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

JAMES GIESECKE, PETER B. DIXON AND MAUREEN T. RIMMER

Centre of Policy Studies
Monash University, Melbourne, Australia

PO Box 11E
Monash University
Victoria 3800 Australia

E-mail: James.Giesecke@buseco.monash.edu.au
Ph: +61 3 9905 9756. *Fax:* +61 3 9905 2426

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ABSTRACT Many studies, both of Australia and of comparable developed economies, 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. However throughout the 1990's many of Australia's state governments embarked on a period of fiscal restraint, seeking to improve financial positions weakened by exposure to failed state government enterprises in the early 1990's. Perhaps because of the deferred consequences of reducing spending on infrastructure, a large proportion of this fiscal adjustment appears to have been borne by spending on public infrastructure. Today, policy attention at the state government level is again focussing on public infrastructure. However in spite of the now robust fiscal positions of Australia's state governments, there remains a reluctance on their part 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 a dynamic multi-regional CGE model (MMRF) to evaluate the regional macroeconomic consequences of four alternative methods of financing an expansion in state government spending on public infrastructure. The four methods are developer charges, payroll tax, government debt, and residential rates. The paper confirms that the services provided by public infrastructure can have significant impacts on the regional macroeconomy. More importantly however, the paper demonstrates that the total gains from urban infrastructure are quite sensitive to the means chosen by government to finance infrastructure investment. In contrast to up-front financing methods (such as developer charges, payroll tax, and residential rates), the paper finds that the gains from urban infrastructure are greatest when the chosen financing method provides a closer match between the timing of the burden of financing the infrastructure and the timing of the benefits provided by the infrastructure. This can be achieved by instruments such as debt, public-private partnerships, and user charges. On this basis the paper finds that a greater reliance by regional governments on debt financing might be warranted, and that the gains from infrastructure expenditure are least when that expenditure is financed by developer charges.

1. INTRODUCTION

Many studies, both of Australia and of comparable developed economies, 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. However throughout the 1990's many of 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. Perhaps because of the deferred consequences of reducing spending on infrastructure, a large proportion of this fiscal adjustment appears to have been borne by spending on public infrastructure. Today, policy attention at the state government level is again focussing on public infrastructure. However in spite of the now robust fiscal positions of Australia's state governments, there remains a reluctance on their part 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 a dynamic multi-regional CGE model (MMRF) 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. The paper confirms that the services provided by public infrastructure can have significant impacts on the regional macroeconomy. More importantly however, the paper demonstrates that the total gains from urban infrastructure are quite sensitive to the means chosen by government to finance infrastructure investment. We examine four alternative financing methods: developer charges, payroll tax, debt and residential rates. In contrast to the up-front financing methods (developer charges, payroll tax, and residential rates), the paper finds that the gains from urban infrastructure are greatest when the chosen financing method (such as debt) provides a closer match between the timing of the burden of financing the infrastructure and the timing of the benefits provided by the infrastructure. This could be achieved by instruments such as debt, public-private partnerships, and user charges. On this basis the paper finds that a greater reliance by regional governments on debt financing might be warranted, and that the gains from infrastructure expenditure are least when that expenditure 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) for our case study. The state of NSW accounts for approximately 35 per cent of national GDP and about 33 per cent of national population. We assume that the state government of New South Wales (NSW) embarks on a program of additional infrastructure construction within the state of NSW. This spending program is financed by the NSW government through either debt, or one of three taxes levied on economic activity within NSW. 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 major and minor 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 might be quite substantial. For example, the World Bank (1994) surveyed empirical studies, undertaken in the late 1980s and early 90s, 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 5 to 96 per cent. The average rate of return across these studies was 48 per cent, and the median was 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 to 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 of this paper were undertaken with the Monash Multi-Regional Forecasting (MMRF) model of the Australian economy. MMRF is large and detailed, making it impractical to provide a full description of its theoretical structure and database in a paper of this size. However the discussion of results in Section 3 relies on familiar economic mechanisms, so that the reader need not know every detail of MMRF 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 large-scale dynamic multi-regional computable general equilibrium model of the Australian economy. The model 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 featuring 38 industries and commodities. Familiar neoclassical assumptions govern the behaviour of the model's economic agents. Decision-making by firms and households within each region is governed by maximising behaviour. 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 tend to 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 within each of the model's 8 regions, 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 employment to its base-case level following some economic shock. 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

In each simulation the NSW government increases its annual spending on urban infrastructure by $1 b. We view this as consisting largely of extra spending on what Aschauer (1989a) calls "core infrastructure" – roads, highways, public transport systems, airports, and utilities. Consistent with the findings of Aschauer (1989a) we assume that this spending will generate ongoing benefits to the residents of NSW. We implement this via an improvement in regional total factor productivity. The program of additional infrastructure investment must be funded by the NSW government. 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.

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 3.5 by considering the funding impacts in isolation. In Section 3.6 we consider the expenditure impacts in isolation. Then in Section 3.7 we consider the productivity impacts in isolation. Finally, in Section 3.8 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 1 through to 10 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 undertake 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 Funding instrument 1: developer charges

Under this financing arrangement, the NSW government is assumed to raise the required $1 b. in each year through an impost on residential property developers. Essentially, we assume that the costs to the NSW government of extending trunk infrastructure services and providing new local roads and utilities are passed on to the

developers of new residential developments. We use MMRF to evaluate the impact of such a tax over the period 2004 to 2017. The results are reported in Table 1. We use a simple BOTE ("back of the envelope" model) to explain the main mechanisms in MMRF that account for the results in Table 1. The BOTE model is comprised of the following:

2 regions: NSW and the rest of Australia. Unless explicitly indicated otherwise, the variables and equations of our BOTE model relate to the regional economy of NSW. To avoid notational clutter, we suppress the regional (NSW) index on all regional variables. Hence all variables and coefficients in the BOTE model are to be read as relating to the NSW economy, unless explicitly indicated otherwise by the superscript "NAT", which denotes a national variable.

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), sector-specific capital (K_2), and commodities *c2* and *c3*, 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, which combines *c2* and *c3* according to a Cobb-Douglas production technology 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 to explain the 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 two 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 1 – 10.

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* (ρ_i) as the post-tax rental price of capital (Q_i) divided by the cost of a new unit of sector-specific capital (P_i^K):

(E1) $\rho_i = Q_i / P_i^K$

In the BOTE model, we assume that units of new capital for sector i are constructed from imported and domestic goods via sector-specific Cobb-Douglas production functions. Hence the cost of a new unit of capital in sector i is:

(E2) $P_i^K = P_2^{\alpha_{(2,i)}^K} \; P_3^{\alpha_{(3,i)}^K} \; T_i^K$

where

P_i^K cost of acquiring a unit of capital for installation in industry i.

P_2 basic price of the domestic commodity, $c2$.

$\alpha_{(2,i)}^K$ share of the tax-exclusive cost of constructing capital for industry i represented by the cost of purchases of the domestic commodity, $c2$.

P_3 basic price of the imported commodity, $c3$.

$\alpha_{(3,i)}^K$ share of the tax-exclusive cost of constructing capital for industry i represented by the cost of purchases of the imported commodity, $c3$.

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

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 model. 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. Via (E2) this has the (direct) effect of increasing the cost of a new dwelling (P_1^K) by 6.4 per cent. Turning to (E1), we first note that in the short-run Q_1 is determined outside of the system of equations (E1) – (E2) by our assumption that the dwellings market clears. In MMRF, the output of the dwellings sector is sold entirely to consumers. In the BOTE model, we represent the demand for dwelling services by households via the following constant elasticity of demand equation.

(E3) $X_1^D = F_1^D P_1^{-\varepsilon_1^D}$

where

X_1^D is household demand for housing services;

F_1^D allows for autonomous movements in household demand for dwellings;

P_1 is the price of housing services; and

ε_D^1 is the elasticity of demand for housing services.

We assume in the BOTE model, as we do in MMRF, that the dwellings market clears. Hence:

(E3) $X_1^D = X_1^S(K_1) = F_1^D P_1^{-\varepsilon_1^D}$

where X_1^S is the supply of dwellings and K_1 is the stock of the dwellings sector's capital (ie houses).

Sector-specific capital stocks (K_i) are assumed to be exogenous in the short run. This fixes X_1^S in the short run, so (E3) determines P_1 (and via E8, Q_1). Hence (E1) determines ρ_1 in the short-run. In the BOTE model, ρ_1 falls by 6.4 per cent. However MMRF projects a somewhat larger (8 per cent) fall in rates of return in the dwellings sector. The MMRF result is greater than that anticipated by the stylised model for two reasons. First, unlike MMRF, the stylised model does not capture the indirect effect of the developer charge on household consumption spending. In MMRF the developer charge operates indirectly to reduce household consumption expenditure (we discuss this effect further below). In (E3) this is equivalent to a fall in the value of F_1^D. This causes the market-clearing value of Q_1 to fall, reducing ρ_1. Second, (E1) is a simplified representation of the actual equation determining expected rates of return in MMRF. In particular, it excludes income taxes on gross dwelling rents and the effects of depreciation on expected rates of return. These simplifications cause (E1) to underestimate somewhat the effect of an increase in the cost of capital on expected rates of return.

In MMRF, the level of investment in any given industry is positively related to that industry's expected rate of return on capital. In the BOTE model, we represent this via the following constant elasticity of capital supply function:

(E4) $\quad I_i = F_i^{Inv} \, \rho_i^{\varepsilon_{Inv}^i}$

where

I_i is capital formation in industry *i*;

F_i^{Inv} allows for autonomous shifts in the relationship between rates of return and capital formation; and

ε_{Inv}^1 is the elasticity of capital supply to sector *i*.

In MMRF, ε_{Inv}^1 has a value of approximately 1.25. Hence the 8 per cent fall in expected rates of return in year 1 translates to an approximately 10 per cent fall in housing construction in NSW in year 1 (row 16).

Equations (E5) and (E6) describe the first order conditions relating to capital and labour inputs which arise from the non-dwellings sector's profit maximisation problem[1]:

(E5) $\quad W \, T_W^{NAT} T_W = MP_L^{(2)} \, P_2$

(E6) $\quad Q_2 \, T_2^Q = MP_K^{(2)} \, P_2$

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[1] Corresponding equations do not exist for the dwellings sector. This sector's only input is capital. The sector's capital stock (and hence output) is exogenous in the short run. Long run capital supply to the sector is determined by (E1), (E3) and (E8) under the assumption that the rate of return on the sector's capital stock is exogenous.

where

W	is the nominal take-home wage;

T_W^{NAT} is the power (one plus the rate) of the federal income tax on labour income;

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

$MP_L^{(2)}$ is the marginal product of labour in *i2*;

$MP_K^{(2)}$ is the marginal product of capital in sector *i*; and

T_2^Q is the power of the income tax on net (after tax) capital income in *i2*.

It is convenient at this point to also define the CPI and the purchaser's price of *c1*:

(E7) $P_C = \prod_{k=1}^{3} P_k^{\alpha_k^C}$

(E8) $P_1 = Q_1 T_1^Q$

where:

P_C is the consumer price index;

α_k^C is the share of spending on good *k* in total household consumption; and

T_1^Q is the power of the income tax on net (after tax) capital income in *i1*.

In MMRF, real consumer wages at the regional level (that is, the nominal before federal tax regional consumer wage, $W\,T_W^{NAT}$, deflated by the regional consumer price index, P_C) is assumed to be equal to the national real wage $W^{NAT}T_W^{NAT}/P_C^{NAT}$:

(E9) $W\,T_W^{NAT}/P_C = W^{NAT}T_W^{NAT}/P_C^{NAT}$

where

W^{NAT} is the nominal national wage; and

P_C^{NAT} is the national consumer price index.

In the short run, national consumer real wages are assumed to be sticky, with national employment endogenous. In the long-run, national employment is exogenous, with equality of national labour demand and national labour supply achieved via movements in the national real consumer wage. Labour is assumed to be mobile between regions in the long run. An important outcome of this treatment of the regional labour market is that, even for a relatively large region such as NSW[2], as a first approximation the regional real consumer wage can be viewed as exogenous to the regional economy. This is not true of the regional real producer wage, since the magnitude and direction of movements in the regional CPI and the prices of *c1* and *c2* can be quite different.

In the BOTE model, (E10) imposes a market clearing condition on net output of *c2*:

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[2] Employment in NSW represents about one third of Australian employment.

$$\text{(E10)} \quad X_2^S(K_2, L_2) = X_2^C + X_2^I(I) + X_2^G + X_2^X(P_2/P_3)$$

Equation (E10) of the stylised model recognises that net output of *c2* (X_2^S) is a function of inputs of capital (K_2) and labour (L_2). Four final users of *c2* are recognised: NSW consumers (X_2^C), NSW investors (X_2^I), the NSW government (X_2^G), and users outside of NSW (X_2^X). Equation (E10) also summarises the ideas that investment demand for *c2* is a positive function of aggregate investment in the region (I), and that international and interregional export demands for *c2* (X_2^X) are a negative function of the regional terms of trade.

As already discussed, in MMRF the short-run effect of the developer charge is to reduce rates of return on capital in the dwellings sector by about 8 per cent. This causes housing construction in NSW to fall by 9.6 per cent (row 16). Investment in new dwellings represents approximately 25 per cent of total NSW investment. Hence the contraction in dwellings investment alone has a direct effect on NSW investment of –2.45 per cent (–9.8 x 0.25). Hence the negative deviation in dwellings investment accounts for the bulk of the deviation in NSW investment (row 2). In (E10), the fall in NSW investment causes X_2^I to fall. Assuming for the moment that X_2^S and X_2^C do not change (we relax this assumption below), a fall in X_2^I will be matched by a rise in X_2^X. This is reflected in the MMRF results for NSW export volumes. In Table 1 we find positive deviations in the 2004 values of NSW interregional exports (0.38 per cent, row 5) and international exports (1.23 per cent, row 6). In MMRF, both international and interregional export volumes are inversely related to export prices[3]. Hence a rise in X_2^X must be associated with a fall in P_2 relative to P_3. In MMRF this is reflected in a negative deviation in the basic price of NSW non-dwelling output of 0.20 per cent in year 1 (row 17) and a positive deviation in the price of the RoA non-dwelling output of 0.15 per cent (row 26).

Returning to (E5), and substituting (E9) into the LHS and (E7) into the RHS, we have:

$$\text{(E11)} \quad \frac{W^{NAT}T_W^{NAT}T_W}{P_C^{NAT}} = MP_L^{(2)}(K_2/L_2)\frac{P_2^{(\alpha_1^C + \alpha_3^C)}}{P_1^{\alpha_1^C}P_3^{\alpha_3^C}}$$

Given that the national real consumer wage is both sticky and determined by conditions in the national labour market, the LHS of (E11) can be viewed as largely exogenous to the NSW regional economy. On the RHS of (E11), the prices of both *c1* and *c3* are not directly affected by the imposition of the developer charge. Hence with P_2 falling, the marginal product of labour in the non-dwellings sector must rise. With K_2 fixed in the short-run, a rise in $MP_L^{(2)}$ requires that L_2 fall. Hence in 2004 we find employment in the non-dwellings sector in MMRF falling by 0.24 per cent relative to basecase (row 18). Since labour is not employed in the dwellings sector,

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[3] In MMRF, international export volumes are significantly more price elastic than interregional export volumes. This explains why the deviation in international export volumes is greater than the deviation in interregional export volumes.

total NSW employment also falls by 0.24 per cent (row 11). With employment in the non-dwellings sector falling by 0.24 per cent, and the share of wages in the sector's total factor cost being approximately 0.73, output in the sector (X_2^S) falls by 0.17 per cent (row 20). Payments to primary factors in the non-dwellings sector represent approximately 88 per cent of NSW GSP (gross state product) at factor cost. Hence the fall in activity in the NSW non-dwellings sector causes real NSW GSP to fall by 0.15 per cent (-0.15 = -0.17 x 0.88). Real NSW GSP at market prices (row 9) falls faster than real NSW GSP at factor cost because of the sharp contraction in NSW investment (row 2) which is subject to relatively high rates of indirect taxation.

Real consumption spending (row 1) falls by 0.17 per cent. This reflects the fall in employment (and hence labour income) and falling rental prices of capital in the region (with employment and the terms of trade lower, so too are capital rental rates). The fall in consumption spending causes household demand for dwelling services to fall. As discussed earlier, in the BOTE model this causes Q_1 to fall and is one reason why our earlier BOTE explanation underestimated the MMRF calculation of the impact of the developer charge on rates of return in the dwellings sector.

<u>The long run effects of the developer charge</u>
In MMRF, changes in capital accumulation in each sector eventually return rates of return on capital to exogenously specified long run rates of return. We can express this feature of MMRF in the BOTE model by assuming that ρ_i is exogenous. Together, equations (E1) and (E2) now imply that a 6.4 per cent increase in T_1^K will increase Q_1 by 6.4 per cent. Via (E8) this will increase the consumer price of dwelling services by 6.4 per cent. Via (E7) this will have a direct effect on the CPI of $\alpha_1^C \cdot 6.4$ per cent. Assuming for the moment that the real national consumer wage is not affected by the shock, equation (E9) implies that a $\alpha_1^C \cdot 6.4$ per cent increase in the NSW CPI will cause a $\alpha_1^C \cdot 6.4$ per cent increase in the NSW nominal wage. In the non-dwellings sector, this causes the producer price of labour to rise relative to the producer cost of capital. We find this reflected in the MMRF results for the year 2017, where the nominal NSW wage is 0.36 per cent (row 15) above basecase while the rental price of capital in the non-dwellings sector is 0.41 per cent (row 21) below basecase. This causes the capital/labour ratio in the sector to rise relative to basecase, as producers substitute away from the now more relatively expensive labour input. This accounts for the –0.33 per cent (-1.18 - -0.85 = -0.33 , rows 18 and 19) deviation in the labour/capital ratio in the MMRF results. A fall in the labour / capital ratio in the non-dwellings sector implies that the marginal product of capital in the sector must fall. Substituting (E1) and (E2) into the RHS of (E6) and re-arranging gives:

$$\text{(E6')} \quad \rho_2 \; T_2^Q \; T_2^K = MP_K^{(2)} \left(\frac{P_2}{P_3} \right)^{\alpha_{(3,2)}^K}$$

All the variables on the RHS of (E6') are exogenous in the long-run. Hence a fall in the marginal product of capital must be associated with a rise in the regional terms of trade (that is, the ratio P_2 / P_3 must rise). We find this reflected in the MMRF results for 2017. The 2017 deviation in the price of NSW non-dwellings output is –0.05 per

cent (row 17), while that for the rest of Australia is –0.53 per cent (row 26). This represents a significant increase in the price of NSW output relative to goods sourced from the rest of Australia or overseas. This causes price sensitive agents in NSW, the rest of Australia, and overseas, to substitute away from goods produced in NSW. In terms of the BOTE model, this is represented by a fall in X_2^X. Assuming for the moment that real domestic absorption ($X_2^C + X_2^I$) is unaffected, output of the non-dwellings sector (X_2^S) must fall. This accounts for MMRF's projection of a –1.10 per cent (row 20) deviation in the output of the NSW non-dwellings sector in 2017. The negative deviation in the sector's output requires its usage of labour and capital to fall relative to basecase (rows 18 and 19). This accounts for the negative deviation in long-run NSW real GDP (row 10). With NSW employment and capital (rows 11 and 12) below their basecase values, so too is household income, and with it, real consumption spending (row 1). Investment in NSW is also below basecase (row 2), reflecting the contraction in the capital stocks of both the dwellings and non-dwellings sectors of the NSW economy (row 12).

3.3 Funding instrument 2: Payroll taxes
In this simulation the NSW government finances the additional spending on infrastructure by raising its annual collection of payroll tax by $1 b. Across each of Australia's state government jurisdictions, payroll tax is the instrument that accounts for the highest proportion of state own-source revenue. As such, the payroll tax instrument represents a feasible alternative to the developer charge for raising the revenue required for the additional infrastructure spending. The NSW payroll tax appears in (E5) of the BOTE model as T_W. The average rate of payroll tax in NSW is initially approximately 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. In both the BOTE model and MMRF, payroll taxes are only levied on the non-dwellings sector (since no labour is employed by the dwellings sector). Returning to (E11) we can see that the short-run direct effect of the imposition of the payroll tax is an increase in the $MP_L^{(2)}$. With capital stocks fixed in the short-run, this requires employment in the non-dwellings sector to fall. In Table 2 we see MMRF projecting a deviation of –0.45 per cent in non-dwellings sector employment (row 19) in 2004. With capital stocks initially fixed, this reduction in employment requires output of the non-dwellings sector to fall. As already mentioned in Section 3.2, wages represent approximately 0.73 per cent of the sector's total primary factor payments. Hence the –0.45 per cent deviation in the sector's employment causes its output to contract by 0.33 (0.73 x 0.45) per cent relative to basecase (row 21). This causes real NSW GDP at factor cost to fall by 0.29 per cent relative to basecase (row 10), since activity in the non-dwellings sector represents approximately 88 per cent of NSW GDP at factor cost. The contraction in real NSW GDP at market prices (row 9) is slightly greater than this (at –0.33 per cent) because of the sharp contraction in NSW investment (row 2) which is subject to relatively high rates of indirect taxation.

With employment in the non-dwellings sector lower, the marginal product of the sector's capital must also fall. From (E6) we can see that, ceterus paribus, a fall in

$MP_K^{(2)}$ must cause Q_2 to fall, and that - via (E1) - this will cause ρ_2 to also fall. Since investment is positively related to rates of return (equation E4), the fall in ρ_2 causes investment in the sector to fall. Investment in the dwellings sector also falls. This is because, with real household consumption spending lower (see below), demand by households for dwellings services declines. Via (E3) this causes the market clearing rental price of dwellings (row 22) to fall relative to basecase, inducing a negative deviation in dwellings investment (row 17). With both dwelling and non-dwelling investment below their basecase values, total NSW investment is 1.37 per cent below basecase (row 2).

The negative deviations in NSW employment and capital rental prices in the first year of the simulation cause real NSW household disposable income to fall relative to basecase. This accounts for the negative deviation in real household consumption spending in year one (row 1). Relative to their basecase values, real consumption spending by both state and federal governments is assumed to be unaffected by the financing shocks (rows 3 and 4). Nevertheless, the reductions in household consumption and private investment are sufficient to cause real NSW absorption to fall by more than the reduction in real NSW GDP at market prices. In the BOTE model, this situation can be represented in (E10) by the case where $\Delta X_2^S > \Delta X_2^C + \Delta X_2^I(I)$. Hence the region's international and interregional trade balances move towards surplus (rows 5 – 8).

Long-run results using the BOTE model
In the long-run, both the NSW real wage, and rates of return on NSW capital, are largely determined outside of the NSW economy. While part of the impact of the payroll tax in the short-run is absorbed by lower rates of return on NSW capital, this is not possible in the long-run. Rather, in the long-run, we expect most of the cost-consequences of the payroll tax to be passed through to higher output prices. Hence the contractionary effects of the payroll tax on the NSW economy will be more severe in the long-run. In terms of the BOTE model, we return again to (E11) and (E6'):

(E11) $\quad W^{NAT}T_W^{NAT}T_W / P_C^{NAT} = MP_L^{(2)}(K_2/L_2) P_2 / P_C$

(E6') $\quad \rho_2 \; T_2^K \; T_2^Q = MP_K^{(2)}(K_2/L_2)\left(\dfrac{P_2}{P_3}\right)^{\alpha_{(3,2)}^K}$

Our long run assumptions relating to the inter-regional mobility of both labour and capital mean that the LHS's of (E11) and (E6') are largely exogenous to the NSW economy in the long-run. Under this closure, an increase in T_W by 0.7 per cent tends to increase the producer price of labour relative to the producer price of capital by about 0.7 per cent. However at the national level the real consumer wage is required to fall by 0.29 per cent to clear the national labour market (row 23). Via (E9) this reduces the price of labour in NSW by about 0.3 per cent. With the payroll tax adding about 0.7 per cent to the per unit cost of labour in NSW, and the fall in the national real wage subtracting about 0.3 per cent from the per unit price of labour in NSW, the producer price of a unit of labour rises by about 0.4 per cent in NSW in the long run (row 16). In the BOTE model the production function has been specified as Cobb-

Douglas, giving a substitution elasticity between capital and labour of 1. However in MMRF, substitution between capital and labour is governed by industry-specific CES functions. On average these functions specify a substitution elasticity of about 0.5. Hence, with the producer price of labour rising by about 0.4 per cent and the producer price of capital largely unaffected by the shock (row 22), we would anticipate an increase in the capital / labour ratio of about 0.2 per cent (0.4 x 0.5). This is reflected in the MMRF results, where we find the capital / labour ratio rising by 0.21 per cent (-0.76 - - 0.97, rows 19 and 20). While this substitution effect allows us to anticipate the direction of change in the capital / labour ratio, it does not allow us to anticipate the change in inputs of capital and labour. To explain the sharp drop in employment and capital in NSW we must turn to (E6') and (E10). We know from the short-run results that capital accumulation in the non-dwellings sector initially falls as a results of the fall in capital rental prices. Hence we might expect the sector's capital stock to be lower in the long-run than in the short-run. Both the BOTE model and the MMRF results confirm this expectation. The rise in sector 2's long-run capital / labour ratio means that the marginal product of capital in sector 2 must fall. With all the LHS variables in (E6') exogenous, a fall in sector 2's marginal product of capital requires that the ratio P_2 / P_3 must rise. This is reflected in the MMRF results, where we find the price of NSW sector 2's output is 0.23 per cent above basecase by 2017 (row 18) while that for the competing product from the rest of Australia is 0.12 per cent below basecase by 2017 (row 27). In the BOTE model, this causes a contraction in X_2^X in (E10). This is expressed in MMRF as sharp contractions in interregional and international export volumes (-0.41 and –1.10 per cent respectively) as price-sensitive agents in the rest of Australia substitute away from NSW goods and price-sensitive agents overseas reduce their imports of NSW goods. In the BOTE model, a long-run reduction in X_2^X translates into a long-run reduction in X_2^S. This is expressed in MMRF as a 0.93 per cent reduction in the output of the non-dwellings sector (row 21). However the contraction in this sector's output is not solely attributable to the contraction in X_2^X. As the sector's output contracts, so too does its employment of labour and capital (rows 19 and 20). This causes household factor income to fall, and with it household real consumption spending. In the BOTE model this is reflected in a contraction in X_2^C, and in MMRF as a -1.1 per cent deviation in NSW real private consumption spending (row 1). With the capital stock smaller in the long-run, less investment is required in each year to maintain the smaller capital stock. Hence long-run investment spending in NSW is also projected to fall relative to basecase by 2017 (row 2). From (E10) of the BOTE model, we can see that (through a fall in X_2^I) this represents a further source of contraction in factor usage in sector 2 and hence the wider NSW economy.

Comparison of long-run results of developer charge and payroll taxes
Recall from Section 3.2 that our long-run assumption of exogenous rates of return on capital implies that the developer charge must eventually be passed on to the users of dwellings services in the form of a higher price for dwelling services. Graph 1 charts the MMRF results describing the transmission of the developer charge through to the price paid by households for dwelling services. The immediate impact of the developer charge in MMRF is to increase the cost of new housing by 5.8 per cent. This is somewhat less than the direct effect of the developer charge (+6.4 per cent)

because the prices of inputs into dwelling construction fall as a result of the tax-induced contraction in dwelling construction activity (in terms of the BOTE model, as T_2^K rises by 6.4 per cent, $P_2^{\alpha_{(2,1)}^K} P_3^{\alpha_{(3,1)}^K}$ falls by 0.6 per cent).

The fall in dwelling construction activity causes investment in the sector to decline below that necessary to maintain the stock of dwellings. Hence, over time, the gradual process of depreciation leads to a decline in the stock of dwellings. This causes the rental price of dwelling services to rise over time. By 2017, this process has caused the rental price of capital in the dwelling services sector to increase by 5.2 per cent relative to basecase. Unlike the BOTE model, in MMRF inputs into the provision of dwelling services include not only the capital services of the dwellings themselves, but also material and service inputs such as finance and property services and maintenance expenditures. Overall, the value of these material and service inputs are projected to comprise about 30 per cent of the purchaser's price of dwelling services by 2017. Hence the impact of the increase in the rental price of capital (+5.2 per cent) on the purchaser's price of dwelling services in 2017 is approximately 3.6 per cent (0.70 x 5.2). In terms of the BOTE model, this corresponds to an increase in P_1 in 2017 of 3.6 per cent. From (E5') it is clear that the impact of this price increase will depend on the value of α_1^C - the share of the cost of dwelling services in total consumption by NSW households. By 2017 this share is about 0.25 in MMRF. Hence $P_1^{\alpha_1^C}$ increases by 0.9 per cent. This is about 0.2 percentage points higher than the increase in T_W under payroll tax financing. This largely accounts for the more severe regional macroeconomic impact of the developer charge in 2017 relative to payroll financing.

3.3 Funding instrument 3: debt

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[4], 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.

The NSW payroll tax appears in (E5) of the BOTE model as T_W. The average rate of payroll tax in NSW is initially approximately 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 in year 1 to raise an additional $84 m. in revenue via the payroll tax instrument requires that T_W increase by 0.06 per cent, from 1.027 to 1.0276. Returning to (E5') we can see that the short-run direct effect of the imposition of the payroll tax is an increase in the $MP_L^{(2)}$. With capital stocks fixed in the short-run, this requires employment in NSW to fall. From Table 3 we see that MMRF projects a fall in NSW employment in year 1 of 0.04 per cent (row 11). The

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[4] 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.

remaining long run and short run mechanisms via which the debt instrument affect the economy are the same as that for the payroll tax instrument, so no further discussion of these mechanisms is necessary.

Debt compared with developer charges and payroll tax financing
A comparison of the results in Tables 1 - 3 show that the short-run effects on the regional macroeconomy of the debt instrument are substantially less disruptive than those of either the developer charge or payroll tax financing. In the short-run, this is largely due to the significantly smaller tax burden imposed on the NSW economy under debt financing. In year 1 of the debt financing simulation, an additional $86 m. in payroll taxes are levied. Under either the developer charge or payroll tax options, the additional taxation burden imposed on the NSW economy is over ten times larger, at $ 1 b. However by 2017, the total tax burden under the debt financing option has become larger than under either of the up-front financing options ($84m x 14 years = $1176 m.). Nevertheless, the impact of debt financing on the macroeconomy is still less severe than under either the developer charge or the payroll tax option. Recall from the discussion of the payroll tax option in Section 3.3 that the macroeconomic consequences of the payroll tax become progressively more severe as rates of return on NSW capital have time to return to their basecase levels. Under the payroll tax financing option, much of this adjustment has taken place by 2017. However, under debt financing, the payroll tax burden is increased incrementally, by approximately $84 m. per annum. Hence the 2017 impacts for the debt instrument represent the combined effects of both the short-run impacts of the most recent additions to the payroll tax burden and the long-run impacts of the earliest additions to the payroll tax burden. Since the long-run impact on employment of an increase in payroll tax is substantially larger than the short run impact (see Section 3.3) the impact on employment of the debt instrument is lower than that of the payroll tax instrument in 2017, even though the total payroll revenue being raised under the debt instrument in 2017 ($1176 m.) is about 17 per cent higher than that being raised under the payroll instrument in 2017 ($1000 m.). Clearly, once the long-run effects of the annual payroll tax increases under the debt instrument have had time to work through the economy, the employment impact of the debt instrument will be greater than that of the payroll tax instrument. This eventuality is hinted at by the greater slope (relative to payroll financing) on the employment curve for debt financing towards the end of the simulation period (Chart 2). Eventually, the annual payroll tax burden under debt must stabilise at $1680 m. Hence in the long run we would expect the impact of the debt instrument on the economy to be about 70 per cent greater than that of the payroll instrument. This eventuality has not had time to unfold in the 13 years of results reported in this paper.

3.4 Funding instrument 4: residential rates
In this simulation the NSW government raises its annual collection of residential rates by $1 b. to finance the additional spending on infrastructure. Residential rates are levied on residential properties on the basis of their estimated market value. Since, for a given discount rate, market value will tend to be closely related to a property's rental price, we model residential rates in MMRF as an income tax levied on capital income in the dwelling services sector. Capital income taxes appear in (E8) of the BOTE model as T_Q^l . 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

T_Q^1 having an initial value of 1.25. In MMRF, this tax initially raises 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 this 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.

In the short-run, the purchaser's price for dwelling services, P_1, is determined by the market clearing condition for residential property (E3). Hence (E8) determines Q_1, and a 3.5 per cent increase in T_1^Q will be matched by a 3.5 per cent decrease in Q_1. In the BOTE model this generates a 3.5 per cent reduction in the post-tax rate of return on residential capital via (E1). Just as we found with the developer charge (and for the same reasons), the BOTE model somewhat underestimates the impact of an increase in residential rates on rates of return, with MMRF calculating a 4.8 per cent reduction in rates of return in the dwellings sector. The short-run transmission of an increase in rates to the wider NSW economy is, from this point, identical to that of the developer charge. The reduction in expected rates of return causes investment in the dwellings sector to fall relative to basecase (row 16) This causes the NSW balance of trade to move towards surplus (rows 5 – 8). However this requires the relative price of traded goods to fall (rows 17, 26). This fall in the NSW terms of trade causes employment to fall (row 11) and with it real consumption (row 1).

The long-run transmission mechanism for rates is also the same as that for developer charges. Using the BOTE model, in the long run ρ_1 is assumed to be exogenous. Hence a 3.5 per cent increase in T_1^Q will cause a 3.5 per cent increase in the long run rental price of dwelling services, P_1 .Chart 3 plots the year-on-year deviation in the rental price of capital in the dwelling services sector under the rates financing option. By 2017 much of the movement towards the long run deviation in P_1 is complete. Unlike the BOTE model, MMRF distinguishes between the price paid by households for dwelling services and the rental price of capital in the dwelling services sector. As discussed in Section 3.2, the cost of capital services accounts for about 70 per cent of the purchaser's price of dwelling services in NSW. In this simulation, expected rates of return in the dwellings sector are returned to their long-run level by the process of depreciation gradually reducing the size of the dwellings capital stock. By 2017 this process has increased the rental price of capital in the sector by 3.1 per cent (Chart 3). This translates into an increase in the price paid by households for dwelling services of 0.7 x 3.1 = 2.1 per cent (Chart 3). As discussed in Section 3.2, real consumer wages in NSW are effectively exogenous in the long run, since they are indexed to the national consumer wage. Hence, just as with the developer charge, an increase in rates feeds into long-run NSW nominal wage demands via its impact on the NSW consumer price index. This increases real producer wages, reducing employment. Since the mechanisms via which the two instruments act on the NSW economy are the same, we might expect the two instruments to have the same macroeconomic impacts. This is broadly the case. By 2017 the developer charge has increased the consumer price of dwellings by 3.6 per cent (Chart 1). For rates, the same figure is 2.1 per cent (Chart 3). The ratio of these impacts is approximately 1.7 per cent. By driving up nominal wages, the direct effect of these price shocks is to reduce

employment in the two simulations. Not surprisingly, the ratio of the employment impacts (-1.2/-0.7 =1.7) in the two simulations is the same as the ratio of the dwellings services price impacts under the two simulations (3.6 / 2.1). The ratios of the remaining macroeconomic impacts under the two financing instruments are broadly similar.

<u>Why rates are less disruptive to the regional macroeconomy than developer charges</u>
An interesting question to consider is - since the amount being raised ($ 1 b.) under both the developer charge and the increase in rates is identical, and since the mechanisms via which both taxes operate on the NSW economy are the same - why are rates found to be a superior financing option to the developer charge? The macroeconomic impacts of the two options depend on the ratio of the dwellings sector's rate of growth in capital stock to its gross rate of return on capital. This can be seen by considering equations (E1), (E2) and (E8) of the BOTE model. Together these three equations imply:

$$\text{(E12)} \quad P_1 = P_2^{\alpha_{(2,i)}^K} P_3^{\alpha_{(3,i)}^K} \rho_1 T_1^Q T_1^K$$

Converting (E12) to a percentage rate of change form, and assuming P_2 and P_3 are unchanged, gives:

$$\text{(E13)} \quad p_1 - \rho_1 = t_1^Q + t_1^K$$

where p_1, ρ_1, t_1^Q, and t_1^K are the percentage changes in the levels variables P_1, ρ_1, T_1^Q, and T_1^K. In the short-run P_1 is given by the market clearing condition in the dwellings services market ($p_1 = 0$) so that positive shocks to t_1^Q or t_1^K act to reduce ρ_1. In the long-run ρ_1 is exogenous ($\rho_1 = 0$) so that positive shocks to t_1^Q or t_1^K act to increase p_1. Clearly, if the shocks to t_1^Q and t_1^K are the same, then developer charges and residential rates have identical effects. In Sections 3.2 and 3.4 we calculated the percentage changes in these *t*'s 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 net growth.

3.5 Building the infrastructure

Table 5 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. We again use the BOTE model developed in Section 3.2 to explain the short-run and long-run MMRF results.

Short run effects of the increase in NSW government spending on urban infrastructure

In terms of the BOTE model, output of the NSW *Construction* sector is aggregated with the output of other non-dwellings industries in *c2*. The extra spending by the NSW government on urban infrastructure can thus be represented in the BOTE model as an increase in X_2^G. The initial level of NSW government consumption spending in the MMRF basecase is $28.7 b. The addition of $1 b. of spending on urban infrastructure therefore lifts real NSW government spending by 3.48 per cent (row 3). In the BOTE model, this is equivalent to a 3.48 per cent increase in X_2^G in (E10). In using (E10) to understand the effects of an increase in X_2^G, it is helpful to view X_2^S as initially given by *i2*'s pre-shock usage of capital and labour, and X_2^C as initially given by the pre-shock level of NSW household income. Then the direct effect of X_2^G can be seen to be a fall in X_2^X. This result is reflected in the MMRF projections, where we find NSW net exports contracting (rows 5-8). However for NSW net exports to contract, the price of goods produced in NSW must rise relative to competing goods produced in the rest of Australia and overseas. In the BOTE model, the ratio P_2 / P_3 must rise. The MMRF results accord with this result. The MMRF variables that correspond broadly to these BOTE prices are reported in rows 17 and 26 of Table 5. MMRF projects a positive deviation in the basic price of the output of the NSW non-dwellings sector (P_2 in the BOTE model) of 0.15 per cent (row 17) and a negative deviation in the basic price of the output of the non-dwellings sector in the rest of Australia (the non-foreign component of P_3 in the BOTE model) of 0.13 per cent (row 26).

The increase in the NSW regional terms of trade, which the rise in the P_2 / P_3 ratio represents, causes NSW employment to rise. Turning to (E11) of the BOTE model, with the real consumer wage exogenous the increase in the ratio P_2 / P_3 causes the marginal product of labour to fall. With capital stocks exogenous in the short run, the fall in the marginal product of labour is secured by a rise in employment. Hence in MMRF we find employment in the non-dwellings sector increasing by 0.19 per cent (row 18) relative to basecase. Since the non-dwelling sector is the sole employer of labour, NSW employment also rises by 0.19 per cent (row 11) relative to basecase. This causes a positive deviation in NSW real GDP (row 9).

The increase in employment causes rates of return on capital to rise, and with them, levels of sectoral investment. In terms of the BOTE model, with employment higher and capital stocks fixed, $MP_K^{(2)}$ in (E6) must rise. P_2 is also rising. With T_2^Q exogenous, Q_2 and with it ρ_2 (via E1) must also rise. With real consumption spending higher (see below) Q_1 is higher (via E3 and E8) and hence so too is ρ_1. As

a result investment in both the dwellings and non-dwellings sectors must rise (via E4). In the MMRF results we see this expressed as a 0.21 per cent (row 16) deviation in dwellings investment and a 0.16 per cent (row 2) deviation in total NSW investment.

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 0.16 per cent increase in real NSW consumption spending (row 1).

Long run effects of the increase in NSW government spending on urban infrastructure
In MMRF, the only factor of production that is assumed to be in long run 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 5, this is reflected in increased usage of capital (row 12) as well as labour by 2017. 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 3.48 per cent increase in real NSW state government consumption spending (row 3) is comprised entirely of additional spending on output of the NSW *Construction* sector. This causes a relatively large (2.33 per cent[5]) positive deviation in the output of NSW *Construction* in 2017. The NSW *Construction* sector is very labour intensive relative to the NSW economy as a whole. Since the deviation in the output of this sector (2.33 per cent) is much greater than the deviation in NSW output (0.14 per cent, row 10) the NSW labour / capital ratio increases relative to basecase.

The 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). This causes the NSW real consumer wage (row 15 – row 14) to also rise. As a result, there is a small increase in the NSW real producer wage (row 15 – row 13). This causes activity in sectors exposed to interregional and international competition to contract. This accounts for the small negative deviations in interregional (row 5) and international (row 6) export volumes. International and interregional imports into NSW (rows 7 and 8) are slightly above basecase. This largely reflects the effects of an increase in NSW economic activity on demand for imports, although there is also a small relative price effect at work (compare rows 17 and 26).

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[5] Not reported in Table 5.

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 expenditure by the NSW government produces a benefit in the form of a permanent increase in private sector[6] 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. 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 equations (E3), (E5), (E6) and (E10). These equations now become:

(E12) $\quad W^{NAT} T_W^{NAT} T_W A_2 / P_C^{NAT} = MP_L^{(2)} P_2^{(\alpha_1^C + \alpha_3^C)} \big/ (P_1^{\alpha_1^C} P_3^{\alpha_3^C})$

(E13) $\quad Q_2 \; T_2^Q \; A_2 = MP_K^{(2)} \; P_{(2)}$

(E14) $\quad X_2^S(K_2/A_2, L_2/A_2) = X_2^C + X_2^I(I) + X_2^G + X_2^X(P_2/P_3)$

(E15) $\quad X_1^D = X_1^S(K_1/A_1) = F_1^D P_1^{-\varepsilon_1^D}$

The initial value of A_i 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_i must fall by approximately 0.07 per cent in each year (-0.15/210). In equation (E12) a fall in A_2 causes $MP_L^{(2)}$ to fall. Since capital stocks are fixed in the short run, this requires employment in the non-dwellings sector to rise. This accounts for the 0.05 per cent deviation in NSW employment in 2005 (rows 18 and 11).

In (E14) both the increase in employment and the improvement in primary factor productivity allow the output of the non-dwellings sector to expand. Payments to labour represent approximately 73 per cent of total factor payments in the NSW non-

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[6] 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.

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 0.05 percentage points (0.8 x 0.07 = 0.05) to 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. Via (E15), output of this sector expands 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).

Returning to (E14), and assuming for the moment that X_2^C and X_2^I are not immediately affected by the shock (we relax this assumption below), the increase X_2^S requires X_2^X to increase. In MMRF, this is reflected 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. The deviation towards balance of trade surplus requires the price of NSW goods to fall relative to the prices of competing imports from the rest of Australia and overseas. This accounts for the negative deviation in the price of output of the non-dwellings sector (row 17) and the NSW GDP deflator (row 13). Note that in (E12) the decline in the regional terms of trade has a damping effect on the positive effect on employment of the improvement in primary factor productivity.

The improvement in primary factor productivity and increase in employment causes rates of return on capital, and hence investment, to increase. In (E13) the increase in employment in the non-dwellings sector causes $MP_K^{(2)}$ to rise. The impact of this on Q_2 is offset somewhat by the fall in P_2, but with A_2 also lower, Q_2 must rise. Via (E1) this causes rates of return on capital in the non-dwellings sector to increase. This causes investment in the sector to also rise (via E4). Investment in the dwellings sector is subject to two countervailing effects. The improvement in primary factor productivity augments the effective supply of capital in the sector by 0.07 per cent. In (E15) this causes P_1 to fall. However household real consumption spending is rising and demand for housing is relatively income elastic. This income effect could be represented in (E15) through an rise in F_1^D. In MMRF the latter effect dominates, leading to a positive deviation in dwellings investment (row 17). 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[7] (row 21). The positive deviation in NSW household disposable income accounts for the positive deviation in NSW real consumption spending (row 1).

3.7 The combined financing, construction, and benefit impacts
Tables 7 to 10 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 a non-linear model, the results in Tables 7 to 10 are nevertheless approximately equal to the sum of the results for the construction effects alone (Table 5), the productivity effects alone (Table 6) and the appropriate financing effects alone (one of Tables 1 to 4). As such, the results in Tables 7 to 10 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 in isolation. To bring these explanations together, without unduly duplicating the explanations in Section 3.2 to 3.6, we concentrate in the remainder of this section on explaining the paths for one key NSW macroeconomic variable - employment (Chart 4). The results in Chart 4 imply a clear preference for debt and rates financing over the payroll taxes and developer charges.

With 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 then 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 still remains below its basecase level by the end of the simulation period.

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. Hence with debt financing, employment in NSW is above its basecase forecast level throughout the simulation period.

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[7] 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.

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 impact on employment is offset by the infrastructure construction stimulus. This allows NSW employment to rise above its basecase forecast level. Just as with developer charges, rates eventually feed into NSW nominal wage demands. Hence the positive employment deviation becomes smaller over 2005 to 2008, until the productivity effects begin to compensate employers for workers' increasing nominal wage demands.

4. CONCLUSIONS

In contrast to up-front financing methods (such as developer charges, payroll tax, and residential rates), the paper finds that the gains from urban infrastructure are greatest when the chosen financing method provides a closer match between the timing of the burden of financing the infrastructure and the timing of the benefits provided by the infrastructure. In this paper this was achieved by using the debt instrument, but it might equally be achieved by other deferred financing methods such as public-private partnerships (PPP's) and user charges. Compared with financing by payroll tax or developer charges (and to a lesser degree, rates), debt financing gives considerably higher increases in employment, consumption, capital and GSP both in the short run and in the long run. The advantage of debt financing over the methods involving immediate taxation is that the costs of the extra infrastructure affect wages in NSW only with a very long lag. With debt financing, employment in NSW is immediately stimulated by increased construction activity, with no offsetting increases in taxes. The effects of the gradual increase in taxes to pay the interest and principal bill are offset by increased productivity. Thus with debt financing, all measures of macroeconomic activity in NSW are above their basecase forecast levels throughout the simulation period. These results suggest that a greater reliance by regional governments on debt financing of infrastructure programs might be warranted. Similarly, the developer charge and payroll tax appear to be poor choices of financing instrument. However we qualify these tentative conclusions by noting that there are at three aspects of our modelling which require further work. Firstly, we intend expanding the study period beyond 2017. This will allow a better comparison of the debt and payroll tax instruments in the very long run. Secondly, such an extension of the study period will allow us to compare net present values of relevant flows (such as real consumption spending) over an appropriately long period. Thirdly, in future work we intend expanding the range of financing options under investigation to include other deferred financing techniques such as PPP's and user charges. Our expectation is that, just as we found with debt, these deferred financing techniques will be superior to up-front financing options.

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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	2017
1 Real consumption	0.00	-0.17	-0.34	-0.49	-0.62	-0.73	-0.85	-0.95	-1.06	-1.15	-1.24	-1.32	-1.40	-1.47	-1.53
2 Real investment	0.00	-2.56	-2.35	-2.35	-2.35	-2.30	-2.27	-2.26	-2.25	-2.24	-2.23	-2.22	-2.21	-2.20	-2.18
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	0.38	0.31	0.27	0.23	0.21	0.17	0.13	0.08	0.04	-0.01	-0.06	-0.11	-0.16	-0.20
6 International exports	0.00	1.23	0.88	0.65	0.43	0.26	0.08	-0.10	-0.28	-0.44	-0.60	-0.75	-0.90	-1.03	-1.16
7 Interregional imports	0.00	-0.51	-0.49	-0.49	-0.49	-0.47	-0.45	-0.44	-0.43	-0.42	-0.41	-0.39	-0.38	-0.36	-0.35
8 International import volumes	0.00	-0.23	-0.32	-0.41	-0.50	-0.56	-0.64	-0.71	-0.79	-0.87	-0.94	-1.01	-1.08	-1.15	-1.21
9 Real GDP (market prices)	0.00	-0.23	-0.34	-0.45	-0.55	-0.63	-0.72	-0.81	-0.89	-0.98	-1.06	-1.14	-1.21	-1.28	-1.35
10 Real GDP (factor cost)	0.00	-0.15	-0.28	-0.39	-0.50	-0.58	-0.67	-0.77	-0.86	-0.95	-1.03	-1.11	-1.19	-1.27	-1.34
11 Employment	0.00	-0.24	-0.35	-0.44	-0.53	-0.58	-0.64	-0.72	-0.79	-0.86	-0.93	-1.00	-1.06	-1.12	-1.18
12 Capital stock	0.00	0.00	-0.17	-0.32	-0.46	-0.60	-0.72	-0.84	-0.94	-1.05	-1.14	-1.23	-1.32	-1.40	-1.47
13 gdp deflator	0.00	-0.01	0.15	0.26	0.36	0.44	0.51	0.58	0.64	0.69	0.74	0.78	0.83	0.86	0.90
14 CPI	0.00	-0.25	-0.07	0.05	0.16	0.27	0.35	0.43	0.50	0.56	0.61	0.66	0.70	0.74	0.77
15 Nominal wage	0.00	-0.29	-0.14	-0.06	0.01	0.04	0.08	0.13	0.17	0.21	0.24	0.28	0.31	0.34	0.36
Selected NSW sectoral variables															
16 Investment in dwellings	0.00	-9.63	-8.33	-7.89	-7.46	-7.04	-6.66	-6.32	-6.01	-5.73	-5.48	-5.26	-5.05	-4.87	-4.70
17 Basic price, non-dwelling sector	0.00	-0.20	-0.18	-0.17	-0.16	-0.15	-0.14	-0.13	-0.12	-0.11	-0.10	-0.09	-0.08	-0.06	-0.05
18 Employment, non-dwelling sector	0.00	-0.24	-0.35	-0.44	-0.53	-0.58	-0.64	-0.72	-0.79	-0.86	-0.93	-1.00	-1.06	-1.12	-1.18
19 Capital stock, non-dwelling sector	0.00	0.00	-0.04	-0.10	-0.16	-0.23	-0.30	-0.37	-0.44	-0.51	-0.58	-0.65	-0.72	-0.79	-0.85
20 Output, non-dwelling sector	0.00	-0.17	-0.26	-0.34	-0.42	-0.47	-0.54	-0.61	-0.69	-0.76	-0.83	-0.90	-0.97	-1.04	-1.10
21 Rental price of capital, non-dwelling sector	0.00	-0.55	-0.59	-0.62	-0.63	-0.59	-0.57	-0.57	-0.55	-0.54	-0.52	-0.50	-0.47	-0.44	-0.41
Selected national and rest-of-Australian macroeconomic impacts															
22 National real wage	0.00	-0.03	-0.07	-0.12	-0.16	-0.24	-0.29	-0.32	-0.35	-0.37	-0.39	-0.41	-0.42	-0.43	-0.44
23 National employment	0.00	-0.04	-0.06	-0.06	-0.06	-0.03	-0.02	-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	-0.11	-0.15	-0.19	-0.22	-0.25	-0.27	-0.29	-0.31	-0.32	-0.33	-0.34	-0.35
25 National non-dwellings capital stock	0.00	0.00	-0.01	-0.02	-0.03	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08
26 Basic price, non-dwelling sector, RoA	0.00	0.15	0.03	-0.05	-0.12	-0.19	-0.25	-0.30	-0.35	-0.39	-0.43	-0.46	-0.48	-0.51	-0.53

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	2017
1 Real consumption	0.00	-0.43	-0.57	-0.65	-0.71	-0.76	-0.81	-0.86	-0.90	-0.95	-0.99	-1.02	-1.06	-1.09	-1.12
2 Real investment	0.00	-1.37	-1.29	-1.28	-1.28	-1.27	-1.27	-1.28	-1.28	-1.29	-1.30	-1.31	-1.31	-1.32	-1.32
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	-0.04	-0.07	-0.09	-0.12	-0.15	-0.18	-0.21	-0.25	-0.28	-0.32	-0.35	-0.38	-0.41
6 International exports	0.00	0.26	0.09	-0.05	-0.17	-0.28	-0.39	-0.49	-0.60	-0.69	-0.79	-0.87	-0.96	-1.03	-1.10
7 Interregional imports	0.00	-0.46	-0.41	-0.37	-0.34	-0.31	-0.28	-0.26	-0.23	-0.21	-0.19	-0.17	-0.14	-0.12	-0.10
8 International import volumes	0.00	-0.51	-0.58	-0.63	-0.68	-0.72	-0.76	-0.81	-0.85	-0.90	-0.94	-0.98	-1.02	-1.06	-1.10
9 Real GDP (market prices)	0.00	-0.33	-0.43	-0.49	-0.54	-0.58	-0.63	-0.67	-0.72	-0.76	-0.81	-0.85	-0.89	-0.93	-0.96
10 Real GDP (factor cost)	0.00	-0.29	-0.38	-0.44	-0.50	-0.54	-0.59	-0.63	-0.68	-0.72	-0.77	-0.81	-0.85	-0.89	-0.92
11 Employment	0.00	-0.45	-0.54	-0.58	-0.62	-0.64	-0.68	-0.71	-0.75	-0.79	-0.83	-0.87	-0.90	-0.94	-0.97
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	-0.77	-0.80
13 gdp deflator	0.00	-0.22	-0.14	-0.09	-0.05	-0.02	0.02	0.05	0.07	0.10	0.12	0.15	0.17	0.19	0.21
14 CPI	0.00	-0.35	-0.26	-0.20	-0.16	-0.12	-0.09	-0.06	-0.04	-0.01	0.01	0.03	0.04	0.06	0.07
15 Nominal consumer wage	0.00	-0.42	-0.38	-0.37	-0.36	-0.36	-0.35	-0.33	-0.32	-0.30	-0.28	-0.26	-0.24	-0.23	-0.21
16 Nominal producer wage	0.00	0.22	0.26	0.27	0.28	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40	0.42	0.43
Selected NSW sectoral variables															
17 Investment in dwellings	0.00	-2.65	-2.64	-2.63	-2.56	-2.47	-2.37	-2.27	-2.19	-2.11	-2.04	-1.98	-1.92	-1.87	-1.83
18 Basic price, non-dwelling sector	0.00	0.04	0.07	0.10	0.12	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23
19 Employment, non-dwelling sector	0.00	-0.45	-0.54	-0.58	-0.62	-0.64	-0.68	-0.71	-0.75	-0.79	-0.83	-0.87	-0.90	-0.94	-0.97
20 Capital stock, non-dwelling sector	0.00	0.00	-0.11	-0.19	-0.27	-0.33	-0.39	-0.44	-0.50	-0.55	-0.59	-0.64	-0.68	-0.72	-0.76
21 Output, non-dwelling sector	0.00	-0.33	-0.42	-0.48	-0.52	-0.56	-0.60	-0.65	-0.69	-0.73	-0.78	-0.82	-0.86	-0.89	-0.93
22 Rental price of capital, non-dwelling sector	0.00	-0.88	-0.63	-0.49	-0.39	-0.31	-0.26	-0.22	-0.19	-0.16	-0.13	-0.11	-0.08	-0.06	-0.03
Selected national macroeconomic impacts															
23 National real wage	0.00	-0.06	-0.12	-0.17	-0.20	-0.24	-0.26	-0.28	-0.28	-0.29	-0.29	-0.29	-0.29	-0.29	-0.29
24 National employment	0.00	-0.09	-0.09	-0.07	-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	-0.06	-0.07	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11
26 National non-dwellings capital stock	0.00	0.00	-0.03	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
27 Basic price, non-dwelling sector, RoA	0.00	0.21	0.14	0.10	0.06	0.03	0.01	-0.02	-0.04	-0.05	-0.07	-0.08	-0.10	-0.11	-0.12

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	2017
1 Real consumption	0.00	-0.03	-0.08	-0.13	-0.19	-0.24	-0.31	-0.37	-0.44	-0.51	-0.59	-0.67	-0.75	-0.84	-0.93
2 Real investment	0.00	-0.11	-0.21	-0.31	-0.42	-0.50	-0.60	-0.71	-0.81	-0.93	-1.04	-1.15	-1.26	-1.37	-1.48
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	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.03	-0.05	-0.06	-0.09	-0.11	-0.13	-0.16
6 International exports	0.00	0.02	0.02	0.02	0.00	-0.01	-0.03	-0.07	-0.12	-0.18	-0.25	-0.33	-0.41	-0.51	-0.60
7 Interregional imports	0.00	-0.04	-0.07	-0.10	-0.13	-0.14	-0.16	-0.17	-0.19	-0.21	-0.23	-0.24	-0.26	-0.27	-0.28
8 International import volumes	0.00	-0.04	-0.08	-0.13	-0.19	-0.23	-0.28	-0.34	-0.40	-0.47	-0.54	-0.61	-0.69	-0.77	-0.85
9 Real GDP (market prices)	0.00	-0.03	-0.06	-0.10	-0.14	-0.18	-0.22	-0.27	-0.32	-0.38	-0.44	-0.51	-0.58	-0.65	-0.72
10 Real GDP (factor cost)	0.00	-0.02	-0.05	-0.09	-0.13	-0.16	-0.20	-0.25	-0.30	-0.35	-0.41	-0.47	-0.54	-0.61	-0.68
11 Employment	0.00	-0.04	-0.08	-0.13	-0.17	-0.21	-0.26	-0.31	-0.37	-0.44	-0.51	-0.58	-0.65	-0.73	-0.81
12 Capital stock	0.00	0.00	-0.01	-0.02	-0.05	-0.07	-0.10	-0.14	-0.18	-0.22	-0.27	-0.33	-0.38	-0.45	-0.51
13 gdp deflator	0.00	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.02	-0.01	0.00	0.01	0.02	0.04	0.06	0.08
14 CPI	0.00	-0.03	-0.04	-0.06	-0.07	-0.08	-0.09	-0.09	-0.09	-0.10	-0.09	-0.09	-0.09	-0.08	-0.08
15 Nominal consumer wage	0.00	-0.03	-0.06	-0.09	-0.12	-0.16	-0.19	-0.22	-0.25	-0.27	-0.29	-0.31	-0.33	-0.35	-0.37
16 Nominal producer wage	0.00	0.02	0.05	0.08	0.11	0.12	0.15	0.18	0.22	0.26	0.30	0.35	0.40	0.45	0.50
Selected NSW sectoral variables															
17 Investment in dwellings	0.00	-0.21	-0.41	-0.62	-0.83	-1.03	-1.22	-1.41	-1.60	-1.78	-1.96	-2.13	-2.29	-2.46	-2.61
18 Basic price, non-dwelling sector	0.00	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.11	0.13	0.15	0.17	0.19
19 Employment, non-dwelling sector	0.00	-0.04	-0.08	-0.13	-0.17	-0.21	-0.26	-0.31	-0.37	-0.44	-0.51	-0.58	-0.65	-0.73	-0.81
20 Capital stock, non-dwelling sector	0.00	0.00	-0.01	-0.02	-0.04	-0.07	-0.10	-0.13	-0.17	-0.21	-0.25	-0.30	-0.36	-0.41	-0.47
21 Output, non-dwelling sector	0.00	-0.03	-0.06	-0.10	-0.14	-0.17	-0.21	-0.26	-0.31	-0.36	-0.42	-0.49	-0.55	-0.62	-0.69
22 Rental price of capital, non-dwelling sector	0.00	-0.07	-0.12	-0.15	-0.18	-0.18	-0.19	-0.20	-0.21	-0.22	-0.22	-0.22	-0.22	-0.22	-0.21
Selected national macroeconomic impacts															
23 National real wage	0.00	-0.01	-0.02	-0.03	-0.04	-0.08	-0.11	-0.13	-0.15	-0.18	-0.20	-0.22	-0.25	-0.27	-0.30
24 National employment	0.00	-0.01	-0.01	-0.02	-0.02	-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	-0.02	-0.03	-0.04	-0.04	-0.05	-0.06	-0.06	-0.07	-0.08
26 National non-dwellings capital stock	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04
27 Basic price, non-dwelling sector, RoA	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.01	0.00	0.00	-0.01

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	2017
1 Real consumption	0.00	-0.17	-0.30	-0.39	-0.48	-0.56	-0.63	-0.70	-0.77	-0.83	-0.89	-0.94	-0.99	-1.03	-1.07
2 Real investment	0.00	-1.63	-1.49	-1.51	-1.51	-1.48	-1.46	-1.45	-1.44	-1.43	-1.42	-1.41	-1.40	-1.39	-1.37
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	0.32	0.27	0.25	0.22	0.21	0.18	0.16	0.13	0.10	0.06	0.03	0.00	-0.03	-0.06
6 International exports	0.00	1.05	0.79	0.63	0.48	0.36	0.24	0.12	0.00	-0.11	-0.22	-0.32	-0.42	-0.51	-0.59
7 Interregional imports	0.00	-0.41	-0.39	-0.40	-0.40	-0.39	-0.38	-0.37	-0.37	-0.36	-0.35	-0.34	-0.33	-0.32	-0.31
8 International import volumes	0.00	-0.12	-0.19	-0.25	-0.31	-0.35	-0.39	-0.44	-0.49	-0.54	-0.58	-0.63	-0.67	-0.71	-0.75
9 Real GDP (market prices)	0.00	-0.11	-0.19	-0.26	-0.33	-0.38	-0.43	-0.49	-0.54	-0.60	-0.65	-0.69	-0.74	-0.78	-0.82
10 Real GDP (factor cost)	0.00	-0.06	-0.16	-0.23	-0.30	-0.35	-0.41	-0.47	-0.53	-0.58	-0.64	-0.69	-0.74	-0.78	-0.83
11 Employment	0.00	-0.09	-0.19	-0.25	-0.31	-0.34	-0.38	-0.43	-0.48	-0.52	-0.57	-0.61	-0.65	-0.69	-0.72
12 Capital stock	0.00	0.00	-0.11	-0.20	-0.29	-0.38	-0.46	-0.53	-0.60	-0.67	-0.73	-0.78	-0.84	-0.89	-0.93
13 gdp deflator	0.00	-0.30	-0.18	-0.11	-0.04	0.01	0.06	0.11	0.15	0.18	0.22	0.25	0.27	0.30	0.32
14 CPI	0.00	-0.25	-0.12	-0.03	0.04	0.11	0.17	0.22	0.27	0.31	0.35	0.38	0.41	0.43	0.45
15 Nominal wage	0.00	-0.26	-0.15	-0.09	-0.04	-0.02	0.01	0.04	0.07	0.10	0.12	0.15	0.17	0.19	0.21
Selected NSW sectoral variables															
16 Investment in dwellings	0.00	-6.31	-5.45	-5.21	-4.94	-4.67	-4.42	-4.18	-3.96	-3.77	-3.59	-3.43	-3.28	-3.14	-3.01
17 Basic price, non-dwelling sector	0.00	-0.15	-0.13	-0.12	-0.11	-0.11	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.06	-0.05	-0.04
18 Employment, non-dwelling sector	0.00	-0.09	-0.19	-0.25	-0.31	-0.34	-0.38	-0.43	-0.48	-0.52	-0.57	-0.61	-0.65	-0.69	-0.72
19 Capital stock, non-dwelling sector	0.00	0.00	-0.03	-0.06	-0.10	-0.14	-0.18	-0.23	-0.27	-0.32	-0.36	-0.40	-0.45	-0.49	-0.53
20 Output, non-dwelling sector	0.00	-0.07	-0.14	-0.19	-0.24	-0.28	-0.32	-0.37	-0.41	-0.46	-0.50	-0.55	-0.59	-0.63	-0.67
21 Rental price of capital, non-dwelling sector	0.00	-0.35	-0.37	-0.39	-0.39	-0.37	-0.36	-0.35	-0.35	-0.34	-0.33	-0.31	-0.29	-0.28	-0.26
Selected national macroeconomic impacts															
22 National real wage	0.00	-0.01	-0.03	-0.06	-0.08	-0.13	-0.17	-0.19	-0.21	-0.23	-0.24	-0.25	-0.26	-0.26	-0.27
23 National employment	0.00	-0.01	-0.03	-0.04	-0.04	-0.02	-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	-0.04	-0.07	-0.10	-0.13	-0.15	-0.16	-0.18	-0.19	-0.20	-0.21	-0.22	-0.22	-0.23
25 National non-dwellings capital stock	0.00	0.00	-0.01	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
26 Basic price, non-dwelling sector, RoA	0.00	0.15	0.07	0.01	-0.04	-0.08	-0.12	-0.16	-0.19	-0.22	-0.24	-0.27	-0.28	-0.30	-0.31

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	2017
1 Real consumption	0.00	0.16	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
2 Real investment	0.00	0.16	0.17	0.18	0.19	0.20	0.20	0.20	0.20	0.19	0.19	0.18	0.17	0.16	0.15
3 Real state government consumption	0.00	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48
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	-0.32	-0.33	-0.33	-0.32	-0.32	-0.31	-0.30	-0.28	-0.27	-0.26	-0.24	-0.23	-0.22
6 International exports	0.00	-0.97	-0.94	-0.89	-0.83	-0.77	-0.71	-0.65	-0.60	-0.55	-0.50	-0.46	-0.42	-0.38	-0.35
7 Interregional imports	0.00	0.43	0.41	0.39	0.38	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.27	0.26
8 International import volumes	0.00	0.20	0.19	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
9 Real GDP (market prices)	0.00	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14
10 Real GDP (factor cost)	0.00	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14
11 Employment	0.00	0.19	0.20	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19
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	0.13
13 gdp deflator	0.00	0.28	0.24	0.21	0.17	0.15	0.12	0.10	0.09	0.07	0.06	0.05	0.04	0.03	0.03
14 CPI	0.00	0.21	0.18	0.15	0.12	0.11	0.09	0.08	0.06	0.05	0.04	0.03	0.03	0.02	0.02
15 Nominal wage	0.00	0.24	0.22	0.20	0.18	0.16	0.14	0.12	0.11	0.10	0.08	0.07	0.07	0.06	0.05
Selected NSW sectoral variables															
16 Investment in dwellings	0.00	0.21	0.35	0.39	0.40	0.40	0.38	0.36	0.34	0.31	0.28	0.25	0.22	0.19	0.17
17 Basic price, non-dwelling sector	0.00	0.15	0.13	0.11	0.10	0.08	0.07	0.06	0.05	0.05	0.04	0.03	0.03	0.03	0.02
18 Employment, non-dwelling sector	0.00	0.19	0.20	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19
19 Capital stock, non-dwelling sector	0.00	0.00	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.11	0.12	0.12	0.13	0.13
20 Output, non-dwelling sector	0.00	0.14	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21 Rental price of capital, non-dwelling sector	0.00	0.40	0.28	0.19	0.14	0.10	0.07	0.05	0.03	0.02	0.01	0.00	-0.01	-0.02	-0.03
Selected national and rest-of-Australian macroeconomic impacts															
22 National real wage	0.00	0.02	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04
23 National employment	0.00	0.03	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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
25 National non-dwellings capital stock	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26 Basic price, non-dwelling sector, RoA	0.00	-0.13	-0.10	-0.08	-0.06	-0.05	-0.04	-0.03	-0.02	-0.02	-0.01	-0.01	0.00	0.00	0.00

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	2017
1 Real consumption	0.00	0.00	0.06	0.13	0.21	0.29	0.37	0.46	0.55	0.66	0.76	0.87	0.99	1.11	1.24
2 Real investment	0.00	0.00	0.11	0.23	0.36	0.46	0.59	0.73	0.87	1.02	1.18	1.33	1.49	1.65	1.81
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	0.68	0.77	0.86	0.95
6 International exports	0.00	0.00	0.17	0.33	0.49	0.64	0.80	0.96	1.14	1.32	1.51	1.70	1.91	2.12	2.33
7 Interregional imports	0.00	0.00	0.02	0.04	0.06	0.06	0.07	0.08	0.09	0.10	0.12	0.13	0.14	0.14	0.15
8 International import volumes	0.00	0.00	0.10	0.19	0.30	0.40	0.50	0.62	0.75	0.88	1.02	1.16	1.31	1.47	1.63
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	1.22	1.37	1.52
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	1.36	1.52
11 Employment	0.00	0.00	0.05	0.10	0.15	0.19	0.23	0.29	0.36	0.43	0.50	0.58	0.67	0.75	0.85
12 Capital stock	0.00	0.00	0.00	0.01	0.03	0.06	0.09	0.14	0.19	0.24	0.31	0.38	0.46	0.54	0.63
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	-0.49
14 CPI	0.00	0.00	-0.02	-0.04	-0.06	-0.08	-0.10	-0.12	-0.14	-0.16	-0.18	-0.21	-0.23	-0.26	-0.28
15 Nominal wage	0.00	0.00	-0.01	-0.02	-0.02	0.01	0.02	0.03	0.04	0.05	0.06	0.06	0.07	0.08	0.08
Selected NSW sectoral variables															
16 Investment in dwellings	0.00	0.00	0.15	0.30	0.46	0.61	0.76	0.92	1.08	1.25	1.42	1.58	1.75	1.90	2.06
17 Basic price, non-dwelling sector	0.00	0.00	-0.03	-0.06	-0.09	-0.11	-0.14	-0.17	-0.20	-0.23	-0.26	-0.29	-0.33	-0.36	-0.40
18 Employment, non-dwelling sector	0.00	0.00	0.05	0.10	0.15	0.19	0.23	0.29	0.36	0.43	0.50	0.58	0.67	0.75	0.85
19 Capital stock, non-dwelling sector	0.00	0.00	0.00	0.01	0.03	0.07	0.11	0.15	0.20	0.27	0.34	0.41	0.50	0.59	0.68
20 Output, non-dwelling sector	0.00	0.00	0.09	0.18	0.28	0.37	0.48	0.58	0.70	0.83	0.96	1.09	1.23	1.38	1.53
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	0.33	0.33	0.33	0.32
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	0.16	0.19	0.22	0.25	0.28	0.32	0.35	0.38
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	0.03	0.04	0.05	0.07	0.08	0.10	0.11	0.13
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	0.06	0.08	0.09	0.11	0.12
26 Basic price, non-dwelling sector, RoA	0.00	0.00	0.01	0.03	0.04	0.06	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23

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	2017
1 Real consumption	0.00	-0.02	-0.10	-0.18	-0.24	-0.28	-0.32	-0.34	-0.34	-0.34	-0.32	-0.30	-0.26	-0.21	-0.15
2 Real investment	0.00	-2.40	-2.08	-1.96	-1.82	-1.66	-1.50	-1.35	-1.20	-1.04	-0.89	-0.73	-0.57	-0.41	-0.25
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	0.08	0.06	0.07	0.10	0.13	0.17	0.20	0.24	0.28	0.32	0.37	0.41	0.47	0.52
6 International exports	0.00	0.26	0.12	0.11	0.11	0.14	0.17	0.21	0.26	0.32	0.40	0.48	0.58	0.69	0.81
7 Interregional imports	0.00	-0.08	-0.06	-0.07	-0.06	-0.04	-0.03	-0.02	-0.01	0.01	0.02	0.03	0.05	0.06	0.08
8 International import volumes	0.00	-0.03	-0.04	-0.03	-0.02	0.01	0.05	0.09	0.13	0.19	0.25	0.32	0.40	0.49	0.59
9 Real GDP (market prices)	0.00	-0.11	-0.13	-0.14	-0.15	-0.14	-0.13	-0.10	-0.07	-0.03	0.01	0.07	0.13	0.21	0.29
10 Real GDP (factor cost)	0.00	-0.03	-0.07	-0.09	-0.10	-0.10	-0.09	-0.07	-0.04	-0.01	0.04	0.09	0.15	0.22	0.30
11 Employment	0.00	-0.05	-0.11	-0.16	-0.20	-0.22	-0.24	-0.25	-0.26	-0.26	-0.26	-0.24	-0.22	-0.19	-0.15
12 Capital stock	0.00	0.00	-0.15	-0.28	-0.39	-0.48	-0.56	-0.63	-0.68	-0.71	-0.74	-0.75	-0.76	-0.75	-0.73
13 gdp deflator	0.00	0.27	0.36	0.40	0.44	0.46	0.48	0.49	0.50	0.50	0.50	0.49	0.47	0.46	0.44
14 CPI	0.00	-0.04	0.08	0.16	0.23	0.29	0.35	0.39	0.42	0.45	0.47	0.49	0.50	0.50	0.50
15 Nominal wage	0.00	-0.05	0.06	0.12	0.17	0.20	0.24	0.28	0.32	0.35	0.38	0.41	0.44	0.47	0.49
Selected NSW sectoral variables															
16 Investment in dwellings	0.00	-9.43	-7.89	-7.27	-6.68	-6.12	-5.59	-5.11	-4.66	-4.25	-3.86	-3.50	-3.17	-2.85	-2.56
17 Basic price, non-dwelling sector	0.00	-0.06	-0.08	-0.12	-0.15	-0.18	-0.21	-0.24	-0.27	-0.29	-0.32	-0.35	-0.38	-0.40	-0.43
18 Employment, non-dwelling sector	0.00	-0.05	-0.11	-0.16	-0.20	-0.22	-0.24	-0.25	-0.26	-0.26	-0.26	-0.24	-0.22	-0.19	-0.15
19 Capital stock, non-dwelling sector	0.00	0.00	-0.02	-0.05	-0.08	-0.10	-0.12	-0.14	-0.15	-0.15	-0.14	-0.13	-0.11	-0.08	-0.05
20 Output, non-dwelling sector	0.00	-0.04	-0.03	-0.02	0.00	0.03	0.06	0.10	0.15	0.20	0.25	0.32	0.39	0.47	0.56
21 Rental price of capital, non-dwelling sector	0.00	-0.16	-0.24	-0.28	-0.29	-0.27	-0.25	-0.24	-0.22	-0.20	-0.19	-0.17	-0.15	-0.13	-0.11
Selected national and rest-of-Australian macroeconomic impacts															
22 National real wage	0.00	-0.01	-0.02	-0.04	-0.07	-0.10	-0.12	-0.12	-0.12	-0.12	-0.10	-0.09	-0.07	-0.05	-0.02
23 National employment	0.00	-0.01	-0.02	-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	-0.06	-0.10	-0.14	-0.17	-0.19	-0.21	-0.22	-0.23	-0.24	-0.24	-0.23	-0.23	-0.22
25 National non-dwellings capital stock	0.00	0.00	-0.01	-0.01	-0.02	-0.03	-0.03	-0.02	-0.02	-0.01	0.00	0.01	0.02	0.03	0.04
26 Basic price, non-dwelling sector, RoA	0.00	0.02	-0.05	-0.10	-0.15	-0.19	-0.22	-0.25	-0.27	-0.29	-0.30	-0.30	-0.31	-0.30	-0.30

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	2017
1 Real consumption	0.00	-0.27	-0.33	-0.34	-0.33	-0.31	-0.28	-0.24	-0.19	-0.13	-0.06	0.01	0.09	0.18	0.27
2 Real investment	0.00	-1.20	-1.01	-0.87	-0.74	-0.61	-0.48	-0.35	-0.22	-0.09	0.05	0.19	0.34	0.48	0.63
3 Real state government consumption	0.00	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48
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	-0.30	-0.27	-0.23	-0.20	-0.15	-0.11	-0.06	-0.01	0.05	0.11	0.17	0.24	0.32
6 International exports	0.00	-0.71	-0.68	-0.60	-0.50	-0.40	-0.30	-0.18	-0.06	0.08	0.22	0.37	0.52	0.69	0.86
7 Interregional imports	0.00	-0.03	0.03	0.06	0.09	0.12	0.14	0.17	0.19	0.22	0.24	0.26	0.28	0.30	0.32
8 International import volumes	0.00	-0.31	-0.29	-0.25	-0.20	-0.14	-0.08	-0.01	0.07	0.16	0.26	0.36	0.47	0.58	0.70
9 Real GDP (market prices)	0.00	-0.21	-0.21	-0.18	-0.14	-0.09	-0.03	0.03	0.11	0.18	0.27	0.37	0.47	0.58	0.69
10 Real GDP (factor cost)	0.00	-0.16	-0.17	-0.14	-0.10	-0.05	0.01	0.07	0.14	0.22	0.31	0.40	0.50	0.61	0.73
11 Employment	0.00	-0.26	-0.29	-0.30	-0.29	-0.28	-0.27	-0.25	-0.22	-0.19	-0.15	-0.11	-0.06	0.00	0.06
12 Capital stock	0.00	0.00	-0.09	-0.15	-0.20	-0.23	-0.25	-0.26	-0.26	-0.24	-0.22	-0.19	-0.15	-0.11	-0.05
13 gdp deflator	0.00	0.06	0.07	0.05	0.03	0.00	-0.02	-0.04	-0.07	-0.09	-0.12	-0.15	-0.18	-0.22	-0.26
14 CPI	0.00	-0.14	-0.10	-0.09	-0.09	-0.09	-0.10	-0.10	-0.11	-0.12	-0.14	-0.15	-0.16	-0.18	-0.20
15 Nominal consumer wage	0.00	-0.18	-0.18	-0.19	-0.20	-0.20	-0.19	-0.18	-0.17	-0.15	-0.14	-0.13	-0.11	-0.10	-0.09
16 Nominal producer wage	0.00	0.46	0.47	0.46	0.45	0.45	0.46	0.47	0.48	0.49	0.51	0.52	0.53	0.55	0.56
Selected NSW sectoral variables															
17 Investment in dwellings	0.00	-2.44	-2.16	-1.95	-1.72	-1.48	-1.24	-1.00	-0.78	-0.57	-0.36	-0.16	0.03	0.20	0.37
18 Basic price, non-dwelling sector	0.00	0.18	0.18	0.15	0.13	0.10	0.08	0.05	0.02	-0.01	-0.04	-0.06	-0.09	-0.12	-0.15
19 Employment, non-dwelling sector	0.00	-0.26	-0.29	-0.30	-0.29	-0.28	-0.27	-0.25	-0.22	-0.19	-0.15	-0.11	-0.06	0.00	0.06
20 Capital stock, non-dwelling sector	0.00	0.00	-0.08	-0.14	-0.18	-0.20	-0.21	-0.21	-0.20	-0.18	-0.15	-0.11	-0.07	-0.01	0.05
21 Output, non-dwelling sector	0.00	-0.19	-0.18	-0.15	-0.11	-0.05	0.01	0.07	0.15	0.23	0.32	0.41	0.51	0.62	0.74
22 Rental price of capital, non-dwelling sector	0.00	-0.48	-0.27	-0.15	-0.05	0.01	0.06	0.10	0.14	0.17	0.20	0.22	0.24	0.25	0.26
Selected national macroeconomic impacts															
23 National real wage	0.00	-0.04	-0.07	-0.10	-0.11	-0.10	-0.09	-0.07	-0.05	-0.03	0.00	0.03	0.06	0.09	0.12
24 National employment	0.00	-0.06	-0.05	-0.03	-0.02	-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	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0.01	0.02
26 National non-dwellings capital stock	0.00	0.00	-0.02	-0.04	-0.04	-0.04	-0.03	-0.03	-0.02	-0.01	0.01	0.02	0.03	0.05	0.07
27 Basic price, non-dwelling sector, RoA	0.00	0.08	0.05	0.04	0.04	0.03	0.04	0.04	0.04	0.05	0.06	0.07	0.09	0.10	0.12

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	2017
1 Real consumption	0.00	0.12	0.16	0.18	0.19	0.21	0.23	0.25	0.28	0.31	0.33	0.37	0.40	0.43	0.46
2 Real investment	0.00	0.06	0.08	0.10	0.13	0.16	0.18	0.22	0.25	0.28	0.31	0.35	0.38	0.42	0.45
3 Real state government consumption	0.00	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48
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	-0.26	-0.21	-0.15	-0.09	-0.02	0.05	0.12	0.19	0.27	0.34	0.42	0.49	0.57
6 International exports	0.00	-0.95	-0.75	-0.54	-0.33	-0.13	0.06	0.24	0.42	0.59	0.76	0.92	1.07	1.22	1.37
7 Interregional imports	0.00	0.40	0.36	0.33	0.31	0.29	0.27	0.25	0.23	0.21	0.20	0.18	0.17	0.15	0.13
8 International import volumes	0.00	0.16	0.21	0.25	0.30	0.35	0.40	0.46	0.53	0.59	0.66	0.73	0.80	0.87	0.95
9 Real GDP (market prices)	0.00	0.10	0.16	0.21	0.26	0.32	0.38	0.44	0.50	0.57	0.64	0.71	0.78	0.85	0.93
10 Real GDP (factor cost)	0.00	0.10	0.16	0.22	0.27	0.33	0.39	0.46	0.53	0.60	0.67	0.74	0.81	0.89	0.97
11 Employment	0.00	0.16	0.17	0.16	0.15	0.15	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22
12 Capital stock	0.00	0.00	0.01	0.02	0.04	0.05	0.06	0.08	0.10	0.12	0.14	0.16	0.19	0.22	0.24
13 gdp deflator	0.00	0.27	0.19	0.11	0.05	-0.01	-0.06	-0.11	-0.16	-0.20	-0.24	-0.27	-0.31	-0.34	-0.38
14 CPI	0.00	0.19	0.11	0.05	-0.01	-0.05	-0.10	-0.14	-0.17	-0.21	-0.24	-0.27	-0.29	-0.32	-0.35
15 Nominal consumer wage	0.00	0.21	0.15	0.09	0.04	0.00	-0.04	-0.07	-0.10	-0.13	-0.16	-0.18	-0.20	-0.22	-0.24
16 Nominal producer wage	0.00	0.26	0.26	0.26	0.27	0.29	0.31	0.34	0.37	0.40	0.44	0.49	0.53	0.58	0.63
Selected NSW sectoral variables															
17 Investment in dwellings	0.00	0.01	0.09	0.07	0.02	-0.03	-0.09	-0.14	-0.19	-0.24	-0.28	-0.32	-0.36	-0.40	-0.43
18 Basic price, non-dwelling sector	0.00	0.15	0.11	0.08	0.04	0.01	-0.02	-0.04	-0.07	-0.09	-0.11	-0.13	-0.15	-0.17	-0.19
19 Employment, non-dwelling sector	0.00	0.16	0.17	0.16	0.15	0.15	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22
20 Capital stock, non-dwelling sector	0.00	0.00	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.16	0.19	0.23	0.26	0.30	0.34
21 Output, non-dwelling sector	0.00	0.11	0.18	0.23	0.28	0.34	0.40	0.46	0.53	0.60	0.67	0.74	0.82	0.90	0.98
22 Rental price of capital, non-dwelling sector	0.00	0.33	0.24	0.19	0.16	0.14	0.13	0.12	0.12	0.11	0.11	0.10	0.10	0.09	0.08
Selected national macroeconomic impacts															
23 National real wage	0.00	0.02	0.03	0.05	0.05	0.06	0.07	0.07	0.08	0.08	0.09	0.10	0.10	0.11	0.12
24 National employment	0.00	0.03	0.02	0.02	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	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.05
26 National non-dwellings capital stock	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.06	0.07	0.08
27 Basic price, non-dwelling sector, RoA	0.00	-0.11	-0.06	-0.02	0.01	0.04	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.20	0.22

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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	2017
1 Real consumption	0.00	-0.02	-0.06	-0.09	-0.10	-0.11	-0.10	-0.08	-0.05	-0.02	0.03	0.09	0.16	0.23	0.32
2 Real investment	0.00	-1.47	-1.22	-1.11	-0.98	-0.83	-0.69	-0.54	-0.39	-0.23	-0.08	0.08	0.24	0.40	0.56
3 Real state government consumption	0.00	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48
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	0.02	0.01	0.05	0.08	0.13	0.18	0.23	0.28	0.34	0.40	0.46	0.52	0.59	0.67
6 International exports	0.00	0.08	0.02	0.08	0.15	0.24	0.33	0.43	0.54	0.66	0.79	0.92	1.07	1.22	1.38
7 Interregional imports	0.00	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.06	0.06	0.07	0.08	0.09	0.10	0.11
8 International import volumes	0.00	0.07	0.10	0.13	0.17	0.23	0.29	0.36	0.44	0.52	0.61	0.71	0.82	0.93	1.05
9 Real GDP (market prices)	0.00	0.02	0.02	0.04	0.07	0.11	0.16	0.21	0.28	0.35	0.43	0.52	0.61	0.72	0.83
10 Real GDP (factor cost)	0.00	0.06	0.06	0.07	0.10	0.14	0.18	0.23	0.29	0.36	0.44	0.52	0.61	0.71	0.82
11 Employment	0.00	0.10	0.06	0.03	0.02	0.02	0.02	0.04	0.05	0.08	0.11	0.15	0.20	0.25	0.31
12 Capital stock	0.00	0.00	-0.09	-0.16	-0.22	-0.26	-0.30	-0.32	-0.33	-0.33	-0.32	-0.30	-0.27	-0.23	-0.19
13 gdp deflator	0.00	-0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.01	-0.01	-0.03	-0.05	-0.07	-0.10	-0.14
14 CPI	0.00	-0.04	0.03	0.07	0.11	0.14	0.16	0.18	0.20	0.20	0.21	0.21	0.20	0.20	0.18
15 Nominal wage	0.00	-0.02	0.06	0.09	0.12	0.15	0.17	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34
Selected NSW sectoral variables															
16 Investment in dwellings	0.00	-6.11	-5.00	-4.57	-4.14	-3.73	-3.33	-2.95	-2.60	-2.26	-1.95	-1.65	-1.37	-1.10	-0.84
17 Basic price, non-dwelling sector	0.00	0.00	-0.03	-0.07	-0.10	-0.14	-0.17	-0.20	-0.23	-0.27	-0.30	-0.33	-0.36	-0.39	-0.42
18 Employment, non-dwelling sector	0.00	0.10	0.06	0.03	0.02	0.02	0.02	0.04	0.05	0.08	0.11	0.15	0.20	0.25	0.31
19 Capital stock, non-dwelling sector	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.01	0.03	0.05	0.08	0.12	0.17	0.22	0.28
20 Output, non-dwelling sector	0.00	0.07	0.09	0.13	0.17	0.23	0.29	0.35	0.42	0.50	0.59	0.68	0.78	0.89	1.00
21 Rental price of capital, non-dwelling sector	0.00	0.04	-0.01	-0.05	-0.05	-0.05	-0.04	-0.03	-0.02	-0.01	0.01	0.02	0.02	0.03	0.04
Selected national macroeconomic impacts															
22 National real wage	0.00	0.02	0.02	0.02	0.01	0.00	0.00	0.01	0.02	0.03	0.05	0.07	0.09	0.12	0.15
23 National employment	0.00	0.03	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24 National capital stock	0.00	0.00	-0.03	-0.06	-0.08	-0.10	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.11	-0.10
25 National non-dwellings capital stock	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.02	0.03	0.04	0.05	0.07
26 Basic price, non-dwelling sector, RoA	0.00	0.03	-0.02	-0.04	-0.06	-0.08	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.09	-0.08

Chart 1. Impact of developer charge on price of dwelling services
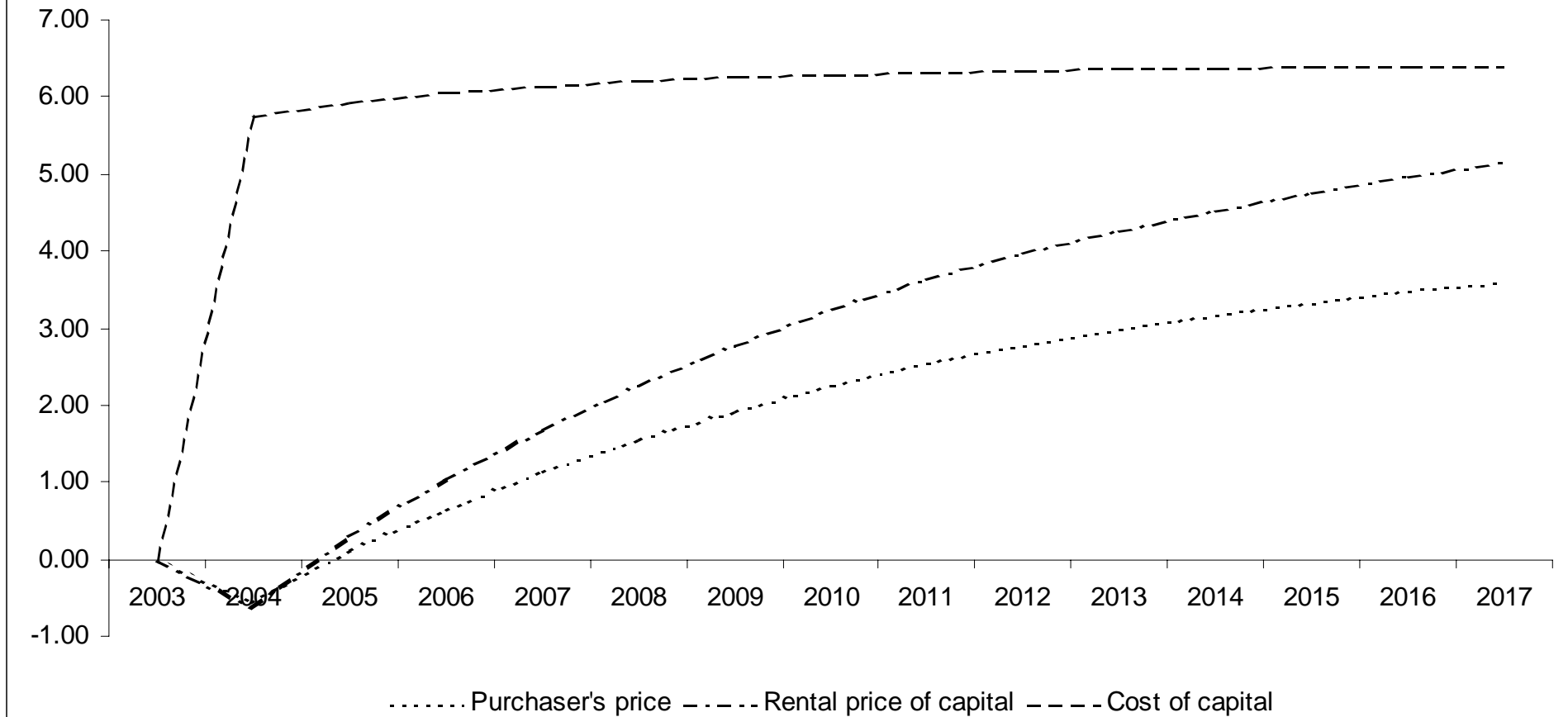
Purchaser's price ········ Rental price of capital –·–·– Cost of capital ––––

Chart 2. NSW employment impacts, financing only
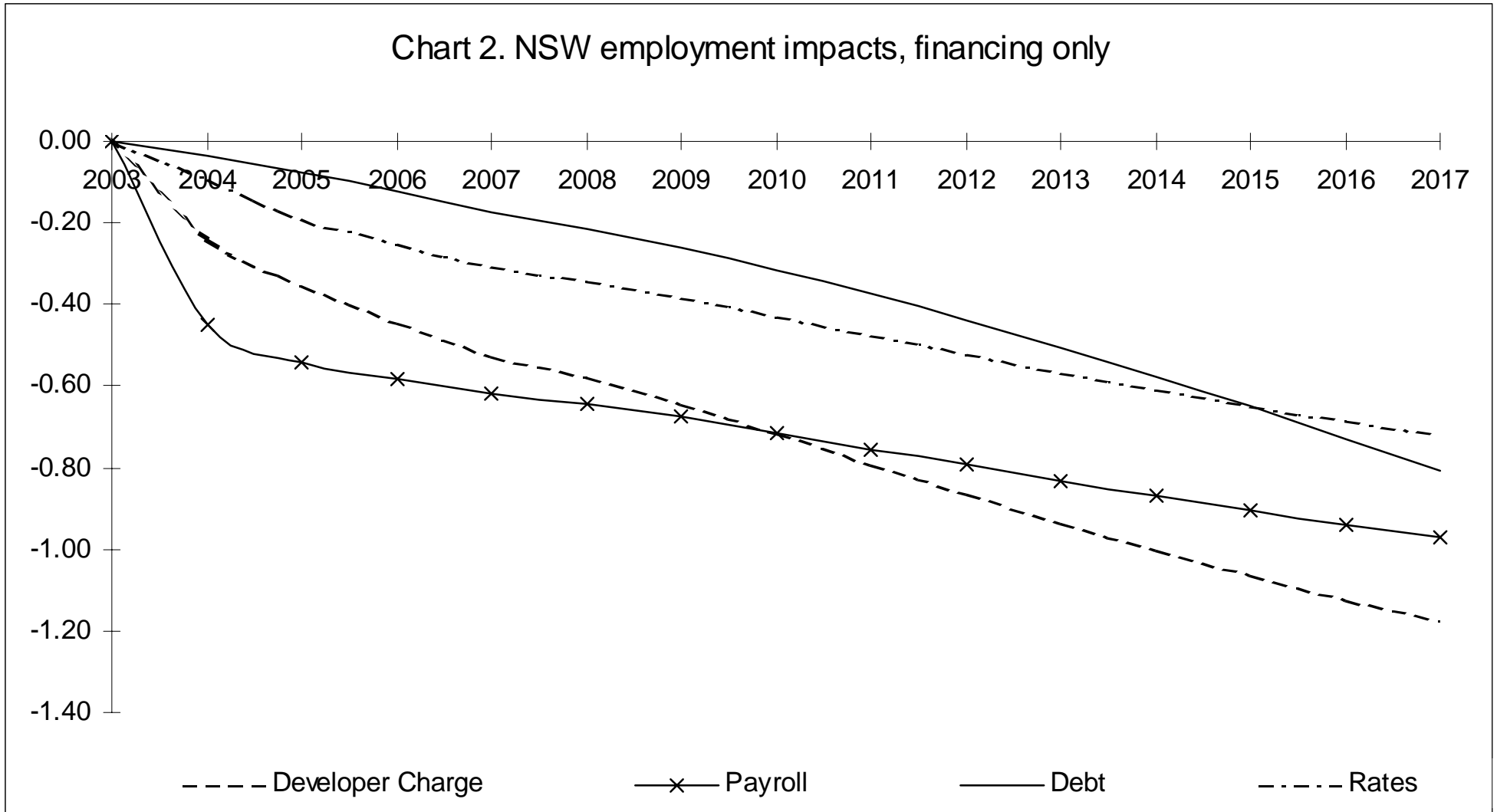
Chart 3. The impact of rates on the price of dwelling services

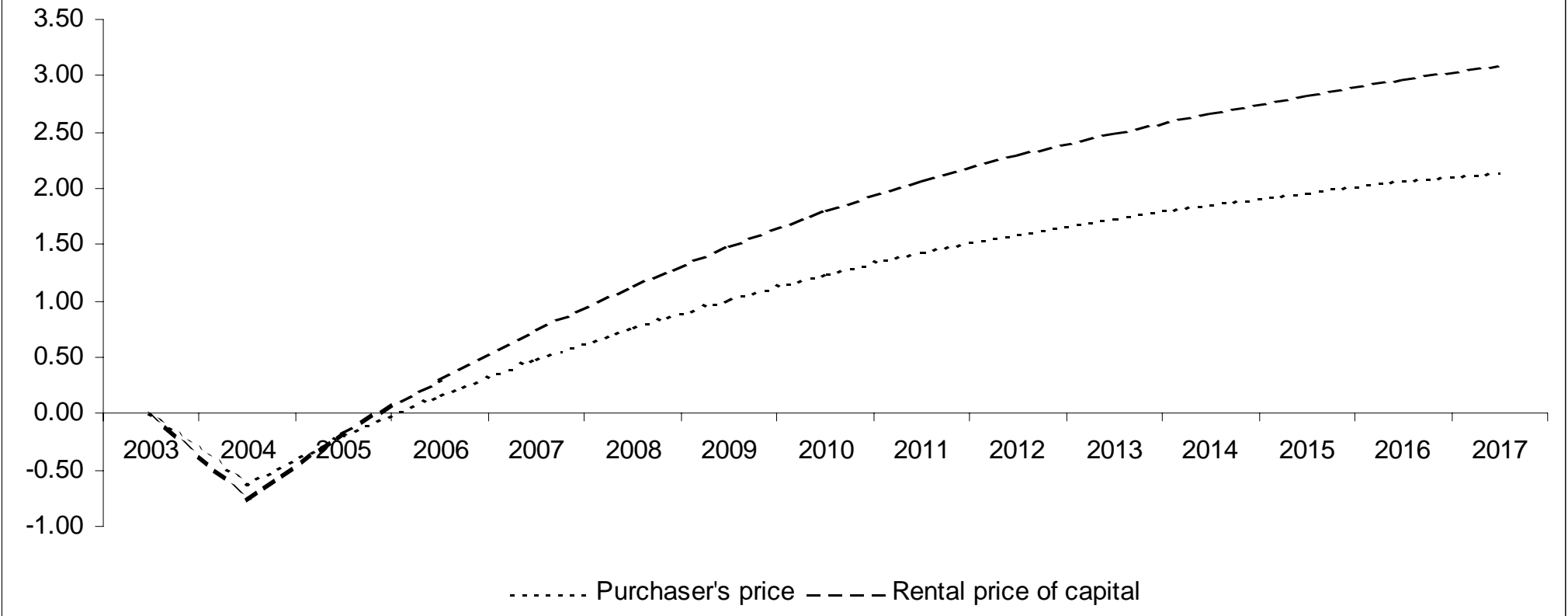........ Purchaser's price – – – – Rental price of capital

Chart 4. NSW Employment impacts: financing, construction, and productivity shocks
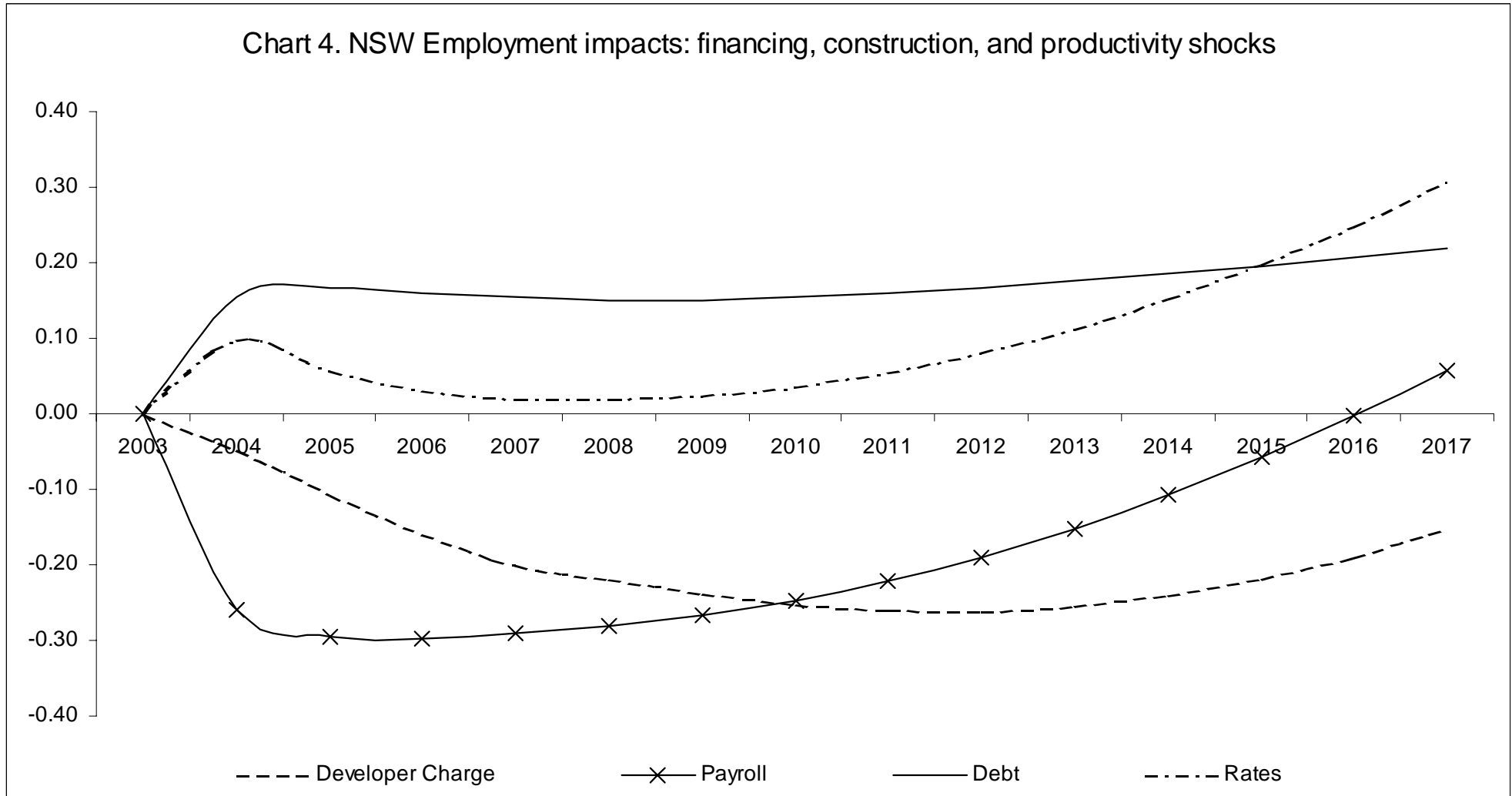
Legend: Developer Charge; Payroll; Debt; Rates

Chart 5: Real GDP at factor cost: financing, construction and productivity shocks