2) to decline. This causes a negative deviation in dwellings investment (row 17). With both dwelling and non-dwelling investment below their basecase values, total NSW investment is 1.3 per cent below basecase (row 2). The remaining elements of NSW absorption (state and federal government consumption) are assumed to be unaffected by the financing shocks (rows 3 and 4). Nevertheless, the reduction in household consumption and private investment are sufficient to cause the deviation in real NSW absorption to exceed that

of real NSW GDP. Hence the region's international and interregional trade balances move towards surplus (rows 5 – 8).

### *3.3.2 Developer charges affect short-run employment only indirectly, via their impact on dwellings investment*

Developer charges do not (directly) affect NSW wages in the short-run. They do however increase the cost of constructing dwellings. This reduces rates of return on new dwellings, causing a fall in dwellings investment and hence a fall in NSW employment. The main mechanisms at work in the MMRF model also operate in the BOTE model. The direct effect of the increase in developer charges ($t_1^K$) is on dwellings rates of return ($r_1$) via (E2). Recall that in the BOTE model $t_1^K$ must increase by 6.4 per cent. Via (E2) this has a direct effect on $r_1$ of –6.4 per cent. In MMRF, this reduction in rates of return in the dwellings sector causes investment in dwellings (row 16) to fall, by 9.4 per cent. This causes a contraction in demand for output of NSW sectors providing inputs to dwelling investment. Investment demand does not appear explicitly in the BOTE model, but this effect is captured by the term $\psi_1 r_1$ in (E9), which suggests that the direct effect on output in the remainder of the NSW economy will be equal to approximately –6.4 x 0.10 = –0.64. However the direct effect over-estimates the final contraction in output in the rest of the NSW economy. As output and employment contract, so too does the price of non-dwellings output. This allows additional sales to be made to price sensitive agents in NSW and the rest of the world, offsetting somewhat the reduction in sales to investment demand. This effect is captured by the term $-\eta_2 (p_2 - p_3)$ in (E9). In the MMRF results, we can see these mechanisms first reflected in the basic price of non-dwellings output (row 17) which is projected to fall by 0.2 per cent. This allows the NSW's balance of trade to move towards surplus (rows 5-8). However additional sales to price-sensitive agents do not outweigh the lost sales to NSW investors. Hence output (row 20) and employment (row 18) in the non-dwellings sector contract, by 0.19 per cent and 0.26 per cent respectively. With NSW employment lower, so too is NSW real consumption, which is projected to contract by 0.20 per cent (row 1). In MMRF this reduction in real consumption spending provides further feed-back to the initial contractive effects of the reduction in dwellings investment demand, an effect captured in the BOTE model by the term $\psi_{21} l_2$ in (E9). All the direct and indirect effects on employment operating in the BOTE model are embodied in (E15), which projects a short-run contraction of 0.3 per cent. This is very close to the MMRF result of 0.26 per cent (row 11).

### *3.3.3 Like developer charges, rates affect short-run employment only indirectly, via their impact on dwellings investment*

In MMRF, an increase in residential rates causes the post-tax return on capital in the dwellings sector to fall. In the short-run, this causes the rate of return in the sector to fall, and with it, dwellings investment. It is this reduction in dwellings investment that causes activity in the regional economy to contract. In terms of the BOTE model, residential rates appear only in (E11). In the short-run, the purchaser's price for dwelling services, $p_1$, is determined by the market clearing condition for dwellings (E3). Hence in the short-run (E11) defines the post-tax rental rate on dwellings capital, $q_1$. Substituting (E11) into (E2) provides:

(E2-b) $r_1 = p_1 - t_1^Q - p_2 - t_1^K$

Equation (E2-b) makes clear that the short-run mechanism transmitting an increase in rates ($t_1^Q$) to the wider NSW economy – rates of return on dwelling capital ($r_1$) – is identical to that of the developer charge ($t_1^K$). That the transmission mechanisms to employment are identical for the two instruments is also clear from (E15), where each instrument has the same employment elasticity. Nevertheless, despite the amount being raised ($ 1 b.) under the two instruments being identical, rates have a smaller impact on employment. This is because the changes in the tax rates required to raise $ 1 b. are different, reflecting differences in the sizes of the bases upon which the two taxes are levied. In section 3.2 we calculated the percentage changes in the tax rates as ($1 b. / $tax_base) x 100. In the developer charge case, $tax_base is equal to the 2004 value of investment in the residential dwellings sector. This was $15.6 b., yielding a shock value for $t_1^K$ of (1 / 15.6) x 100 = 6.4 per cent. In the residential rates case, $tax_base is equal to the 2004 value of gross returns to capital in the dwellings services sector. This was $28.6 b., yielding a shock value for $t_1^Q$ of (1 / 28.6) x 100 = 3.5 per cent. Raising $1 b. from the two instruments will only yield identical results in the case where the annual investment in the sector is equal to the annual gross return on capital in the sector. This is broadly the same as the requirement that the gross growth rate in capital in the sector be the same as the gross rate of return on capital in the sector. For dwelling services, it is reasonable to expect the former to typically be less than the latter: rates of return on capital in the sector will need to be similar to that available on other assets, while slow-changing demographic factors will be the main determinant of the sector's growth rate.

#### *3.3.4 Like payroll tax financing, debt financing also directly affects short-run producer wages, however much of the impact is deferred.*

The debt instrument (since it is assumed to be financed through payroll tax) directly affects real producer wages in the short-run. However, it has a relatively small impact on short-run employment since the bulk of the revenue raising effort is deferred. A comparison of the results in Tables E1 - E4 show that the short-run effects on the regional macroeconomy of the debt instrument are the least disruptive of the alternative financing options. In the short-run, this is largely due to the significantly smaller tax burden imposed on the NSW economy under debt financing. In year one of the debt financing simulation, an additional $86 m. in payroll taxes are levied. Under any of the alternative up-front financing options, the additional taxation burden imposed on the NSW economy in year 1 is over ten times larger, at $ 1 b. However, as discussed in Section 3.4, the annual payroll tax burden under debt will eventually grow to a steady $1.7 b.: 70 per cent larger than the long-run annual tax burden ($ 1 b.) under any of the alternative financing options.

### 3.4 A long-run BOTE model

In the long-run it is practical to assume that labour and capital are in elastic supply to the NSW economy at exogenously given real consumer wages and rates of return on

capital. This simplifies the BOTE model, since it allows us to dispense with those equations relating to quantity variables (E4, E7, E8, and E9). In their place, we add the Cobb-Douglas unit cost function for sector 2:

(E16) $P_2 = (W\ T_W)^{\beta_1}\ (Q_2 T_2^Q)^{\beta_2}$

the percentage change expression for which is:

(E17) $p_2 = \beta_1\ (w + t_W) + \beta_2\ q_2$

In the long-run, we can conceive of the negative impact of the various taxes on the NSW economy entirely in terms of their impact on $p_2$. Any tax-induced increase in $p_2$ will cause price-sensitive agents in NSW, the rest of Australia and overseas to substitute away from goods produced in NSW. With the production of NSW goods lower, and relative factor prices largely exogenous to the NSW economy, there will be proportionate falls in labour and capital usage within NSW. This will lead to proportionate falls in GDP, consumption, investment and other macroeconomic indicators of regional economic activity. Hence our aim with the long-run BOTE model is to use (E2), (E11), (E13), (E14) and (E17) to derive an expression for $p_2$ solely in terms of the three tax instruments. This expression is given by (E18), which is derived in Appendix B and discussed below.

(E18) $p_2 = \left(\frac{1}{\alpha_3^{LR}}\right) t_W + \left(\frac{\alpha_1^{LR}}{\alpha_3^{LR}}\right) t_1^K + \left(\frac{\alpha_1^{LR}}{\alpha_3^{LR}}\right) t_1^Q$

Equation (E18) and the BOTE equations underlying it (E2, E11, E13, E14 and E17) account for the main mechanisms in MMRF by which the various tax instruments affect the NSW economy in the long-run. In the long-run, rates of return on capital are assumed to be exogenous. In terms of (E2) and (E11) of the BOTE model, this means that $p_1 = t_1^Q + p_2 + t_1^K$: that is, changes in both developer charges and residential rates will be passed through to households in the form of higher prices for dwelling services in the long run. Such an increase in dwellings prices will be passed through to nominal NSW wages (via E13 and E14), since the long run real consumer wage in NSW is assumed to be given by the national real consumer wage. The long-run pass-through of dwellings prices to the regional nominal wage accounts for the $\alpha_1$ terms in (E18). Increases in nominal wages feed into the cost of constructing *c2* (via E17). This not only increases the price of *c2*, but also *c1*, since the cost of constructing dwellings also rises. This multiplier effect accounts for the $\alpha_3$ terms in (E18).

Payroll taxes have a direct effect and an indirect effect on the price of *c2* in the long run. A 1% increase in the payroll tax rate lifts the producer wage by 1%. It also lifts the long-run rental rate on capital by 1% (via E2). This lifts the price of *c2* by 1% (via E17). This accounts for the value of 1 in the numerator of the coefficient on $t_W$ in (E18). The 1% increase in the price of *c2* then feeds into the NSW nominal wage (equations E13 and E14) lifting the price of *c1* and *c2* (but not *c3*). Again, this

multiplier effect accounts for the $\alpha_3$ term in the denominator of the coefficient on $t_W$ in (E18).

Our MMRF results end in 2030. To use (E18) to explain the MMRF results, we must use the household budget shares from the 2030 MMRF basecase database. By 2030, while the share of dwelling services in the household budget is little changed from its 2004 value ($\alpha_1^{LR} = 0.25$), the share of imports from the rest of Australia and overseas has grown ($\alpha_3^{LR} = 0.39$). Evaluating (E18) using the 2030 MMRF values for the $\alpha_i$ 's provides:

(E19) $p_2 = 2.6\, t_W + 0.6\, t_1^K + 0.6\, t_1^Q$

The 2030 shock values to $t_W$, $t_1^K$, and $t_1^Q$ depend on the basecase 2030 values for tax bases and the cost of investment. Between 2004 and 2030 the cost of investment in NSW in the basecase rises by approximately 80 per cent. Hence the cost of the infrastructure program rises to \$1.8 b. Starting with $t_W$, we begin by noting that the NSW payroll tax rate in 2030 in MMRF is unchanged from its 2004 value, at 2.7 per cent. However the economy has grown, so the tax raises approximately \$11.5 b. in 2030. Hence the requirement to raise an additional \$ 1.8 b. via the payroll instrument requires that $T_W$ increase by 0.4 per cent, from 1.027 to 1.031. That is, $t_w$ = +0.4 under payroll financing. In the long-run BOTE model this causes the price of NSW non-dwelling commodities to rise by 0.4 x 2.6 = 1.0 per cent.

Turning to developer charges ($t_1^K$) we note that in MMRF, the 2030 value for investment in dwellings in NSW in the basecase simulation has grown to \$56.4 b. In the BOTE model the initial value for $T_1^K$ is 1. Hence to raise \$1 b. annually to finance additional infrastructure spending via a developer charge, the value of $T_1^K$ in the BOTE model must rise from 1.0 to 1.032. That is, $t_1^K$ = 3.2. In the BOTE model this causes the long-run price of NSW non-dwellings output to rise by 3.2 x 0.6 = 1.9 per cent.

The 2030 basecase value for the average income tax rate on capital income in the NSW dwellings sector remains 0.2, so the long-run initial value of $T_Q^1$ remains 1.25. By 2030 this tax is raising approximately \$19.3 b. from \$96.4 b. of gross capital income in the NSW dwellings sector. Under rates financing, long-run collections of capital income taxes from the dwellings sector must rise by \$1.8 b., to \$21.1 b. This requires the rate of the tax to increase from 0.20 to 0.22. In the BOTE model, this is represented by a 2.4 per cent increase in the value of $T_Q^1$, from 1.25 to 1.28. That is, $t_1^Q$ = 2.4. Hence our BOTE estimate of the long-run impact of rates financing on the price of NSW non-dwellings output is +2.4 x 0.6 = 1.4 per cent.

The additional payroll tax burden required to pay principal and interest under debt financing eventually grows to a steady \$1.7 b. in 2004 dollars, or 3.1 b. (\$1.7 x 1.8) in 2030 dollars. This requires that $T_W$ increase by 0.7 per cent, from 1.027 to 1.034.

That is, the long run value for $t_w$ is 0.7 under debt financing. In the long-run BOTE model this causes the price of NSW non-dwelling commodities to rise by 0.7 x 2.6 = 1.8 per cent.

***Table 2: Ranking of long-run impacts, financing shocks only***

| **Instrument** | **BOTE estimate: $p_2$** | **MMRF results** | | |
|---|---|---|---|---|
| | **(1)** | **(2)** $p_2$ | **(3)** $p^{nsw}_2 - p^{roa}_2$ | **(4)** $l$ |
| Developer charge | 1.9 | 0.05 | 0.65 | -1.5 |
| Rates | 1.4 | 0.02 | 0.39 | -0.9 |
| Debt | 1.8 | 0.39 | 0.57 | -1.6 |
| Payroll | 1.0 | 0.30 | 0.47 | -1.2 |

Table 2 summarises the results of the long-run BOTE model (column 1) and compares them with selected MMRF results (columns 2 – 4). On first inspection, the long-run BOTE model appears not to track the MMRF results particularly well. Two differences stand out. Firstly, the absolute level of the price impacts is significantly greater in the BOTE model (compare columns 1 and 2). This largely reflects differences in the price-normalising assumptions of the two models. Secondly, the rankings of the instruments in terms of damage to the NSW economy are different (compare columns 1 and 4). Compared with the BOTE results, the pair-wise rankings of debt and developer charges, and payroll taxes and rates, are swapped in the MMRF results. This reflects differences between the two models in the way in which changes in the rental prices of capital in the dwellings sector are passed through to consumer prices. The sources of difference between the BOTE and MMRF results are expanded upon below.

The NSW price level in the BOTE model is determined by the exogenous status of $p_3$ and $\lambda$. When deriving (E18) in Appendix B we assumed that $p_3 = \lambda = 0$. However in the MMRF results this assumption does not hold. With taxes higher, but no change in productivity or government infrastructure spending, the national real wage must fall in MMRF to clear the national labour market. In terms of the BOTE model, $\lambda < 0$. More importantly, prices in MMRF are normalised against an exogenous national CPI. Hence a rise in the prices of NSW goods must be offset by a decrease in the prices of goods in the rest of Australia. In the BOTE model, this would be represented by setting $p_3 < 0$. Furthermore, the extent of the movement in the price level in the rest of Australia depends on which of the four NSW tax instruments is being shocked. This explains why developer charges and rates (which affect the NSW CPI directly) have smaller absolute impacts on $p_2$ in MMRF than the debt and payroll instruments (column 2). Finally, relative to MMRF, BOTE equation (E17) overstates the impact of changes in NSW taxes on NSW prices. This is because, unlike MMRF, the BOTE model does not allow for imported intermediate inputs. Column (3) of Table 2 partly corrects for these price level effects by comparing the relative price of *c2* produced in NSW and the rest of Australia.

Compared with MMRF, the BOTE model will tend to overstate the impact of developer charges and rates on the price of dwellings (and by extension, nominal

wages) because in the BOTE model capital services account for all of the inputs into dwelling services (via E11), whereas in MMRF they only account for approximately seventy per cent[4]. This explains why, relative to debt and payroll taxes, the BOTE model tends to over-estimate the long-run consequences of developer charges and rates.

With these differences between the BOTE and MMRF models in mind, we can see that, besides elucidating the mechanisms by which the various tax instruments affect the NSW economy, the BOTE model also correctly anticipates the relative impacts of like instruments in MMRF: the developer charge has a greater long-run impact on the economy than rates; debt has a greater long-run impact than payroll financing. Just as in the short-run case, rates financing is superior to the developer charge because the dwellings sector is slow growing. In the long-run, payroll financing is superior to debt financing because the revenue raising effort required to finance principal and interest payments under debt financing grows to a sum approximately 70 per cent higher than the annual revenue raising effort required under payroll financing.

### 3.5 Building the infrastructure

Table E5 reports MMRF projections for the economic effects of an unfunded $1 b. increase in the NSW government's annual infrastructure budget. We model this as a $1 b. increase in spending by the NSW government on output of the NSW *Construction* sector. In terms of the BOTE model, output of the NSW *Construction* sector is aggregated with the output of other non-dwellings industries in *c2*. Hence we can begin to explain the impacts of an increase in government spending using the BOTE model by explicitly accounting for government demands in (E9):

$$\text{(E20)} \quad x_2 = -\eta_2 (p_2 - p_3) + \psi_{21} l_2 + \psi_{22} r_1 + \psi_{23} g$$

where $\psi_{23}$ is the elasticity of demand for *c2* with respect to aggregate government consumption spending. We can solve for the short run impact of a change in government spending on employment by substituting (A5) and (A6) from Appendix A into (E20) and noting that $t_w = t_1^Q = t_1^K = 0$:

$$\text{(E21)} \quad l_2 = \psi_{23} / (\beta_1 + \eta_2 \Phi_1 - \psi_{21} - \psi_{22} \psi_1 / \eta_1 + \psi_{22} \Phi_1)\, g$$

Since approximately 8 per cent of NSW's non-dwellings output is sold to the NSW government, $\psi_{23}$ has the value 0.08 in the BOTE model. This puts the value of the employment elasticity in (E21) at 0.034. The initial level of NSW government consumption spending on NSW-sourced goods in the MMRF basecase is $28.2 b. The addition of $1 b. of spending on urban infrastructure therefore lifts real NSW government spending on NSW goods by 3.5 per cent, ie. in the BOTE model $g = 3.5$[5].

[4] The remaining 30 per cent of the cost to households of dwelling services is accounted for by various material and service inputs such as finance and property services and maintenance expenditures.

[5] In row 3 of Table 5 real state government consumption rises by 3.47 per cent. This is 0.03 percentage points less than the value of $g$ in the BOTE model, because approximately $0.5 b. of NSW spending is on imports to NSW.

Thus the BOTE model anticipates an increase in NSW employment of 0.12 per cent ( = 0.034 x 3.5). This understates the MMRF result (0.21 per cent) partly because (E9) does not include a term accounting for increased investment demand in sector *i2*. Despite underestimating the MMRF employment impact, the BOTE model nevertheless makes clear the transmission mechanisms through which the increase in construction spending affects the NSW economy. The direct effect of the expansion in government spending is to generate an increase in output of *c2* via (E20) of 0.28 per cent (+3.5 x $\psi_{23}$). However MMRF anticipates a smaller increase in output for the non-dwelling sector (+0.15 per cent). This is because $p_2$ is not constant. With output higher, so too must be employment (via E8). With employment higher so too is the rental rate on capital in *i2*, which causes $p_2$ to rise via (E7). Hence we see in MMRF that the basic price of non-dwelling output rises by 0.15 per cent. In (E9) this causes price-sensitive demands for *c2* to contract. This is reflected in the MMRF results by a movement towards deficit in the NSW balance of trade (rows 5 – 8). With rental rates on capital higher, so too is investment, with MMRF projecting an initial impact on capital formation of 0.14 per cent. With employment and capital rental rates higher, so too is household income. In MMRF, regional household consumption spending is linked to regional household incomes. This accounts for the 0.18 per cent increase in real private consumption spending.

In the long-run, the only factor of production that is assumed to be in fixed supply to the NSW economy is agricultural land. However returns to agricultural land represent an insignificant (less than one per cent) proportion of NSW GDP at factor cost. Within the constraint of exogenous long run national labour supply, NSW is assumed to be able to attract additional labour from the rest of Australia at the market clearing national real wage. Capital is in elastic supply to NSW industries at exogenous rates of return on regional industry capital. Hence long run factor supplies to the non-agricultural industries of NSW are highly elastic. This allows the NSW economy to accommodate a long run expansion in government spending through increased employment of labour and capital with only small movements in relative prices. In Table E5 this is reflected in increased usage of capital (row 12) as well as labour (row 11). The employment / capital ratio is higher in NSW (compare rows 18 and 19) despite the fall in the rental / wage ratio (compare rows 21 and 15) because of a change in the industrial composition of NSW economic activity. Recall that the increase in NSW state government spending is comprised entirely of additional spending on output of the NSW Construction sector. This causes a relatively large (2.1 per cent[6]) positive deviation in output of NSW *Construction* in 2030. The NSW *Construction* sector is very labour intensive, compared with the NSW economy as a whole. Since the deviation in the output of this sector (2.1 per cent) is much greater than the deviation in NSW output (0.10 per cent) the NSW labour / capital ratio increases relative to basecase. The long-run increase in labour and capital supply to the NSW economy causes household factor incomes to be higher. This allows household consumption spending to be higher than basecase (row 1). Real investment spending (row 2) is above its basecase level because of the positive deviation in the NSW capital stock (row 12). The increase in demand for labour by the NSW economy causes a small rise in the national real wage (row 22).

[6] Not reported in Table E5.

### 3.6 Benefits from the additional infrastructure

Consistent with literature on the productivity effects of public sector infrastructure expenditure, we assume that each dollar of additional infrastructure investment by the NSW government produces a benefit in the form of a permanent increase in private sector[7] primary factor productivity. The literature suggests that the benefits from such expenditure might be substantial. For example the average rate of return on public infrastructure reported in World Bank (1994) is approximately 50 per cent. However we recognise that the actual benefits that might arise from additional spending on infrastructure in NSW must ultimately depend on the details of the infrastructure that is to be built, and so can only be known after evaluations have been undertaken on a project-by-project basis. Hence our assumptions relating to the benefits of additional infrastructure spending are necessarily illustrative only. Despite being illustrative, our benefit assumptions remain important to our assessment of the instruments. For example, they influence our conclusions about the length of time that the deviations in certain macroeconomic indicators, such as employment, are negative. For the purpose of illustrating with MMRF the economic effects of an infrastructure-induced improvement in regional productivity, we adopt a far more conservative ratio of benefits to costs than those found in the World Bank's literature survey. We assume that each additional dollar of infrastructure spending provides an annuity of 0.15 dollars. This is delivered in the form of a permanent increase in NSW private sector productivity. We assume that the stream of benefits commences one year after the infrastructure is built. With a return of 0.15 cents, and a one year lag between spending and the commencement of benefits, the benefit-cost ratio with a discount rate of 7 per cent is 2. This is approximately the hurdle ratio employed by NSW public authorities.

To explain the short-run MMRF projections of the impact of the productivity improvement on the NSW economy using the BOTE model, we must include a variable describing primary factor productivity ( $A_i$ ) in the constraint of (E5). The first order condition (E6) then becomes:

(E22) $\beta_1 P_2 \; L_2^{\beta_1 - 1} K_2^{\beta_2} = W \, T_w A_2$

The percentage change form for which is:

(E23) $(\beta_1 - 1)\, l_2 = w \; + t_w - p_2 + a_2$

Similarly, (E8) becomes:

(E24) $x_2 + a_2 = \beta_1 \; l_2$

The general improvement in primary factor productivity also augments the services provided by the dwellings capital stock. Hence (E4) becomes:

[7] We assume that the *Public Administration* and *Defence* industries (which sell almost all their output to government final demands) in NSW do not participate in the general improvement in NSW primary factor productivity.

(E25) $p_1 = \left(\psi_1 / \eta_1\right) l_2 + \left(1/\eta_1\right) a_1$

As derived in Appendix C, these equations lead to the following short-run relationship between NSW employment and productivity:

(C6) $l_2 = \left[\Phi_6/\Phi_7\right] a$

The BOTE estimate for the short-run elasticity of employment to productivity ($\Phi_6/\Phi_7$) is –1.5[8]. In (E22) the initial value of A is 1. The value of returns to primary factors in all sectors other than the public sector in NSW is approximately $210 b. Since each additional $1 b. of infrastructure is assumed to generate on-going benefits of $0.15 b. per annum, the value of A must fall by approximately 0.07 per cent in each year (-0.15/210). Equation (C6) implies that this will generate a year 1 increase in employment 0.1 per cent (–0.07 x –1.5). This overestimates the MMRF result (0.05 per cent) for two reasons. Firstly, government spending in MMRF is held fixed in this simulation, thus tying down employment in the public sector. Secondly, as discussed in section 3.2, the labour / capital substitution elasticity in the BOTE model is approximately double that of MMRF[9]. Despite overestimating the employment response, the BOTE model clearly illustrates the main economic mechanisms operating in MMRF, as expanded upon below.

The initial effects of the increase in productivity is to cause employment (via E23) and output (via E24) to rise. The expansion in output can be traced to both the increase in productivity and the increase in employment. Payments to labour represent approximately 73 per cent of total factor payments in the NSW non-dwellings sector. Hence the 0.05 per cent deviation in the sector's employment accounts for 0.04 percentage points (0.73 x 0.05) of the deviation in the sector's output (row 20). The deviation in the sector's output is greater than 0.04 per cent because of the 0.07 per cent improvement (relative to basecase) in the sector's primary factor productivity. Recall however that in the MMRF simulation the assumed improvement in primary factor productivity is isolated to private sector industries. NSW public sector industries (*Public Administration* and *Defence*) account for approximately a fifth of the value added in the NSW non-dwellings sector. Hence primary factor technical change contributes the remaining 0.05 percentage points (0.8 x 0.07 = 0.05) of the deviation in the output of the NSW non-dwellings sector (row 20). Value added in this sector accounts for approximately 88 per cent of NSW GDP at factor cost. Hence the deviation in this sector's output accounts for 0.08 percentage points of the 0.09 per cent deviation in real NSW GDP (row 10). Returns to capital in the dwellings sector account for the remaining 12 per cent of NSW GDP at factor cost. In the MMRF simulation the dwellings sector is assumed to participate in the improvement in productivity. This causes the sector's output to expand by 0.07 per cent. This accounts for the remaining 0.01 percentage points (0.12 x 0.07 = 0.01) of the positive deviation in NSW real GDP in 2005 (row 10).

[8] Note that an improvement in productivity implies $a < 0$.

[9] This has no bearing on the direct effect of an improvement in primary factor productivity on labour demand. However the productivity improvement causes NSW consumer prices to fall. With regional wages indexed to regional consumer prices, this causes the relative producer price of labour to fall. The employment response to this fall in the producer wage in the BOTE model is double that of MMRF.

Turning to (E9), the increase in NSW output of *c2* exceeds the increase in demand for *c2* by NSW agents, hence $p_2$ must fall. In MMRF we see this reflected in a 0.03 per cent fall in the price of non-dwellings output and in positive deviations in interregional (row 5) and international (row 6) export volumes. Import volumes also rise relative to basecase (rows 7 and 8), largely because economic activity in NSW is higher than basecase. Note that via (E23) the fall in $p_2$ has a damping effect on the response of employment to the rise in productivity (see E23).

The improvement in primary factor productivity and increase in employment causes rates of return on capital in sector 2, and hence investment in sector 2, to increase. However the primary factor productivity shock has offsetting effects on dwellings investment. With the dwellings capital stock more productive, less dwellings capital is required, causing $p_1$ to tend to fall (see E25). At the same time, real consumption spending is higher ($l_2$ in E25) and demand for dwellings is relatively income elastic. This has a positive effect on the deviation in $p_1$. Also, the cost of constructing capital ($p_2$ in the BOTE model) is falling, tending to cause the rate of return on dwellings capital to rise (see E11). In MMRF, the net effect of these movements is to cause rates of return on dwellings capital to rise, leading to a 0.15 per cent increase in dwellings investment (row 16). With investment in both the non-dwellings and dwellings sectors rising relative to basecase, there is a positive deviation in aggregate NSW real investment spending (row 2).

In MMRF, movements in household consumption spending are linked to movements in household disposable income. In this simulation, there is a positive deviation in NSW household disposable income because of the positive deviations in NSW employment (row 11), the real wage (row 15 – row 14), and returns to capital in the NSW non-dwellings sector[10] (row 21). The positive deviation in NSW household disposable income accounts for the positive deviation in NSW real consumption spending (row 1).

In the long-run, the improvement in NSW primary factor productivity is expressed largely as a reduction in the price of NSW goods relative to goods in the rest of Australia. To take account of technical change in the long-run BOTE model, (E17) becomes

(E26) $\quad p_2 = \beta_1 \ (w + t_w) + \beta_2 \ q_2 + a$

Using (E2), (E13) and (E14), and retaining $p_3$ and $\lambda$ as exogenous variables provides the following relationship between *a* and $p_2$:

(E27) $\ p_2 - p_3 = \left(1/\alpha_3\right)\lambda + \left(1/\alpha_3\beta_1\right)a$

[10] The NSW dwellings capital stock is assumed to be entirely owned by residents of NSW and output of the NSW dwellings services industry is sold only to NSW residents. Hence movements in capital rentals in this sector affect the aggregate income and the aggregate outlays of NSW households in equal amounts.

In the long run, the accumulated values for the *a*'s (the 0.07 per cent shock to *a* occurs in each year from 2005 inclusive) must feed through into negative deviations in $p_2$. This effect is attenuated by rising real wages ($\lambda > 0$) and rising prices of imports from the rest of Australia ($p_3 > 0$). Recall that the national stock of labour is assumed fixed in this simulation, hence the gains from the productivity improvement are expressed as an increase in the national real wage. By 2030 MMRF projects the national real wage to be 0.81 per cent above its basecase value. This, and the price normalising assumption in MMRF (the national CPI is the numeraire) causes prices of imports to NSW from the rest of Australia ($p_3$ in the BOTE model) to rise. These effects are offset by the improvement in productivity. Overall, MMRF projects the NSW GDP deflator to be approximately 1.3 per cent lower than its basecase value. This causes the quantity of NSW goods demanded to rise. With factor prices largely exogenous to the long-run NSW economy, this causes proportional expansions in capital supply (row 15) and employment (row 14).

### 3.7 The combined financing, construction, and benefit impacts

Tables E7 to E10 report results for simulations in which the construction, financing, and productivity effects of the infrastructure program are fed into the model simultaneously as exogenous shocks. While MMRF is non-linear, the results in Tables E7 to E10 are nevertheless approximately equal to the sum of the results for the construction effects alone (Table E5), the productivity effects alone (Table E6) and the appropriate financing effects alone (one of Tables E1 to E4). As such, the results in Tables E7 to E10 are explicable in terms of the explanations provided in Sections 3.2 to 3.6 for the separate effects of the financing, construction and productivity shocks considered in isolation. To bring these explanations together, without unduly duplicating the explanations in Section 3.2 to 3.6, we begin by concentrating on explaining the paths for one key indicator of aggregate NSW economic activity - employment (Chart 1). In the short run, the results in Chart 1 imply a clear preference for debt and rates financing over payroll tax and developer charge financing. However in the long-run the developer charge is joined by debt as the least stimulative of the financing instruments, leaving rates and payroll taxes as the most favourable long-run financing instruments. Because the short run and long run rankings of the instruments are different, we go on to consider real consumption impacts. This allows us to calculate, for each instrument, the present value of the deviation in NSW real consumption under various discount rates. This calculation reveals a clear preference for debt and rates financing over the payroll and developer charge alternatives.

Turning first to Chart 1, we see that under payroll tax financing the costs of employing labour in NSW rise immediately, leading to a steep fall in employment. NSW employment then stays below its basecase forecast level until 2016. Beyond 2016 the extra productivity in NSW is sufficient to compensate NSW employers for the payroll tax. This allows employment in NSW to move above its basecase forecast level beyond 2016.

With developer charges, the costs of extra infrastructure expenditure do not affect NSW wages in the short run. However they lead to a reduction in housing construction activity with a related short-run reduction in employment. The employment trough under developer charges is shallower than under payroll financing. However it is significantly longer. While developer charges do not directly affect the cost of employing labour in the short run, in the long run they work their way into the rental values of NSW properties, thereby affecting the NSW CPI and NSW wages. This has a long run damping effect on NSW employment. Employment in NSW does not begin returning to its basecase level until 2012, and does not equal its basecase level again until 2018. Thereafter the employment deviation for developer charges remains permanently below that for payroll tax financing.

With debt financing, employment in NSW is immediately stimulated by increased construction activity. Thereafter, the effects of the gradual increase in taxes to pay the interest and principal bill on the borrowed funds are approximately offset by increased productivity. This accounts for the relatively stable employment deviation between 2004 and 2023. After 2023, the tax burden ceases to grow, allowing the extra productivity in NSW to more rapidly offset the additional tax burden. Employment in NSW is above its basecase forecast level throughout the simulation period.

Under rates financing, rates of return on residential property immediately fall, but not by as much as under developer charges. While housing investment contracts, the negative impact on employment is offset by the stimulus provided by the construction of the infrastructure. Like developer charges, rates eventually feed into NSW nominal wage demands. Hence the positive employment deviation becomes smaller over 2005 to 2008. Thereafter, the productivity gains begin to compensate employers for workers' increasing nominal wage demands.

Chart 1 and the foregoing discussion make clear that the short run and long run employment rankings of the instruments are not the same. This complicates the task of ranking the instruments. Nevertheless, it is clear that policy makers with a preference for short-run employment gains will eschew the developer charge and payroll instruments in favour of rates and debt, since the employment deviations for the former instruments remain negative for over a decade from the commencement of the infrastructure program. Also, if debt financing were not an option, it is clear from Chart 1 that rates financing always dominates the two alternatives. However a more definitive ranking of the instruments requires us to be explicit about the time preference of NSW policy makers. Chart 2 contains the percentage deviations in NSW real consumption spending away from their basecase values. These tend to track the employment deviations. One exception is rates financing, the deviation path for which is initially negative (in contrast, the employment deviation is always positive). This reflects the fact that the short run incidence of rates is on post-tax capital rentals, thus reducing household income and hence consumption. Chart 3 converts the percentage point deviations in real consumption spending to deviations in $m. This makes possible the calculation of the present value of the alternative real consumption paths. These are reported in Chart 4 under alternative values for the discount rate. It is clear from Chart 4 that under any discount rate, the present value of the real consumption deviations of debt and rates always exceeds that of either payroll taxes or developer charges. Also, within a plausible range for the discount rate, rates financing tends to have a slightly higher present value than debt. Only under a

relatively high discount rate (>0.07) is debt preferable to rates financing, although within a plausible range for the discount rate of say 0.03 to 0.08 the present values for the two instruments are quite close. At a discount rate of 5%, the present value for rates is $18.4 b. and that for debt is $17.3 b. After debt, payroll tax financing has the highest present value. At a discount rate of 5%, the present value for payroll financing is $12.9 b. Only under an implausibly high discount rate (>0.16) is the present value of developer charge financing greater than the present value of payroll financing. At a discount rate of 5%, the present value for the developer charge is $6.0 b.

*Table 3: Instruments ranked under alternative criteria*[*]

| *Ranking criterion:* | Employment impact | | Present value of real |
|---|---|---|---|
| *Instrument:* | Short run | Long run | consumption deviation |
| Developer charge | 3 | 3 | 4 |
| Payroll tax | 4 | 2 | 3 |
| Debt | 1 | 4 | 2 |
| Rates | 2 | 1 | 1 |

** "1" denotes highest ranked*

On the basis of the preceding discussion, Table 3 advances three rankings of the instruments, on the basis of their short-run (<7 years) and long-run employment impacts and the present value of their real consumption impacts. The table suggests that the case against developer charge financing is quite strong: the instrument is poorly ranked in terms of both short-run and long-run employment effects, and has the lowest present value of real consumption of all four instruments. On the basis of the criteria in Table 3, rates and debt are the preferred instruments. Rates financing is ranked second after debt in terms of short-run employment gains, but has the largest long run employment gains and the highest present value. The present value for debt is only slightly lower than that for rates, but has the disadvantage for policy makers interested in long run employment gains that the interest and principal burden eventually builds to a level that makes the instrument the lowest ranked in terms of long run employment effects.

## 4. CONCLUSIONS

In contrast to financing via developer charges and payroll tax, the paper found that the gains from urban infrastructure are greatest under either rates or debt financing. The advantage of debt financing is that it provides a closer match between the timing of the burden of financing the infrastructure and the timing of the benefits provided by the infrastructure. With debt financing, employment in NSW is immediately stimulated by increased construction activity, with little offsetting increase in taxes. However this gain comes at the cost of a need to finance a growing principal and interest bill. Hence while debt is favourably ranked in terms of short-run employment gains and the present value of real consumption, it is the least favourably ranked in terms of long run employment effects. Rates financing is also favourably ranked. Imposition of rates in isolation has a negative impact on employment in the short-run because it reduces rates of return on dwellings, causing housing construction to contract. However this is more than offset by the employment gains from infrastructure construction and rising productivity. In the long-run, rates are passed through to higher NSW wages, increasing the relative price of NSW-sourced goods.

This has a long-run damping effect on NSW activity, but this is more than offset by rising productivity. Developer charges also reduce rates of return in the short-run and feed through to NSW wages and prices in the long run. However these effects are greater than under rates financing because the dwellings sector is slow growing. This leads to a long (14 year) negative deviation in employment, and a low long run employment ranking. Accordingly, the present value of real consumption under developer charges is also low. Payroll financing immediately places the revenue raising burden on the producer price of labour. This causes a large short run employment contraction. The effects of rising productivity eventually return employment to its basecase level under payroll financing, but this still leaves a long (12 year) period of negative employment deviation. This leaves payroll financing relatively lowly ranked in terms of the present value of real consumption.

**APPENDIX A: Short-run BOTE relationship between employment and alternative state tax instruments.**

Substitute (E11) into (E2):

(A1) $r_1 = p_1 - t_1^Q - p_2 - t_1^K$

Substitute (E4) into (E14), noting that $p_3 = 0$:

(A2) $p_C = \alpha_1 \left(\psi_1 / \eta_1\right) l_2 + \alpha_2 p_2$

Substitute (E8) into (E9):

(A3) $\beta_1 \; l_2 = -\eta_2 \; p_2 + \psi_{21} \; l_2 + \psi_{22} \; r_1$

Substitute (A2) into (E13), noting that $\lambda = 0$:

(A4) $w = \alpha_1 \left(\psi_1 / \eta_1\right) l_2 + \alpha_2 p_2$

Substitute (E4) into (A1):

(A5) $r_1 = \left(\psi_1 / \eta_1\right) l_2 - t_1^Q - p_2 - t_1^K$

Substitute (A4) into (E7):

(A6) $p_2 = \Phi_1 \; l_2 + \Phi_2 \; t_w$

where:

$$\Phi_1 = (\alpha_1 \psi_1 + \eta_1 \beta_2) / \eta_1 (1 - \alpha_2)$$
$$\Phi_2 = 1 / (1 - \alpha_2)$$

Substitute (A5) and (A6) into (A3):

(A7) $\Phi_3 \; l_2 = \Phi_4 \Phi_2 \; t_w + \Phi_5 \; t_1^Q + \Phi_5 t_1^K$

where

$$\Phi_3 = \beta_1 + (\eta_2 + \psi_{22}) \Phi_1 - \psi_{21} - \psi_{22} (\psi_1 / \eta_1)$$
$$\Phi_4 = -(\eta_2 + \psi_{22})$$
$$\Phi_5 = -\psi_{22}$$

**APPENDIX B: Long-run BOTE relationship between employment and alternative state tax instruments.**

Substitute (E14) into (E13) noting that both $p_3$ and $\lambda$ equal 0:

(B1) $w = \alpha_1 p_1 + \alpha_2 p_2$

Rates of return are exogenous in the long-run. Hence from (E2):

(B2) $q_i = p_2 + t_i^K$

Substitute (E11) into (B1)

(B3) $w = \alpha_1 q_1 + \alpha_1 t_1^Q + \alpha_2 p_2$

Substitute (B2) into (B3):

(B4) $w = (\alpha_1 + \alpha_2) p_2 + \alpha_1 (t_1^K + t_1^Q)$

Substitute (B2) and (B4) into (E17) and noting that $t_2^K = 0$;

(B5) $p_2 = \left(\frac{1}{\alpha_3}\right) t_W + \left(\frac{\alpha_1}{\alpha_3}\right) t_1^K + \left(\frac{\alpha_1}{\alpha_3}\right) t_1^Q$

**APPENDIX C: Short-run BOTE relationship between productivity and employment.**

Substitute (E11) into (E2) noting that $t_1^Q = t_1^K = 0$:

(C1) $r_1 = p_1 - p_2$

Substitute (E25) and (E14) into (E13) noting that $p_3 = \lambda = 0$ and $a_1 = a_2 = a$:

(C2) $w = \left(\alpha_1 \psi_1 / \eta_1\right) l_2 + \left(\alpha_1 / \eta_1\right) a + \alpha_2 p_2$

Substitute (C2) into (E23) noting that $t_W = 0$:

(C3) $\left(\beta_1 - 1 - \alpha_1 \psi_1 / \eta_1\right) l_2 - \left(\alpha_1 / \eta_1 + 1\right) a = \left(\alpha_2 - 1\right) p_2$

Substitute (E9) into (E24):

(C4) $\beta_1 l_2 = -\eta_2 p_2 + \psi_{21} l_2 + \psi_{22} r_1 + a$

Substitute (E25) into (C1):

(C5) $r_1 = \left(\psi_1 / \eta_1\right) l_2 + \left(1/\eta_1\right) a - p_2$

Substitute (C5) and (C3) into (C4):

(C6) $l_2 = \left[\Phi_6 / \Phi_7\right] a$

where:

$$\Phi_6 = \left(\psi_{22}/\eta_1\right) + 1 + \left(\eta_2 + \psi_{22}\right)\left(\alpha_1/\eta_1 + 1\right)/\left(\alpha_2 - 1\right)$$

$$\Phi_7 = \beta_1 - \psi_{21} - \left(\psi_{22}\psi_1/\eta_1\right) - \left(-\eta_2 - \psi_{22}\right)\left[\left(\beta_1 - 1 - \alpha_1\psi_1/\eta_1\right)/\left(\alpha_2 - 1\right)\right]$$

On the basis of the parameter values discussed in Appendix D, $\Phi_6 = -3.6$ and $\Phi_7 = 2.4$, hence the short-run BOTE estimate of the elasticity of employment to productivity is –1.5.

## APPENDIX D: Evaluation of the BOTE elasticities using MMRF data

Parameterisation of the short-run BOTE model requires the evaluation of:

$\alpha_1$ share of dwelling services in regional household budget;

$\alpha_2$ share of regional (non-dwellings) goods in regional household budget;

$\alpha_3$ share of imported goods in regional household budget;

$\psi_1$ elasticity of dwelling services demand with respect to employment;

$\psi_{21}$ elasticity of demand for non-dwellings with respect to employment;

$\psi_{22}$ elasticity of demand for non-dwellings with respect to rates of return;

$\eta_1$ household own-price elasticity of demand for dwelling services;

$\eta_2$ economy-wide own-price elasticity of demand for non-dwellings;

$\beta_1$ share of labour costs in non-dwellings sector of regional economy; and,

$\beta_2$ share of capital costs in non-dwellings sector of regional economy.

The household budget shares (the $\alpha$'s) and the non-dwellings cost shares (the $\beta$'s) can be read directly from the MMRF database. The 2004 values for these are $\alpha_1 = 0.24$, $\alpha_2 = 0.55$, $\alpha_3 = 0.21$, $\beta_1 = 0.73$, and $\beta_2 = 0.27$.

We evaluate $\psi_1$ by first noting that $l_2$ appears in (E3) of the BOTE model as a proxy for real private consumption spending. Hence our BOTE estimate for $\psi_1$ is:

$$\psi_1 = \varepsilon_1 \times \eta_{C_R,l} = 1.27 \times 0.65 = 0.83$$

where $\varepsilon_1$ is the NSW household's expenditure elasticity for dwelling services from the MMRF database for 2004, and $\eta_{C_R,l}$ is the share of labour income in NSW household consumption spending in the MMRF database for 2004.

*Household own-price elasticity of demand for dwelling services*

Since $\psi_1$ $l_2$ measures the effect of changes in real consumption on demand for dwelling services, $\eta_1$ must be the compensated own-price elasticity of demand for dwelling services. We use the Frisch formula and Hicks-Slutsky equation to evaluate $\eta_1$ as follows:

$$\eta_1 = \varepsilon_1 S_1 + \eta_1^{UC} \qquad \text{(Hicks-Slutsky partition)}$$

$$\eta_1^{UC} = -\varepsilon_1 S_1 (1+\varepsilon_1/f) + \varepsilon_1/f \qquad \text{(Frisch formula)}$$

where $\eta_1^{UC}$ is the uncompensated own-price elasticity of demand for dwellings services in NSW, $S_1$ is the share of dwellings services in the budget of NSW

households, and $f$ is the Frisch parameter (the negative of the ratio of total spending to supernumerary spending). We can read the values for $S_1$ and $f$ directly from the 2004 MMRF database: $S_1 = 0.24$; $f$ = -1.6. Hence

$$\eta_1^{UC} = -\varepsilon_1 S_1 (1+\varepsilon_1/f)+\varepsilon_1/f = -1.27 \times 0.24(1-1.27/1.6) - 1.27/1.6 = -0.86$$
$$\eta_1 = \varepsilon_1 S_1 + \eta_1^{UC} = 1.27 \times 0.24 - 0.86 = -0.56$$

*Own-price elasticity of demand for non-dwellings*

Unlike dwelling services, non-dwellings commodities are used in MMRF not only for current consumption purposes, but also as inputs to capital formation, intermediate inputs, demand by government, and exports. Hence our BOTE estimate for $\eta_2$ must be a sales-share weighted average of the price elasticities of demand for these various users of c2:

$$\eta_2 = S^{(1)}\eta_2^{(1)} + S^{(2)}\eta_2^{(2)} + S^{(3)}\eta_2^{(3)} + S^{(41)}\eta_2^{(41)} + S^{(42)}\eta_2^{(42)} + S^{(51)}\eta_2^{(51)} + S^{(52)}\eta_2^{(52)} + S^{(6)}\eta_2^{(6)}$$

Where $S^{(1)}$, $S^{(2)}$ $S^{(3)}$, $S^{(41)}$, $S^{(42)}$, $S^{(51)}$, $S^{(52)}$, and $S^{(6)}$ are, respectively, the shares in the total sales of NSW non-dwelling commodities of sales to NSW intermediate demands, NSW capital formation demands, NSW households, international exports, interstate exports, state government consumption, federal government consumption, and margin demands; and the $\eta_2^{(u)}$'s are the respective price elasticities for each user. From the MMRF database, the values for the sales shares are: $S^{(1)}$=0.32, $S^{(2)}$=0.08, $S^{(3)}$=0.16, $S^{(41)}$=0.12, $S^{(42)}$=0.10, $S^{(51)}$=0.06, $S^{(52)}$=0.02, and $S^{(6)}$=0.14.

The price elasticity of demand for NSW non-dwellings goods by NSW producers is given by $\eta_2^{(1)}$. In MMRF, NSW producers are assumed to face CES substitution possibilities between alternative sources of supply for each commodity. Under this assumption, the own-price elasticity of demand for any particular NSW sourced good on the part of NSW producers is given by the negative of the Armington elasticity for that good multiplied by the share of imports in total usage of that good. The average Armington elasticity faced by NSW producers is approximately 2.0, and the share of imports in total usage of non-dwellings commodities by NSW producers is 0.34. Hence our BOTE estimate of $\eta_2^{(1)}$ is –0.34 x 2.0 = –0.69.

The price elasticity of demand for NSW non-dwellings goods by NSW capital creators is given by $\eta_2^{(2)}$. In MMRF, NSW capital creators are assumed to face CES substitution possibilities between alternative sources of supply for each commodity. Under this assumption, the own-price elasticity of demand for any particular NSW sourced good on the part of NSW capital creators is given by the negative of the Armington elasticity for that good multiplied by the share of imports in total usage of that good. The average Armington elasticity faced by NSW capital creators is approximately 2.6, and the share of imports in total usage of non-dwellings commodities by NSW capital creators is 0.30. Hence our BOTE estimate of $\eta_2^{(2)}$ is –0.34 x 2.6 = –0.77.

In MMRF NSW households face three alternative sources of supply for non-dwelling commodities (*c2* and *c3* in the BOTE model): NSW, the rest of Australia, and overseas. Hence to use MMRF data to evaluate $\eta_2^{(3)}$, we must proceed in two steps: first, we evaluate the compensated own price elasticity of demand for non-dwelling commodities (an aggregate of *c2* and *c3* in the BOTE model) using MMRF data; second, we use MMRF data on Armington elasticities and sourcing shares to distinguish the own-price elasticity of demand for NSW non-dwelling commodities (*c2* in the BOTE model) from that for the non-dwellings commodity undifferentiated by source.

To evaluate the compensated own price elasticity of demand for non-dwelling commodities (an aggregate of *c2* and *c3* in the BOTE model) we begin with the Hicks-Slutsky partition, $\eta_{(2+3)}^{(3)}=\varepsilon_{(2+3)}S_{(2+3)}+\eta_{(2+3)}^{UC}$, and the Frisch equation, $\eta_{(2+3)}^{UC}=-\varepsilon_{(2+3)}S_{(2+3)}(1+\varepsilon_{(2+3)}/f)+\varepsilon_{(2+3)}/f$, where:

$\eta_{(2+3)}^{(3)}$ is the compensated own-price elasticity of demand for non-dwelling commodities

$\varepsilon_{(2+3)}$ is the NSW household's expenditure elasticity for non-dwelling commodities

$S_{(2+3)}$ is the share of non-dwelling commodities in the NSW household's budget

$\eta_{(2+3)}^{UC}$ is the uncompensated own-price elasticity of demand for non-dwelling commodities

We know from our evaluation of $\eta_1$ that $\varepsilon_1 = 1.27$ and $S_1 = 0.24$, from which we can calculate that the marginal budget share for *c1* ($\Delta_1$) is 0.30. Hence the marginal budget share for *c2* and *c3* ($\Delta_{(2+3)}$) is 0.70 (1 – 0.30 = 0.70). Since $S_1$ is 0.24, $S_{(2+3)}$ must equal 0.76 (1 – 0.24 = 0.76). Hence $\varepsilon_{(2+3)} = 0.92$ ($\varepsilon_{(2+3)} = \Delta_{(2+3)} / S_{(2+3)} = 0.70 / 0.76$). From which we can calculate that $\eta_{(2+3)}^{(3)} = -0.21$. Purchases of NSW produced non-dwelling goods by the NSW household account for about 55 per cent of the NSW household's budget. Purchases of imported goods account for about 21 per cent of the NSW budget. Hence a 1% increase in the price of NSW non-dwellings commodities would have a –0.21 x 0.55 = –0.12 per cent impact on the demand for non-dwellings commodities *irrespective of source*. However, via the Armington assumption, such a rise in the price of NSW goods relative to non-NSW goods would also induce substitution away from NSW goods. The strength of this substitution is given by negative of the Armington elasticity multiplied by the share of imports in non-dwelling consumption by NSW households. The average Armington elasticity faced by NSW households is approximately 2.1, and the share of imports in non-dwellings consumption is approximately 0.21 / (0.21 + 0.55) = 0.27. Hence our BOTE estimate for $\eta_2^{(3)}$ = –0.21 x 0.55 – 2.1 x 0.27 = –0.68.

The price elasticity of demand for NSW non-dwellings goods by foreigners is given by $\eta_2^{(41)}$. In MMRF, each NSW good faces a constant elasticity foreign demand schedule. The export value weighted average of these elasticities is approximately -5, which is our BOTE estimate for $\eta_2^{(41)}$.

The price elasticity of demand for NSW non-dwellings goods by agents in the rest of Australia is given by $\eta_2^{(42)}$. Like their counterparts in NSW, agents in the RoA are assumed to face CES substitution possibilities between goods sourced from NSW and goods sourced from the rest of Australia and overseas. Given this Armington assumption, the own-price elasticity of NSW goods in the rest of Australia will be given by the negative of the Armington elasticity multiplied by the share of goods sourced from regions other than NSW in total purchases by agents in the rest of Australia. The weighted average Armington elasticity faced by agents in the rest of Australia is approximately –4.2, and the share of non-NSW goods in total usage is approximately 0.94. Hence our BOTE estimate for $\eta_2^{(42)}$ = -4.2 x 0.94 = –4.2.

Government demands for source-specific commodities in MMRF are modelled as being exogenous. Hence $\eta_2^{(51)} = \eta_2^{(52)} = 0$. Margin demands are modelled as moving in proportion with the commodity flows that they facilitate. Hence changes in the prices of margins have only an indirect effect on sales of margin services, via their effect on the purchaser's price of the good they are facilitating. Margins represent an average of approximately 10 per cent of the purchaser's price of the average transaction in MMRF, and from the above calculations the weighted average price elasticity on non-margin sales is –1.6. Hence $\eta_2^{(6)} \approx -1.6 \times 0.10 \approx -0.16$.

We now have sufficient back-of-the-envelope estimates of elasticities from MMRF to evaluate to $\eta_2$:

$$\eta_2 = -0.69 \times 0.32 - 0.77 \times 0.08 - 0.68 \times 0.16 - 5 \times 0.12$$
$$- 4.2 \times 0.1 - 0 \times 0.06 - 0 \times 0.02 - 0.16 \times 0.14 = -1.4$$

$\psi_{21}$ - e*lasticity of demand for non-dwellings with respect to employment*

The parameter $\psi_{21}$ captures the effects of changes in industry activity and changes in household consumption within NSW on the demand for *c2* (the effect of changes in investment in NSW on demand for *c2* are measured by $\psi_{21}$). The elasticity of changes in employment on household demand for *c2* is given by the product of the share of c2 sold to NSW households (0.16), the household expenditure elasticity for c2 (0.91) and the share of labour in NSW household income (0.65). Our estimate of the elasticity of changes in employment on demand for *c2* for current production is given by the product of the share of *c2* sold to NSW producers (0.32) and the share of payments to labour in NSW GDP at factor cost (0.7). Hence our BOTE estimate of $\psi_{21}$ is 0.16 x 0.91 x 0.65 + 0.32 x 0.7 = 0.31.

$\psi_{22}$ - *elasticity of demand for non-dwellings with respect to rates of return*

Our BOTE estimate for the elasticity of demand for *c2* with respect to changes in rates of return is equal to the share of NSW non-dwellings commodities sold to NSW investors (0.08) multiplied by the average MMRF elasticity of investment to rates of return (1.2). Hence $\psi_{22}$ = 0.08 x 1.2 = 0.10.

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**TABLE 1: DEVELOPER CHARGE FINANCING IMPACTS (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | -0.20 | -0.33 | -0.45 | -0.55 | -0.65 | -0.75 | -0.84 | -0.93 | -1.01 | -1.10 | -1.17 | -1.25 | -1.32 | . . . | -1.86 |
| 2 Real investment | 0.00 | -2.50 | -2.37 | -2.37 | -2.39 | -2.37 | -2.36 | -2.37 | -2.37 | -2.37 | -2.37 | -2.37 | -2.37 | -2.36 | . . . | -2.01 |
| 3 Real state government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | 0.36 | 0.32 | 0.29 | 0.25 | 0.23 | 0.20 | 0.16 | 0.12 | 0.08 | 0.04 | -0.01 | -0.05 | -0.10 | . . . | -0.52 |
| 6 International exports | 0.00 | 1.17 | 0.90 | 0.70 | 0.51 | 0.35 | 0.19 | 0.03 | -0.13 | -0.28 | -0.42 | -0.56 | -0.69 | -0.81 | . . . | -1.89 |
| 7 Interregional imports | 0.00 | -0.51 | -0.48 | -0.47 | -0.46 | -0.43 | -0.41 | -0.39 | -0.38 | -0.36 | -0.35 | -0.33 | -0.32 | -0.30 | . . . | -0.03 |
| 8 International import volumes | 0.00 | -0.25 | -0.32 | -0.38 | -0.45 | -0.50 | -0.55 | -0.62 | -0.68 | -0.74 | -0.81 | -0.87 | -0.93 | -0.99 | . . . | -1.51 |
| 9 Real GDP (market prices) | 0.00 | -0.24 | -0.34 | -0.43 | -0.52 | -0.59 | -0.67 | -0.75 | -0.83 | -0.91 | -0.99 | -1.06 | -1.13 | -1.20 | . . . | -1.84 |
| 10 Real GDP (factor cost) | 0.00 | -0.17 | -0.27 | -0.37 | -0.46 | -0.54 | -0.63 | -0.71 | -0.79 | -0.88 | -0.96 | -1.03 | -1.11 | -1.18 | . . . | -1.86 |
| 11 Employment | 0.00 | -0.26 | -0.34 | -0.41 | -0.48 | -0.52 | -0.58 | -0.64 | -0.70 | -0.76 | -0.82 | -0.88 | -0.94 | -1.00 | . . . | -1.49 |
| 12 Capital stock | 0.00 | 0.00 | -0.16 | -0.31 | -0.45 | -0.58 | -0.71 | -0.82 | -0.93 | -1.03 | -1.13 | -1.22 | -1.30 | -1.38 | . . . | -2.03 |
| 13 gdp deflator | 0.00 | 0.02 | 0.15 | 0.24 | 0.33 | 0.40 | 0.46 | 0.52 | 0.57 | 0.62 | 0.67 | 0.71 | 0.75 | 0.79 | . . . | 1.14 |
| 14 CPI | 0.00 | -0.23 | -0.08 | 0.02 | 0.12 | 0.20 | 0.28 | 0.34 | 0.41 | 0.46 | 0.51 | 0.56 | 0.60 | 0.63 | . . . | 0.91 |
| 15 Nominal wage | 0.00 | -0.26 | -0.15 | -0.08 | -0.02 | 0.01 | 0.05 | 0.09 | 0.13 | 0.16 | 0.20 | 0.23 | 0.26 | 0.29 | . . . | 0.55 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 16 Investment in dwellings | 0.00 | -9.35 | -8.49 | -8.19 | -7.92 | -7.67 | -7.42 | -7.19 | -6.97 | -6.77 | -6.57 | -6.39 | -6.21 | -6.05 | . . . | -4.17 |
| 17 Basic price, non-dwelling sector | 0.00 | -0.20 | -0.18 | -0.16 | -0.15 | -0.13 | -0.12 | -0.11 | -0.10 | -0.09 | -0.09 | -0.08 | -0.07 | -0.06 | . . . | 0.05 |
| 18 Employment, non-dwelling sector | 0.00 | -0.26 | -0.34 | -0.41 | -0.48 | -0.52 | -0.58 | -0.64 | -0.70 | -0.76 | -0.82 | -0.88 | -0.94 | -1.00 | . . . | -1.49 |
| 19 Capital stock, non-dwelling sector | 0.00 | 0.00 | -0.05 | -0.10 | -0.15 | -0.21 | -0.27 | -0.33 | -0.39 | -0.45 | -0.51 | -0.57 | -0.63 | -0.69 | . . . | -1.26 |
| 20 Output, non-dwelling sector | 0.00 | -0.19 | -0.25 | -0.32 | -0.38 | -0.43 | -0.48 | -0.54 | -0.61 | -0.67 | -0.73 | -0.79 | -0.85 | -0.91 | . . . | -1.50 |
| 21 Rental price of capital, non-dwelling sector | 0.00 | -0.56 | -0.56 | -0.55 | -0.54 | -0.50 | -0.48 | -0.47 | -0.46 | -0.45 | -0.43 | -0.42 | -0.40 | -0.38 | . . . | -0.08 |
| **Selected national and rest-of-Australian macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 22 National real wage | 0.00 | -0.03 | -0.07 | -0.11 | -0.14 | -0.20 | -0.24 | -0.27 | -0.30 | -0.32 | -0.33 | -0.35 | -0.36 | -0.37 | . . . | -0.41 |
| 23 National employment | 0.00 | -0.05 | -0.05 | -0.05 | -0.05 | -0.03 | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 24 National capital stock | 0.00 | 0.00 | -0.06 | -0.10 | -0.15 | -0.19 | -0.22 | -0.25 | -0.27 | -0.29 | -0.31 | -0.33 | -0.34 | -0.36 | . . . | -0.41 |
| 25 National non-dwellings capital stock | 0.00 | 0.00 | -0.01 | -0.02 | -0.03 | -0.04 | -0.05 | -0.05 | -0.05 | -0.05 | -0.06 | -0.06 | -0.06 | -0.06 | . . . | -0.07 |
| 26 Basic price, non-dwelling sector, RoA | 0.00 | 0.13 | 0.04 | -0.03 | -0.09 | -0.14 | -0.19 | -0.24 | -0.28 | -0.32 | -0.35 | -0.38 | -0.41 | -0.43 | . . . | -0.60 |

**TABLE 2: PAYROLL FINANCING IMPACTS (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | -0.50 | -0.61 | -0.68 | -0.74 | -0.79 | -0.83 | -0.87 | -0.91 | -0.95 | -0.98 | -1.02 | -1.05 | -1.08 | . . . | -1.30 |
| 2 Real investment | 0.00 | -1.31 | -1.25 | -1.24 | -1.24 | -1.24 | -1.25 | -1.27 | -1.29 | -1.30 | -1.32 | -1.33 | -1.34 | -1.35 | . . . | -1.28 |
| 3 Real state government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | -0.03 | -0.06 | -0.08 | -0.11 | -0.14 | -0.17 | -0.20 | -0.23 | -0.26 | -0.30 | -0.33 | -0.36 | -0.39 | . . . | -0.67 |
| 6 International exports | 0.00 | 0.17 | 0.02 | -0.11 | -0.23 | -0.32 | -0.43 | -0.53 | -0.62 | -0.71 | -0.80 | -0.88 | -0.96 | -1.03 | . . . | -1.61 |
| 7 Interregional imports | 0.00 | -0.48 | -0.43 | -0.38 | -0.35 | -0.31 | -0.28 | -0.26 | -0.23 | -0.21 | -0.18 | -0.16 | -0.13 | -0.11 | . . . | 0.24 |
| 8 International import volumes | 0.00 | -0.56 | -0.62 | -0.67 | -0.71 | -0.75 | -0.79 | -0.83 | -0.87 | -0.91 | -0.95 | -0.99 | -1.03 | -1.06 | . . . | -1.33 |
| 9 Real GDP (market prices) | 0.00 | -0.37 | -0.44 | -0.50 | -0.55 | -0.60 | -0.64 | -0.68 | -0.73 | -0.77 | -0.81 | -0.85 | -0.89 | -0.92 | . . . | -1.24 |
| 10 Real GDP (factor cost) | 0.00 | -0.32 | -0.40 | -0.46 | -0.51 | -0.55 | -0.60 | -0.64 | -0.69 | -0.73 | -0.77 | -0.81 | -0.85 | -0.88 | . . . | -1.20 |
| 11 Employment | 0.00 | -0.51 | -0.57 | -0.61 | -0.64 | -0.66 | -0.69 | -0.73 | -0.77 | -0.80 | -0.84 | -0.87 | -0.90 | -0.93 | . . . | -1.21 |
| 12 Capital stock | 0.00 | 0.00 | -0.11 | -0.20 | -0.28 | -0.35 | -0.42 | -0.48 | -0.53 | -0.58 | -0.63 | -0.68 | -0.72 | -0.76 | . . . | -1.09 |
| 13 gdp deflator | 0.00 | -0.18 | -0.11 | -0.07 | -0.03 | 0.00 | 0.03 | 0.06 | 0.08 | 0.10 | 0.13 | 0.15 | 0.17 | 0.18 | . . . | 0.36 |
| 14 CPI | 0.00 | -0.30 | -0.22 | -0.17 | -0.13 | -0.10 | -0.08 | -0.05 | -0.03 | -0.02 | 0.00 | 0.02 | 0.03 | 0.04 | . . . | 0.15 |
| 15 Nominal consumer wage | 0.00 | -0.38 | -0.36 | -0.35 | -0.35 | -0.35 | -0.34 | -0.32 | -0.31 | -0.29 | -0.28 | -0.26 | -0.25 | -0.23 | . . . | -0.10 |
| 16 Nominal producer wage | 0.00 | 0.27 | 0.29 | 0.29 | 0.30 | 0.30 | 0.31 | 0.32 | 0.34 | 0.36 | 0.37 | 0.39 | 0.40 | 0.41 | | 0.55 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | . . . | |
| 17 Investment in dwellings | 0.00 | -2.22 | -2.23 | -2.27 | -2.27 | -2.26 | -2.24 | -2.21 | -2.18 | -2.16 | -2.13 | -2.10 | -2.07 | -2.05 | . . . | -1.71 |
| 18 Basic price, non-dwelling sector | 0.00 | 0.03 | 0.07 | 0.10 | 0.12 | 0.14 | 0.16 | 0.17 | 0.18 | 0.19 | 0.20 | 0.21 | 0.22 | 0.23 | . . . | 0.30 |
| 19 Employment, non-dwelling sector | 0.00 | -0.51 | -0.57 | -0.61 | -0.64 | -0.66 | -0.69 | -0.73 | -0.77 | -0.80 | -0.84 | -0.87 | -0.90 | -0.93 | . . . | -1.21 |
| 20 Capital stock, non-dwelling sector | 0.00 | 0.00 | -0.12 | -0.21 | -0.29 | -0.35 | -0.41 | -0.47 | -0.52 | -0.56 | -0.61 | -0.65 | -0.69 | -0.73 | . . . | -1.04 |
| 21 Output, non-dwelling sector | 0.00 | -0.37 | -0.44 | -0.50 | -0.54 | -0.58 | -0.62 | -0.66 | -0.71 | -0.75 | -0.79 | -0.82 | -0.86 | -0.90 | . . . | -1.21 |
| 22 Rental price of capital, non-dwelling sector | 0.00 | -0.93 | -0.69 | -0.53 | -0.41 | -0.31 | -0.25 | -0.21 | -0.17 | -0.14 | -0.11 | -0.08 | -0.06 | -0.03 | | 0.18 |
| **Selected national macroeconomic impacts** | | | | | | | | | | | | | | | . . . | |
| 23 National real wage | 0.00 | -0.08 | -0.14 | -0.18 | -0.21 | -0.25 | -0.26 | -0.27 | -0.28 | -0.28 | -0.28 | -0.28 | -0.28 | -0.28 | . . . | -0.26 |
| 24 National employment | 0.00 | -0.11 | -0.09 | -0.06 | -0.05 | -0.02 | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 25 National capital stock | 0.00 | 0.00 | -0.03 | -0.05 | -0.07 | -0.08 | -0.09 | -0.09 | -0.10 | -0.10 | -0.10 | -0.10 | -0.10 | -0.10 | . . . | -0.09 |
| 26 National non-dwellings capital stock | 0.00 | 0.00 | -0.03 | -0.05 | -0.06 | -0.07 | -0.07 | -0.07 | -0.06 | -0.06 | -0.06 | -0.06 | -0.06 | -0.06 | . . . | -0.04 |
| 27 Basic price, non-dwelling sector, RoA | 0.00 | 0.17 | 0.12 | 0.08 | 0.05 | 0.02 | 0.00 | -0.02 | -0.03 | -0.05 | -0.06 | -0.07 | -0.08 | -0.09 | . . . | -0.17 |

**TABLE 3: DEBT FINANCING IMPACTS (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | -0.05 | -0.10 | -0.16 | -0.23 | -0.29 | -0.35 | -0.42 | -0.50 | -0.57 | -0.65 | -0.73 | -0.81 | -0.89 | . . . | -1.69 |
| 2 Real investment | 0.00 | -0.11 | -0.22 | -0.33 | -0.44 | -0.53 | -0.62 | -0.73 | -0.83 | -0.94 | -1.04 | -1.15 | -1.25 | -1.35 | . . . | -1.78 |
| 3 Real state government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 | -0.02 | -0.03 | -0.05 | -0.07 | -0.09 | -0.11 | -0.13 | -0.16 | . . . | -0.63 |
| 6 International exports | 0.00 | 0.01 | 0.01 | 0.00 | -0.02 | -0.04 | -0.07 | -0.12 | -0.18 | -0.25 | -0.32 | -0.40 | -0.49 | -0.59 | . . . | -1.90 |
| 7 Interregional imports | 0.00 | -0.04 | -0.08 | -0.11 | -0.14 | -0.16 | -0.18 | -0.19 | -0.21 | -0.23 | -0.24 | -0.25 | -0.26 | -0.27 | . . . | -0.05 |
| 8 International import volumes | 0.00 | -0.05 | -0.10 | -0.16 | -0.22 | -0.27 | -0.33 | -0.39 | -0.46 | -0.53 | -0.60 | -0.67 | -0.75 | -0.82 | . . . | -1.65 |
| 9 Real GDP (market prices) | 0.00 | -0.03 | -0.07 | -0.12 | -0.16 | -0.20 | -0.25 | -0.30 | -0.36 | -0.42 | -0.48 | -0.55 | -0.62 | -0.69 | . . . | -1.52 |
| 10 Real GDP (factor cost) | 0.00 | -0.03 | -0.07 | -0.10 | -0.15 | -0.19 | -0.23 | -0.28 | -0.33 | -0.39 | -0.45 | -0.51 | -0.58 | -0.65 | . . . | -1.47 |
| 11 Employment | 0.00 | -0.05 | -0.10 | -0.15 | -0.21 | -0.25 | -0.30 | -0.36 | -0.42 | -0.49 | -0.56 | -0.63 | -0.70 | -0.77 | . . . | -1.57 |
| 12 Capital stock | 0.00 | 0.00 | -0.01 | -0.03 | -0.05 | -0.08 | -0.12 | -0.15 | -0.20 | -0.24 | -0.29 | -0.35 | -0.40 | -0.46 | . . . | -1.28 |
| 13 gdp deflator | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | -0.02 | -0.01 | -0.01 | 0.01 | 0.02 | 0.03 | 0.05 | 0.07 | 0.09 | . . . | 0.47 |
| 14 CPI | 0.00 | -0.02 | -0.04 | -0.05 | -0.06 | -0.07 | -0.07 | -0.07 | -0.07 | -0.07 | -0.07 | -0.07 | -0.06 | -0.05 | . . . | 0.13 |
| 15 Nominal consumer wage | 0.00 | -0.03 | -0.06 | -0.09 | -0.12 | -0.16 | -0.19 | -0.22 | -0.24 | -0.27 | -0.28 | -0.30 | -0.32 | -0.33 | . . . | -0.27 |
| 16 Nominal producer wage | 0.00 | 0.03 | 0.06 | 0.09 | 0.13 | 0.15 | 0.18 | 0.21 | 0.25 | 0.29 | 0.33 | 0.38 | 0.43 | 0.47 | . . . | 0.97 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 17 Investment in dwellings | 0.00 | -0.19 | -0.38 | -0.57 | -0.76 | -0.94 | -1.11 | -1.28 | -1.45 | -1.61 | -1.77 | -1.92 | -2.07 | -2.21 | . . . | -2.62 |
| 18 Basic price, non-dwelling sector | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.05 | 0.06 | 0.07 | 0.09 | 0.11 | 0.12 | 0.14 | 0.16 | 0.18 | . . . | 0.39 |
| 19 Employment, non-dwelling sector | 0.00 | -0.05 | -0.10 | -0.15 | -0.21 | -0.25 | -0.30 | -0.36 | -0.42 | -0.49 | -0.56 | -0.63 | -0.70 | -0.77 | . . . | -1.57 |
| 20 Capital stock, non-dwelling sector | 0.00 | 0.00 | -0.01 | -0.03 | -0.05 | -0.08 | -0.12 | -0.15 | -0.19 | -0.24 | -0.29 | -0.34 | -0.40 | -0.45 | . . . | -1.24 |
| 21 Output, non-dwelling sector | 0.00 | -0.03 | -0.07 | -0.12 | -0.16 | -0.20 | -0.25 | -0.30 | -0.35 | -0.41 | -0.47 | -0.53 | -0.60 | -0.67 | . . . | -1.49 |
| 22 Rental price of capital, non-dwelling sector | 0.00 | -0.08 | -0.14 | -0.18 | -0.21 | -0.21 | -0.21 | -0.22 | -0.23 | -0.23 | -0.23 | -0.23 | -0.22 | -0.21 | . . . | 0.17 |
| **Selected national macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 23 National real wage | 0.00 | -0.01 | -0.02 | -0.04 | -0.05 | -0.09 | -0.12 | -0.15 | -0.17 | -0.19 | -0.21 | -0.24 | -0.26 | -0.28 | . . . | -0.43 |
| 24 National employment | 0.00 | -0.01 | -0.02 | -0.02 | -0.03 | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 25 National capital stock | 0.00 | 0.00 | 0.00 | -0.01 | -0.01 | -0.02 | -0.03 | -0.03 | -0.04 | -0.04 | -0.05 | -0.06 | -0.06 | -0.07 | . . . | -0.14 |
| 26 National non-dwellings capital stock | 0.00 | 0.00 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 | -0.02 | -0.03 | -0.03 | -0.03 | -0.03 | -0.04 | -0.04 | . . . | -0.07 |
| 27 Basic price, non-dwelling sector, RoA | 0.00 | 0.01 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | -0.01 | -0.02 | . . . | -0.18 |

**TABLE 4: RESIDENTIAL RATES FINANCING IMPACTS (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | -0.20 | -0.30 | -0.38 | -0.45 | -0.52 | -0.58 | -0.64 | -0.70 | -0.75 | -0.81 | -0.85 | -0.90 | -0.94 | . . . | -1.26 |
| 2 Real investment | 0.00 | -1.60 | -1.51 | -1.53 | -1.54 | -1.53 | -1.52 | -1.52 | -1.52 | -1.52 | -1.52 | -1.52 | -1.51 | -1.51 | . . . | -1.22 |
| 3 Real state government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | 0.31 | 0.28 | 0.25 | 0.23 | 0.22 | 0.20 | 0.17 | 0.15 | 0.12 | 0.09 | 0.06 | 0.03 | 0.00 | . . . | -0.28 |
| 6 International exports | 0.00 | 1.00 | 0.80 | 0.65 | 0.52 | 0.41 | 0.30 | 0.19 | 0.09 | -0.02 | -0.11 | -0.21 | -0.30 | -0.38 | . . . | -1.11 |
| 7 Interregional imports | 0.00 | -0.41 | -0.40 | -0.39 | -0.39 | -0.37 | -0.36 | -0.35 | -0.34 | -0.33 | -0.32 | -0.31 | -0.30 | -0.28 | . . . | -0.09 |
| 8 International import volumes | 0.00 | -0.15 | -0.20 | -0.24 | -0.29 | -0.32 | -0.35 | -0.39 | -0.43 | -0.47 | -0.51 | -0.55 | -0.59 | -0.62 | . . . | -0.93 |
| 9 Real GDP (market prices) | 0.00 | -0.12 | -0.19 | -0.26 | -0.31 | -0.36 | -0.41 | -0.46 | -0.51 | -0.56 | -0.61 | -0.65 | -0.69 | -0.74 | . . . | -1.10 |
| 10 Real GDP (factor cost) | 0.00 | -0.08 | -0.16 | -0.22 | -0.28 | -0.33 | -0.39 | -0.44 | -0.49 | -0.55 | -0.60 | -0.65 | -0.69 | -0.74 | . . . | -1.14 |
| 11 Employment | 0.00 | -0.12 | -0.19 | -0.24 | -0.29 | -0.31 | -0.35 | -0.39 | -0.43 | -0.47 | -0.51 | -0.54 | -0.58 | -0.62 | . . . | -0.91 |
| 12 Capital stock | 0.00 | 0.00 | -0.11 | -0.20 | -0.29 | -0.38 | -0.46 | -0.53 | -0.60 | -0.66 | -0.72 | -0.78 | -0.84 | -0.89 | . . . | -1.28 |
| 13 gdp deflator | 0.00 | -0.28 | -0.19 | -0.12 | -0.06 | -0.01 | 0.03 | 0.07 | 0.11 | 0.14 | 0.17 | 0.20 | 0.23 | 0.25 | . . . | 0.48 |
| 14 CPI | 0.00 | -0.23 | -0.12 | -0.05 | 0.02 | 0.08 | 0.13 | 0.18 | 0.22 | 0.25 | 0.29 | 0.32 | 0.34 | 0.37 | . . . | 0.55 |
| 15 Nominal wage | 0.00 | -0.24 | -0.15 | -0.10 | -0.06 | -0.03 | -0.01 | 0.02 | 0.05 | 0.07 | 0.10 | 0.12 | 0.14 | 0.16 | . . . | 0.33 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 16 Investment in dwellings | 0.00 | -6.10 | -5.55 | -5.40 | -5.25 | -5.08 | -4.92 | -4.76 | -4.61 | -4.47 | -4.33 | -4.20 | -4.08 | -3.96 | . . . | -2.54 |
| 17 Basic price, non-dwelling sector | 0.00 | -0.15 | -0.13 | -0.12 | -0.11 | -0.10 | -0.09 | -0.08 | -0.08 | -0.07 | -0.06 | -0.06 | -0.05 | -0.05 | . . . | 0.02 |
| 18 Employment, non-dwelling sector | 0.00 | -0.12 | -0.19 | -0.24 | -0.29 | -0.31 | -0.35 | -0.39 | -0.43 | -0.47 | -0.51 | -0.54 | -0.58 | -0.62 | . . . | -0.91 |
| 19 Capital stock, non-dwelling sector | 0.00 | 0.00 | -0.03 | -0.06 | -0.10 | -0.14 | -0.17 | -0.21 | -0.25 | -0.28 | -0.32 | -0.36 | -0.40 | -0.43 | . . . | -0.77 |
| 20 Output, non-dwelling sector | 0.00 | -0.09 | -0.14 | -0.18 | -0.23 | -0.26 | -0.29 | -0.33 | -0.37 | -0.41 | -0.45 | -0.49 | -0.52 | -0.56 | . . . | -0.91 |
| 21 Rental price of capital, non-dwelling sector | 0.00 | -0.37 | -0.36 | -0.36 | -0.35 | -0.32 | -0.30 | -0.29 | -0.29 | -0.28 | -0.27 | -0.26 | -0.25 | -0.24 | . . . | -0.05 |
| **Selected national macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 22 National real wage | 0.00 | -0.01 | -0.03 | -0.05 | -0.08 | -0.12 | -0.14 | -0.16 | -0.18 | -0.19 | -0.20 | -0.21 | -0.22 | -0.23 | . . . | -0.25 |
| 23 National employment | 0.00 | -0.01 | -0.03 | -0.03 | -0.03 | -0.02 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 24 National capital stock | 0.00 | 0.00 | -0.04 | -0.07 | -0.10 | -0.12 | -0.15 | -0.16 | -0.18 | -0.19 | -0.21 | -0.22 | -0.23 | -0.24 | . . . | -0.27 |
| 25 National non-dwellings capital stock | 0.00 | 0.00 | -0.01 | -0.01 | -0.02 | -0.03 | -0.03 | -0.04 | -0.04 | -0.04 | -0.04 | -0.04 | -0.04 | -0.05 | . . . | -0.05 |
| 26 Basic price, non-dwelling sector, RoA | 0.00 | 0.13 | 0.07 | 0.02 | -0.02 | -0.06 | -0.09 | -0.12 | -0.15 | -0.18 | -0.20 | -0.22 | -0.24 | -0.25 | . . . | -0.37 |

**TABLE 5: CONSTRUCTION IMPACTS (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | 0.18 | 0.19 | 0.19 | 0.18 | 0.17 | 0.17 | 0.17 | 0.17 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | . . . | 0.10 |
| 2 Real investment | 0.00 | 0.14 | 0.15 | 0.16 | 0.18 | 0.19 | 0.19 | 0.20 | 0.20 | 0.20 | 0.19 | 0.19 | 0.18 | 0.17 | . . . | 0.05 |
| 3 Real state government consumption | 0.00 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | . . . | 3.47 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | -0.30 | -0.32 | -0.32 | -0.32 | -0.32 | -0.31 | -0.30 | -0.29 | -0.28 | -0.27 | -0.26 | -0.24 | -0.23 | . . . | -0.13 |
| 6 International exports | 0.00 | -0.93 | -0.91 | -0.86 | -0.80 | -0.75 | -0.69 | -0.64 | -0.59 | -0.54 | -0.50 | -0.46 | -0.43 | -0.39 | . . . | -0.15 |
| 7 Interregional imports | 0.00 | 0.44 | 0.42 | 0.39 | 0.38 | 0.36 | 0.35 | 0.34 | 0.33 | 0.32 | 0.30 | 0.29 | 0.28 | 0.27 | . . . | 0.13 |
| 8 International import volumes | 0.00 | 0.22 | 0.21 | 0.20 | 0.20 | 0.19 | 0.19 | 0.19 | 0.19 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | . . . | 0.11 |
| 9 Real GDP (market prices) | 0.00 | 0.14 | 0.14 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.14 | 0.13 | . . . | 0.09 |
| 10 Real GDP (factor cost) | 0.00 | 0.14 | 0.14 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.14 | 0.14 | 0.14 | . . . | 0.10 |
| 11 Employment | 0.00 | 0.21 | 0.21 | 0.20 | 0.19 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | . . . | 0.14 |
| 12 Capital stock | 0.00 | 0.00 | 0.02 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.11 | 0.11 | 0.12 | 0.12 | . . . | 0.11 |
| 13 gdp deflator | 0.00 | 0.27 | 0.23 | 0.20 | 0.17 | 0.14 | 0.12 | 0.10 | 0.09 | 0.08 | 0.06 | 0.05 | 0.05 | 0.04 | . . . | -0.01 |
| 14 CPI | 0.00 | 0.19 | 0.16 | 0.14 | 0.12 | 0.10 | 0.09 | 0.08 | 0.07 | 0.06 | 0.05 | 0.04 | 0.03 | 0.03 | . . . | 0.00 |
| 15 Nominal wage | 0.00 | 0.22 | 0.21 | 0.19 | 0.17 | 0.16 | 0.14 | 0.12 | 0.11 | 0.10 | 0.09 | 0.08 | 0.07 | 0.06 | . . . | 0.00 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 16 Investment in dwellings | 0.00 | 0.07 | 0.19 | 0.26 | 0.31 | 0.35 | 0.36 | 0.37 | 0.37 | 0.36 | 0.34 | 0.32 | 0.30 | 0.28 | . . . | 0.03 |
| 17 Basic price, non-dwelling sector | 0.00 | 0.15 | 0.13 | 0.11 | 0.09 | 0.08 | 0.07 | 0.06 | 0.05 | 0.04 | 0.04 | 0.03 | 0.03 | 0.02 | . . . | 0.01 |
| 18 Employment, non-dwelling sector | 0.00 | 0.21 | 0.21 | 0.20 | 0.19 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | . . . | 0.14 |
| 19 Capital stock, non-dwelling sector | 0.00 | 0.00 | 0.03 | 0.05 | 0.06 | 0.08 | 0.09 | 0.10 | 0.10 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | . . . | 0.11 |
| 20 Output, non-dwelling sector | 0.00 | 0.15 | 0.15 | 0.15 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | . . . | 0.10 |
| 21 Rental price of capital, non-dwelling sector | 0.00 | 0.42 | 0.30 | 0.21 | 0.15 | 0.10 | 0.07 | 0.04 | 0.03 | 0.01 | 0.00 | -0.01 | -0.02 | -0.03 | . . . | -0.06 |
| **Selected national and rest-of-Australian macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 22 National real wage | 0.00 | 0.03 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 | 0.03 | . . . | 0.00 |
| 23 National employment | 0.00 | 0.04 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 24 National capital stock | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | -0.01 |
| 25 National non-dwellings capital stock | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | -0.01 |
| 26 Basic price, non-dwelling sector, RoA | 0.00 | -0.11 | -0.09 | -0.07 | -0.06 | -0.05 | -0.04 | -0.03 | -0.03 | -0.02 | -0.02 | -0.01 | -0.01 | -0.01 | . . . | 0.01 |

**TABLE 6: PRODUCTIVITY INCREASE (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | 0.00 | 0.06 | 0.13 | 0.21 | 0.29 | 0.37 | 0.46 | 0.55 | 0.65 | 0.76 | 0.87 | 0.98 | 1.10 | . . . | 3.00 |
| 2 Real investment | 0.00 | 0.00 | 0.11 | 0.23 | 0.36 | 0.47 | 0.59 | 0.73 | 0.88 | 1.03 | 1.19 | 1.35 | 1.51 | 1.67 | . . . | 3.64 |
| 3 Real state government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | 0.00 | 0.06 | 0.13 | 0.19 | 0.25 | 0.31 | 0.38 | 0.45 | 0.52 | 0.60 | 0.69 | 0.77 | 0.86 | . . . | 2.31 |
| 6 International exports | 0.00 | 0.00 | 0.17 | 0.33 | 0.49 | 0.64 | 0.79 | 0.96 | 1.13 | 1.31 | 1.50 | 1.70 | 1.90 | 2.11 | . . . | 5.34 |
| 7 Interregional imports | 0.00 | 0.00 | 0.02 | 0.04 | 0.06 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.11 | 0.12 | 0.13 | 0.13 | . . . | -0.06 |
| 8 International import volumes | 0.00 | 0.00 | 0.09 | 0.19 | 0.30 | 0.39 | 0.50 | 0.62 | 0.75 | 0.88 | 1.02 | 1.16 | 1.31 | 1.46 | . . . | 3.86 |
| 9 Real GDP (market prices) | 0.00 | 0.00 | 0.09 | 0.18 | 0.28 | 0.37 | 0.47 | 0.58 | 0.70 | 0.82 | 0.95 | 1.08 | 1.23 | 1.37 | . . . | 3.80 |
| 10 Real GDP (factor cost) | 0.00 | 0.00 | 0.09 | 0.18 | 0.28 | 0.37 | 0.47 | 0.58 | 0.69 | 0.82 | 0.94 | 1.08 | 1.22 | 1.37 | . . . | 3.79 |
| 11 Employment | 0.00 | 0.00 | 0.05 | 0.10 | 0.15 | 0.19 | 0.23 | 0.29 | 0.35 | 0.42 | 0.50 | 0.58 | 0.66 | 0.75 | . . . | 2.25 |
| 12 Capital stock | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.06 | 0.10 | 0.14 | 0.19 | 0.24 | 0.31 | 0.38 | 0.46 | 0.55 | . . . | 2.14 |
| 13 gdp deflator | 0.00 | 0.00 | -0.03 | -0.06 | -0.10 | -0.13 | -0.16 | -0.19 | -0.23 | -0.26 | -0.30 | -0.35 | -0.39 | -0.44 | . . . | -1.29 |
| 14 CPI | 0.00 | 0.00 | -0.02 | -0.04 | -0.06 | -0.08 | -0.10 | -0.12 | -0.14 | -0.16 | -0.18 | -0.20 | -0.23 | -0.25 | . . . | -0.64 |
| 15 Nominal wage | 0.00 | 0.00 | -0.01 | -0.02 | -0.02 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.08 | . . . | 0.12 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 16 Investment in dwellings | 0.00 | 0.00 | 0.15 | 0.30 | 0.46 | 0.61 | 0.77 | 0.94 | 1.11 | 1.28 | 1.46 | 1.64 | 1.82 | 2.00 | . . . | 3.93 |
| 17 Basic price, non-dwelling sector | 0.00 | 0.00 | -0.03 | -0.06 | -0.08 | -0.11 | -0.14 | -0.17 | -0.20 | -0.23 | -0.26 | -0.30 | -0.33 | -0.37 | . . . | -0.90 |
| 18 Employment, non-dwelling sector | 0.00 | 0.00 | 0.05 | 0.10 | 0.15 | 0.19 | 0.23 | 0.29 | 0.35 | 0.42 | 0.50 | 0.58 | 0.66 | 0.75 | . . . | 2.25 |
| 19 Capital stock, non-dwelling sector | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.07 | 0.11 | 0.15 | 0.21 | 0.27 | 0.34 | 0.42 | 0.50 | 0.59 | . . . | 2.25 |
| 20 Output, non-dwelling sector | 0.00 | 0.00 | 0.09 | 0.18 | 0.28 | 0.37 | 0.48 | 0.59 | 0.70 | 0.83 | 0.96 | 1.09 | 1.23 | 1.38 | . . . | 3.82 |
| 21 Rental price of capital, non-dwelling sector | 0.00 | 0.00 | 0.08 | 0.15 | 0.20 | 0.22 | 0.24 | 0.27 | 0.29 | 0.31 | 0.32 | 0.32 | 0.32 | 0.32 | . . . | -0.08 |
| **Selected national and rest-of-Australian macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 22 National real wage | 0.00 | 0.00 | 0.01 | 0.02 | 0.04 | 0.09 | 0.12 | 0.15 | 0.18 | 0.21 | 0.25 | 0.28 | 0.31 | 0.34 | . . . | 0.81 |
| 23 National employment | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 24 National capital stock | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.04 | 0.06 | 0.07 | 0.08 | 0.10 | 0.11 | . . . | 0.40 |
| 25 National non-dwellings capital stock | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.07 | 0.08 | 0.09 | 0.11 | . . . | 0.38 |
| 26 Basic price, non-dwelling sector, RoA | 0.00 | 0.00 | 0.01 | 0.03 | 0.04 | 0.05 | 0.07 | 0.09 | 0.10 | 0.12 | 0.14 | 0.16 | 0.18 | 0.20 | . . . | 0.53 |

**TABLE 7: INFRASTRUCTURE CONSTRUCTION AND PRODUCTIVITY EFFECTS UNDER DEVELOPER CHARGE FINANCING (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | -0.02 | -0.08 | -0.13 | -0.17 | -0.20 | -0.21 | -0.22 | -0.22 | -0.21 | -0.19 | -0.16 | -0.12 | -0.07 | . . . | 1.19 |
| 2 Real investment | 0.00 | -2.36 | -2.11 | -1.99 | -1.87 | -1.73 | -1.59 | -1.45 | -1.31 | -1.16 | -1.01 | -0.86 | -0.71 | -0.55 | . . . | 1.61 |
| 3 Real state government consumption | 0.00 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | . . . | 3.46 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | 0.07 | 0.07 | 0.09 | 0.12 | 0.16 | 0.20 | 0.24 | 0.28 | 0.33 | 0.38 | 0.43 | 0.48 | 0.54 | . . . | 1.65 |
| 6 International exports | 0.00 | 0.24 | 0.16 | 0.17 | 0.20 | 0.25 | 0.30 | 0.36 | 0.42 | 0.50 | 0.58 | 0.68 | 0.78 | 0.90 | . . . | 3.23 |
| 7 Interregional imports | 0.00 | -0.08 | -0.05 | -0.04 | -0.03 | -0.01 | 0.01 | 0.02 | 0.04 | 0.05 | 0.07 | 0.08 | 0.09 | 0.10 | . . . | 0.06 |
| 8 International import volumes | 0.00 | -0.03 | -0.01 | 0.01 | 0.04 | 0.09 | 0.14 | 0.19 | 0.25 | 0.31 | 0.39 | 0.46 | 0.55 | 0.64 | . . . | 2.41 |
| 9 Real GDP (market prices) | 0.00 | -0.10 | -0.11 | -0.12 | -0.11 | -0.10 | -0.07 | -0.05 | -0.01 | 0.04 | 0.09 | 0.15 | 0.22 | 0.29 | . . . | 1.98 |
| 10 Real GDP (factor cost) | 0.00 | -0.03 | -0.05 | -0.06 | -0.06 | -0.05 | -0.03 | -0.01 | 0.02 | 0.06 | 0.11 | 0.17 | 0.23 | 0.30 | . . . | 1.95 |
| 11 Employment | 0.00 | -0.05 | -0.09 | -0.12 | -0.15 | -0.16 | -0.16 | -0.17 | -0.17 | -0.16 | -0.15 | -0.13 | -0.11 | -0.08 | . . . | 0.87 |
| 12 Capital stock | 0.00 | 0.00 | -0.15 | -0.27 | -0.38 | -0.47 | -0.55 | -0.61 | -0.66 | -0.70 | -0.72 | -0.74 | -0.74 | -0.73 | . . . | 0.16 |
| 13 gdp deflator | 0.00 | 0.28 | 0.34 | 0.37 | 0.40 | 0.41 | 0.43 | 0.43 | 0.44 | 0.43 | 0.43 | 0.42 | 0.40 | 0.39 | . . . | -0.17 |
| 14 CPI | 0.00 | -0.04 | 0.06 | 0.12 | 0.18 | 0.23 | 0.27 | 0.30 | 0.33 | 0.36 | 0.38 | 0.39 | 0.40 | 0.41 | . . . | 0.26 |
| 15 Nominal wage | 0.00 | -0.04 | 0.04 | 0.09 | 0.14 | 0.17 | 0.20 | 0.24 | 0.27 | 0.30 | 0.34 | 0.37 | 0.39 | 0.42 | . . . | 0.66 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 16 Investment in dwellings | 0.00 | -9.28 | -8.19 | -7.69 | -7.23 | -6.80 | -6.38 | -5.99 | -5.60 | -5.24 | -4.88 | -4.54 | -4.21 | -3.89 | . . . | -0.35 |
| 17 Basic price, non-dwelling sector | 0.00 | -0.06 | -0.08 | -0.11 | -0.14 | -0.17 | -0.20 | -0.23 | -0.26 | -0.29 | -0.32 | -0.35 | -0.38 | -0.41 | . . . | -0.86 |
| 18 Employment, non-dwelling sector | 0.00 | -0.05 | -0.09 | -0.12 | -0.15 | -0.16 | -0.16 | -0.17 | -0.17 | -0.16 | -0.15 | -0.13 | -0.11 | -0.08 | . . . | 0.87 |
| 19 Capital stock, non-dwelling sector | 0.00 | 0.00 | -0.02 | -0.04 | -0.06 | -0.08 | -0.09 | -0.09 | -0.09 | -0.08 | -0.07 | -0.05 | -0.02 | 0.01 | . . . | 1.07 |
| 20 Output, non-dwelling sector | 0.00 | -0.03 | -0.01 | 0.01 | 0.04 | 0.08 | 0.13 | 0.18 | 0.23 | 0.29 | 0.36 | 0.43 | 0.51 | 0.59 | . . . | 2.36 |
| 21 Rental price of capital, non-dwelling sector | 0.00 | -0.16 | -0.18 | -0.20 | -0.19 | -0.17 | -0.16 | -0.15 | -0.13 | -0.12 | -0.11 | -0.10 | -0.09 | -0.08 | . . . | -0.22 |
| **Selected national and rest-of-Australian macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 22 National real wage | 0.00 | -0.01 | -0.02 | -0.03 | -0.05 | -0.07 | -0.07 | -0.08 | -0.07 | -0.06 | -0.05 | -0.04 | -0.02 | 0.00 | . . . | 0.40 |
| 23 National employment | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 24 National capital stock | 0.00 | 0.00 | -0.05 | -0.10 | -0.14 | -0.17 | -0.19 | -0.21 | -0.23 | -0.24 | -0.24 | -0.25 | -0.25 | -0.24 | . . . | -0.03 |
| 25 National non-dwellings capital stock | 0.00 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 | -0.02 | -0.01 | -0.01 | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | . . . | 0.29 |
| 26 Basic price, non-dwelling sector, RoA | 0.00 | 0.02 | -0.04 | -0.08 | -0.11 | -0.14 | -0.17 | -0.19 | -0.21 | -0.22 | -0.23 | -0.24 | -0.24 | -0.24 | . . . | -0.08 |

**TABLE 8: INFRASTRUCTURE CONSTRUCTION AND PRODUCTIVITY EFFECTS UNDER PAYROLL FINANCING (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | -0.32 | -0.36 | -0.36 | -0.35 | -0.33 | -0.30 | -0.25 | -0.20 | -0.14 | -0.07 | 0.01 | 0.09 | 0.18 | . . . | 1.77 |
| 2 Real investment | 0.00 | -1.16 | -0.98 | -0.85 | -0.71 | -0.59 | -0.47 | -0.34 | -0.21 | -0.08 | 0.06 | 0.20 | 0.34 | 0.49 | . . . | 2.37 |
| 3 Real state government consumption | 0.00 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | . . . | 3.47 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | -0.32 | -0.31 | -0.28 | -0.24 | -0.21 | -0.16 | -0.12 | -0.07 | -0.02 | 0.04 | 0.10 | 0.17 | 0.24 | . . . | 1.50 |
| 6 International exports | 0.00 | -0.76 | -0.72 | -0.63 | -0.54 | -0.43 | -0.32 | -0.20 | -0.08 | 0.06 | 0.20 | 0.35 | 0.51 | 0.68 | . . . | 3.52 |
| 7 Interregional imports | 0.00 | -0.04 | 0.01 | 0.05 | 0.08 | 0.11 | 0.14 | 0.16 | 0.19 | 0.21 | 0.24 | 0.26 | 0.28 | 0.30 | . . . | 0.34 |
| 8 International import volumes | 0.00 | -0.34 | -0.32 | -0.27 | -0.22 | -0.16 | -0.10 | -0.02 | 0.06 | 0.15 | 0.24 | 0.34 | 0.45 | 0.57 | . . . | 2.59 |
| 9 Real GDP (market prices) | 0.00 | -0.23 | -0.22 | -0.19 | -0.15 | -0.10 | -0.04 | 0.02 | 0.10 | 0.18 | 0.27 | 0.36 | 0.46 | 0.57 | . . . | 2.61 |
| 10 Real GDP (factor cost) | 0.00 | -0.19 | -0.18 | -0.15 | -0.11 | -0.06 | 0.00 | 0.06 | 0.14 | 0.22 | 0.30 | 0.40 | 0.50 | 0.61 | . . . | 2.64 |
| 11 Employment | 0.00 | -0.30 | -0.31 | -0.32 | -0.31 | -0.30 | -0.28 | -0.26 | -0.23 | -0.20 | -0.16 | -0.11 | -0.06 | -0.01 | . . . | 1.16 |
| 12 Capital stock | 0.00 | 0.00 | -0.09 | -0.16 | -0.20 | -0.23 | -0.25 | -0.26 | -0.25 | -0.24 | -0.22 | -0.19 | -0.15 | -0.10 | . . . | 1.13 |
| 13 gdp deflator | 0.00 | 0.09 | 0.08 | 0.06 | 0.04 | 0.02 | -0.01 | -0.03 | -0.06 | -0.09 | -0.12 | -0.15 | -0.18 | -0.22 | . . . | -0.95 |
| 14 CPI | 0.00 | -0.10 | -0.08 | -0.07 | -0.07 | -0.08 | -0.09 | -0.10 | -0.11 | -0.12 | -0.13 | -0.15 | -0.16 | -0.18 | . . . | -0.50 |
| 15 Nominal consumer wage | 0.00 | -0.15 | -0.16 | -0.18 | -0.19 | -0.19 | -0.18 | -0.17 | -0.16 | -0.15 | -0.14 | -0.13 | -0.11 | -0.10 | . . . | 0.02 |
| 16 Nominal producer wage | 0.00 | 0.49 | 0.48 | 0.47 | 0.46 | 0.46 | 0.46 | 0.47 | 0.48 | 0.50 | 0.51 | 0.52 | 0.53 | 0.55 | . . . | 0.66 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 17 Investment in dwellings | 0.00 | -2.15 | -1.90 | -1.71 | -1.52 | -1.32 | -1.12 | -0.93 | -0.73 | -0.54 | -0.35 | -0.16 | 0.03 | 0.21 | . . . | 2.20 |
| 18 Basic price, non-dwelling sector | 0.00 | 0.18 | 0.17 | 0.15 | 0.13 | 0.11 | 0.08 | 0.05 | 0.03 | 0.00 | -0.03 | -0.06 | -0.09 | -0.12 | . . . | -0.61 |
| 19 Employment, non-dwelling sector | 0.00 | -0.30 | -0.31 | -0.32 | -0.31 | -0.30 | -0.28 | -0.26 | -0.23 | -0.20 | -0.16 | -0.11 | -0.06 | -0.01 | . . . | 1.16 |
| 20 Capital stock, non-dwelling sector | 0.00 | 0.00 | -0.09 | -0.15 | -0.19 | -0.21 | -0.22 | -0.22 | -0.21 | -0.19 | -0.16 | -0.12 | -0.07 | -0.02 | . . . | 1.30 |
| 21 Output, non-dwelling sector | 0.00 | -0.21 | -0.20 | -0.17 | -0.12 | -0.07 | -0.01 | 0.06 | 0.13 | 0.22 | 0.31 | 0.40 | 0.51 | 0.62 | . . . | 2.67 |
| 22 Rental price of capital, non-dwelling sector | 0.00 | -0.52 | -0.31 | -0.17 | -0.07 | 0.01 | 0.06 | 0.11 | 0.15 | 0.18 | 0.21 | 0.23 | 0.25 | 0.26 | . . . | 0.03 |
| **Selected national macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 23 National real wage | 0.00 | -0.05 | -0.08 | -0.10 | -0.12 | -0.11 | -0.10 | -0.08 | -0.05 | -0.03 | 0.00 | 0.03 | 0.06 | 0.09 | . . . | 0.55 |
| 24 National employment | 0.00 | -0.07 | -0.05 | -0.03 | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 25 National capital stock | 0.00 | 0.00 | -0.03 | -0.05 | -0.06 | -0.06 | -0.06 | -0.05 | -0.05 | -0.04 | -0.03 | -0.02 | 0.00 | 0.01 | . . . | 0.29 |
| 26 National non-dwellings capital stock | 0.00 | 0.00 | -0.03 | -0.04 | -0.05 | -0.04 | -0.04 | -0.03 | -0.02 | -0.01 | 0.01 | 0.02 | 0.04 | 0.05 | . . . | 0.33 |
| 27 Basic price, non-dwelling sector, RoA | 0.00 | 0.06 | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.10 | . . . | 0.36 |

**TABLE 9: INFRASTRUCTURE CONSTRUCTION AND PRODUCTIVITY EFFECTS UNDER DEBT FINANCING (percentage deviations from basecase values)**

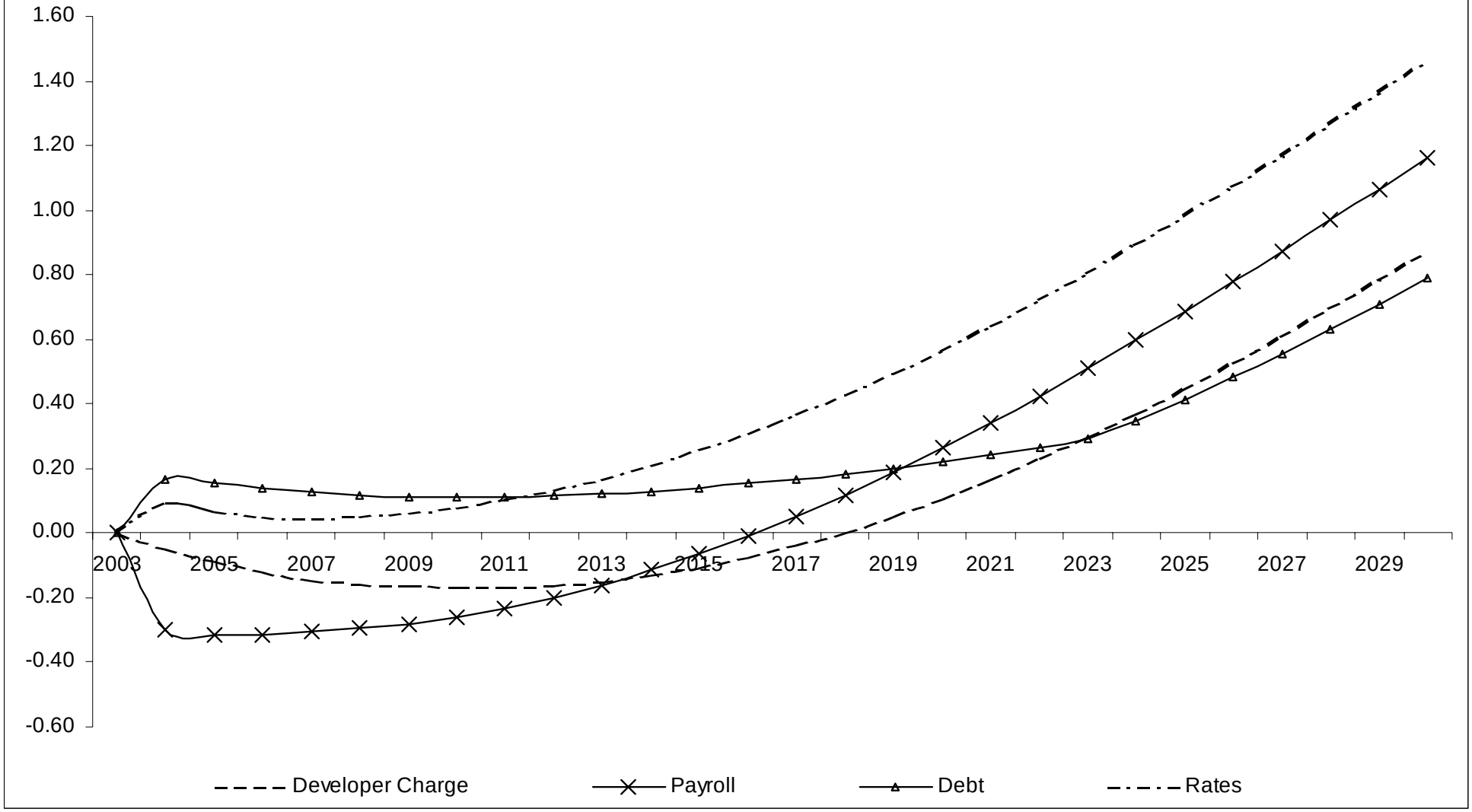
| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | 0.14 | 0.15 | 0.16 | 0.16 | 0.17 | 0.18 | 0.20 | 0.22 | 0.24 | 0.27 | 0.30 | 0.33 | 0.36 | . . . | 1.37 |
| 2 Real investment | 0.00 | 0.03 | 0.05 | 0.07 | 0.10 | 0.13 | 0.16 | 0.20 | 0.24 | 0.29 | 0.33 | 0.38 | 0.43 | 0.48 | . . . | 1.86 |
| 3 Real state government consumption | 0.00 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | 3.47 | . . . | 3.47 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | -0.30 | -0.26 | -0.21 | -0.15 | -0.09 | -0.02 | 0.04 | 0.11 | 0.18 | 0.25 | 0.33 | 0.40 | 0.47 | . . . | 1.53 |
| 6 International exports | 0.00 | -0.92 | -0.73 | -0.53 | -0.34 | -0.15 | 0.03 | 0.20 | 0.37 | 0.53 | 0.68 | 0.83 | 0.98 | 1.13 | . . . | 3.22 |
| 7 Interregional imports | 0.00 | 0.40 | 0.36 | 0.32 | 0.29 | 0.26 | 0.24 | 0.22 | 0.21 | 0.19 | 0.17 | 0.16 | 0.14 | 0.13 | . . . | 0.05 |
| 8 International import volumes | 0.00 | 0.17 | 0.20 | 0.23 | 0.27 | 0.32 | 0.36 | 0.42 | 0.47 | 0.53 | 0.60 | 0.66 | 0.73 | 0.81 | . . . | 2.26 |
| 9 Real GDP (market prices) | 0.00 | 0.10 | 0.15 | 0.20 | 0.24 | 0.29 | 0.35 | 0.41 | 0.47 | 0.53 | 0.60 | 0.67 | 0.74 | 0.81 | . . . | 2.31 |
| 10 Real GDP (factor cost) | 0.00 | 0.11 | 0.16 | 0.21 | 0.26 | 0.31 | 0.37 | 0.43 | 0.49 | 0.56 | 0.63 | 0.70 | 0.77 | 0.85 | . . . | 2.36 |
| 11 Employment | 0.00 | 0.17 | 0.16 | 0.14 | 0.13 | 0.12 | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | 0.14 | 0.15 | . . . | 0.79 |
| 12 Capital stock | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.07 | 0.08 | 0.10 | 0.12 | 0.14 | 0.17 | 0.20 | . . . | 0.93 |
| 13 gdp deflator | 0.00 | 0.25 | 0.18 | 0.11 | 0.05 | 0.00 | -0.05 | -0.09 | -0.13 | -0.17 | -0.21 | -0.24 | -0.28 | -0.31 | . . . | -0.84 |
| 14 CPI | 0.00 | 0.17 | 0.10 | 0.04 | -0.01 | -0.05 | -0.08 | -0.12 | -0.15 | -0.18 | -0.20 | -0.23 | -0.25 | -0.28 | . . . | -0.51 |
| 15 Nominal consumer wage | 0.00 | 0.19 | 0.13 | 0.08 | 0.04 | 0.00 | -0.04 | -0.07 | -0.10 | -0.12 | -0.15 | -0.16 | -0.18 | -0.20 | . . . | -0.16 |
| 16 Nominal producer wage | 0.00 | 0.25 | 0.26 | 0.27 | 0.28 | 0.31 | 0.33 | 0.36 | 0.40 | 0.43 | 0.47 | 0.52 | 0.56 | 0.61 | . . . | 1.08 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 17 Investment in dwellings | 0.00 | -0.13 | -0.04 | -0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | . . . | 1.26 |
| 18 Basic price, non-dwelling sector | 0.00 | 0.15 | 0.11 | 0.08 | 0.04 | 0.01 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 | -0.13 | -0.15 | -0.17 | . . . | -0.52 |
| 19 Employment, non-dwelling sector | 0.00 | 0.17 | 0.16 | 0.14 | 0.13 | 0.12 | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | 0.14 | 0.15 | . . . | 0.79 |
| 20 Capital stock, non-dwelling sector | 0.00 | 0.00 | 0.02 | 0.03 | 0.05 | 0.06 | 0.08 | 0.09 | 0.11 | 0.14 | 0.16 | 0.19 | 0.23 | 0.26 | . . . | 1.10 |
| 21 Output, non-dwelling sector | 0.00 | 0.12 | 0.17 | 0.22 | 0.26 | 0.32 | 0.37 | 0.43 | 0.49 | 0.56 | 0.62 | 0.70 | 0.77 | 0.85 | . . . | 2.37 |
| 22 Rental price of capital, non-dwelling sector | 0.00 | 0.33 | 0.24 | 0.17 | 0.13 | 0.11 | 0.10 | 0.09 | 0.09 | 0.09 | 0.09 | 0.08 | 0.08 | 0.08 | . . . | 0.02 |
| **Selected national macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 23 National real wage | 0.00 | 0.02 | 0.03 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.06 | 0.06 | 0.07 | 0.07 | 0.08 | 0.09 | . . . | 0.38 |
| 24 National employment | 0.00 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 25 National capital stock | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 | . . . | 0.25 |
| 26 National non-dwellings capital stock | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | . . . | 0.29 |
| 27 Basic price, non-dwelling sector, RoA | 0.00 | -0.10 | -0.05 | -0.02 | 0.01 | 0.04 | 0.06 | 0.08 | 0.10 | 0.11 | 0.13 | 0.15 | 0.16 | 0.17 | . . . | 0.34 |

**TABLE 10: INFRASTRUCTURE CONSTRUCTION AND PRODUCTIVITY EFFECTS UNDER RESIDENTIAL RATES FINANCING (percentage deviations from basecase values)**

| NSW Macroeconomic Impacts | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | . . . | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Real consumption | 0.00 | -0.02 | -0.05 | -0.06 | -0.07 | -0.06 | -0.05 | -0.02 | 0.01 | 0.06 | 0.11 | 0.17 | 0.23 | 0.31 | . . . | 1.81 |
| 2 Real investment | 0.00 | -1.46 | -1.25 | -1.14 | -1.02 | -0.89 | -0.75 | -0.61 | -0.46 | -0.31 | -0.16 | 0.00 | 0.15 | 0.31 | . . . | 2.42 |
| 3 Real state government consumption | 0.00 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | 3.46 | . . . | 3.46 |
| 4 Real federal government consumption | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 5 Interregional exports | 0.00 | 0.01 | 0.02 | 0.06 | 0.10 | 0.15 | 0.20 | 0.25 | 0.31 | 0.37 | 0.43 | 0.50 | 0.57 | 0.64 | . . . | 1.89 |
| 6 International exports | 0.00 | 0.07 | 0.06 | 0.13 | 0.22 | 0.31 | 0.41 | 0.52 | 0.64 | 0.76 | 0.89 | 1.03 | 1.18 | 1.34 | . . . | 4.05 |
| 7 Interregional imports | 0.00 | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.10 | 0.11 | 0.12 | . . . | 0.00 |
| 8 International import volumes | 0.00 | 0.07 | 0.11 | 0.15 | 0.20 | 0.27 | 0.34 | 0.41 | 0.50 | 0.59 | 0.68 | 0.79 | 0.90 | 1.01 | . . . | 3.00 |
| 9 Real GDP (market prices) | 0.00 | 0.01 | 0.03 | 0.05 | 0.09 | 0.13 | 0.19 | 0.25 | 0.31 | 0.39 | 0.47 | 0.56 | 0.66 | 0.76 | . . . | 2.75 |
| 10 Real GDP (factor cost) | 0.00 | 0.06 | 0.07 | 0.09 | 0.12 | 0.16 | 0.21 | 0.26 | 0.32 | 0.40 | 0.47 | 0.56 | 0.65 | 0.75 | . . . | 2.69 |
| 11 Employment | 0.00 | 0.09 | 0.07 | 0.05 | 0.05 | 0.05 | 0.06 | 0.08 | 0.10 | 0.13 | 0.17 | 0.21 | 0.26 | 0.31 | . . . | 1.46 |
| 12 Capital stock | 0.00 | 0.00 | -0.09 | -0.16 | -0.21 | -0.26 | -0.29 | -0.32 | -0.33 | -0.33 | -0.32 | -0.30 | -0.27 | -0.23 | . . . | 0.93 |
| 13 gdp deflator | 0.00 | -0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | -0.01 | -0.03 | -0.05 | -0.07 | -0.09 | -0.12 | -0.14 | . . . | -0.83 |
| 14 CPI | 0.00 | -0.04 | 0.02 | 0.05 | 0.08 | 0.10 | 0.12 | 0.13 | 0.14 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | . . . | -0.10 |
| 15 Nominal wage | 0.00 | -0.02 | 0.04 | 0.07 | 0.10 | 0.12 | 0.15 | 0.17 | 0.19 | 0.22 | 0.24 | 0.26 | 0.27 | 0.29 | . . . | 0.45 |
| **Selected NSW sectoral variables** | | | | | | | | | | | | | | | | |
| 16 Investment in dwellings | 0.00 | -6.04 | -5.25 | -4.89 | -4.53 | -4.19 | -3.86 | -3.53 | -3.21 | -2.91 | -2.61 | -2.32 | -2.04 | -1.76 | . . . | 1.33 |
| 17 Basic price, non-dwelling sector | 0.00 | 0.00 | -0.03 | -0.07 | -0.10 | -0.13 | -0.17 | -0.20 | -0.23 | -0.26 | -0.30 | -0.33 | -0.36 | -0.39 | . . . | -0.88 |
| 18 Employment, non-dwelling sector | 0.00 | 0.09 | 0.07 | 0.05 | 0.05 | 0.05 | 0.06 | 0.08 | 0.10 | 0.13 | 0.17 | 0.21 | 0.26 | 0.31 | . . . | 1.46 |
| 19 Capital stock, non-dwelling sector | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.06 | 0.09 | 0.12 | 0.17 | 0.22 | 0.28 | . . . | 1.57 |
| 20 Output, non-dwelling sector | 0.00 | 0.07 | 0.10 | 0.14 | 0.20 | 0.26 | 0.32 | 0.39 | 0.47 | 0.56 | 0.65 | 0.74 | 0.84 | 0.95 | . . . | 2.97 |
| 21 Rental price of capital, non-dwelling sector | 0.00 | 0.04 | 0.01 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.05 | 0.06 | 0.06 | . . . | -0.19 |
| **Selected national macroeconomic impacts** | | | | | | | | | | | | | | | | |
| 22 National real wage | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.05 | 0.06 | 0.08 | 0.10 | 0.12 | 0.14 | . . . | 0.56 |
| 23 National employment | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | . . . | 0.00 |
| 24 National capital stock | 0.00 | 0.00 | -0.03 | -0.06 | -0.08 | -0.10 | -0.12 | -0.13 | -0.13 | -0.14 | -0.14 | -0.13 | -0.13 | -0.12 | . . . | 0.12 |
| 25 National non-dwellings capital stock | 0.00 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | . . . | 0.32 |
| 26 Basic price, non-dwelling sector, RoA | 0.00 | 0.02 | -0.01 | -0.03 | -0.04 | -0.06 | -0.07 | -0.07 | -0.08 | -0.08 | -0.08 | -0.08 | -0.07 | -0.06 | . . . | 0.16 |

Chart 1. NSW Employment impacts: financing, construction, and productivity shocks

*(% deviation from basecase)*



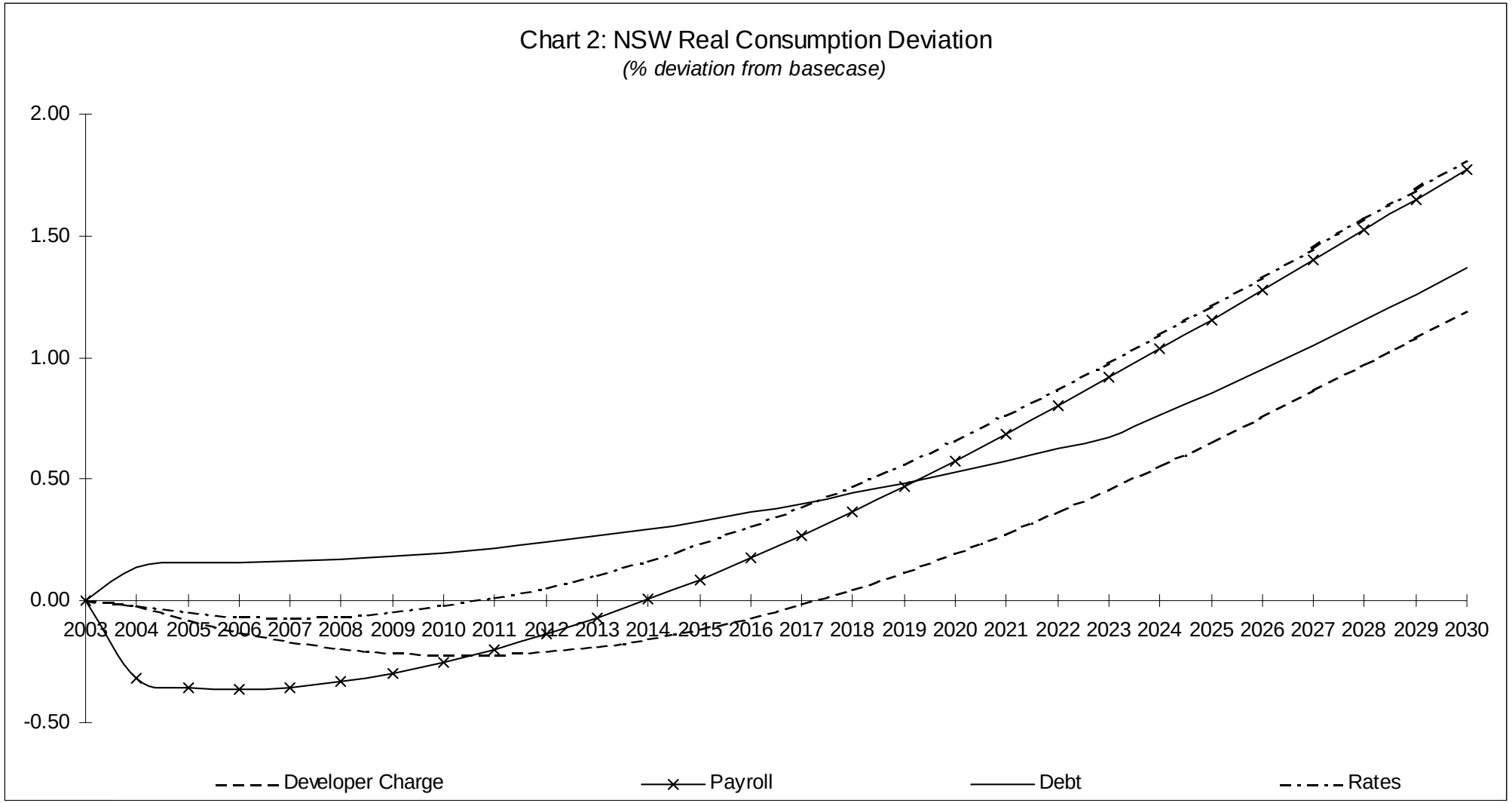


Chart 2: NSW Real Consumption Deviation
(% deviation from basecase)
2.00
1.50
1.00
0.50
0.00
-0.50
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030
Developer Charge
Payroll
Debt
Rates

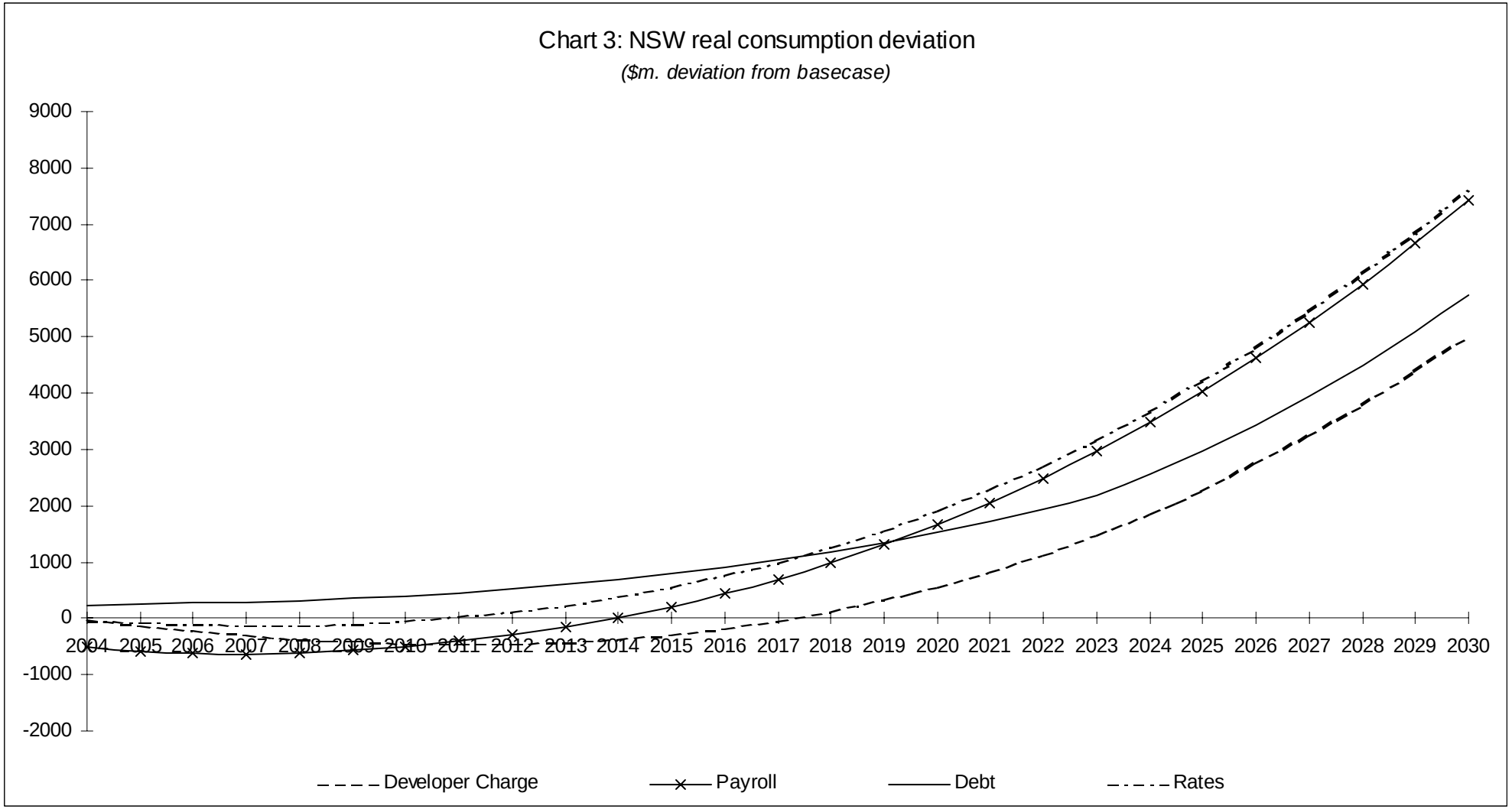


Chart 3: NSW real consumption deviation
($m. deviation from basecase)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030
Developer Charge
Payroll
Debt
Rates

Chart 4: Present value of NSW real consumption impacts 2004 - 2030
*($b. 2004)*