Horizontal Fiscal Equalisation: Modelling update and Scenarios

This report was prepared for
the South Australian Department of the Premier and Cabinet

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Executive summary

Introduction

In Australia, as in most other federations, a system of fiscal equalisation is used to address concerns that states have different fiscal capacities. Fiscal equalisation aims to even out these differences in fiscal capacities so that each state government is in an equally strong position to provide services. The actual services that are provided in each state remains the responsibility of each state government.

The method of implementing equalisation varies between jurisdictions, and in Australia it involves adjustments to the general purpose grants that states receive from the pool of GST revenue. Each year the Commonwealth Grants Commission (CGC) makes recommendations on the equalisation adjustments. The CGC (2015) explains the equalisation principle that it applies as follows.

> State governments should receive funding from the pool of goods and services tax such that, after allowing for material factors affecting revenues and expenditures, each would have the fiscal capacity to provide services and the associated infrastructure at the same standard, if each made the same effort to raise revenue from its own sources and operated at the same level of efficiency.

While most federations have fiscal equalisation systems, this Australian equalisation principle and the associated equalisation factors stand out as being particularly comprehensive. This earns praise from the prominent German economist, Paul Spahn (2007).

> Despite shortcomings such as a high degree of complexity, the Australia system has become *the* model for an ideal equalisation system. The basic approach is sound, complete, feasible, and reasonably transparent…the unique benchmark against which all equalisation mechanisms have to be compared in terms of their vulnerability to manipulation and perverse incentives.

The economic impacts of the Australian equalisation system were estimated by Independent Economics (2012) for use by the South Australian Government in its submission to the GST Distribution Review (2012). Our report found that the existing Horizontal Fiscal Equalisation (HFE) system provided an annual consumer benefit of $295 million, compared to a situation in which all equalisation adjustments, except on account of indigeneity, were abandoned[1].

This benefit arises because the equalisation system removes the incentive for fiscally induced migration between states. For example, without equalisation, a state with a high endowment of mineral resources will have a fiscal advantage, allowing it to offer lower taxes and higher government services. This leads to fiscally induced migration from states with lower fiscal capacity to states with higher fiscal capacity.

Australia's equalisation system aims to even out the differences in fiscal capacities between states. This allows interstate migration to be driven instead by economic opportunities, resulting in a better performing national labour market. Economically induced interstate migration leads to higher national income, while fiscally induced migration leads to lower national income.

[1] In any system of grants it is assumed that indigenous needs would be funded.

While this benefit from fiscal equalisation is based on an efficient pattern of interstate migration, fiscal equalisation is also supported on the grounds of fairness. By giving each state the same fiscal capacity to provide government services, it means that like individuals living in different states can be treated in the same way by government. This promotes horizontal equity.

In recent years the amount of equalisation has increased because the fiscal advantage to WA from its endowment of mineral resources has strengthened with the mining boom. The resulting downward adjustments to WA's share of GST revenue has led to proposals to modify the HFE system.

The South Australian Government has now commissioned this second modelling report from Independent Economics on HFE. This report:

- updates our 2012 report to provide contemporary estimates of the economic impacts of the existing HFE system;
- models possible new proposals to modify the HFE system; and
- designs and models a fully-efficient or welfare-maximising HFE system.

HFE: aims, factors and practice

The equalisation transfers between states recommended by the CGC are driven by four factors:

- natural endowments;
- demographic circumstances;
- geographic circumstances; and
- economic circumstances.

Further, as made clear in the CGC equalisation principle, the CGC does *not* equalise for differences in the operating efficiency of state governments. All five factors are now considered in turn.

Natural endowments

Higher natural endowments of mining resources and prime land provide a state with a clear fiscal advantage in collecting mining royalties, land tax and conveyancing duties. Equalising for this fiscal advantage can be expected to promote both equity and efficiency. It promotes equity by making it possible for citizens of states with lower natural endowments to receive comparable government services and pay comparable taxes to citizens of states with higher natural endowments. It promotes efficiency by eliminating fiscally induced migration caused by differences in natural endowments.

Demographic circumstances

Demographic circumstances can significantly affect a state's fiscal capacity. If a high proportion of a state's population is in a low socio-economic group or elderly, revenue-raising capacity will be lower and expenditure needs higher. Equalising for this fiscal disadvantage can be expected to promote both equity and efficiency for the same reasons that equalisation for natural endowments does.

Geographic circumstances

Geographic circumstances can also affect a state's fiscal capacity. The CGC partially equalises for geographic factors, such as remoteness and regional costs. This partial equalisation aims to fund like roads, health care and other services in like areas. The funding premium for remote areas is based on

the spending practices of states governments as a whole. This involves greater funding in remote areas than in urban areas, but not to the extent that the quality of service provision reaches the same standard.

Economic circumstances

The CGC also equalises for the effects of economic circumstances on a state's budget. Examples include the CGC assessments for payroll tax revenue and the wage costs of expenditures. The CGC payroll tax assessment reflects relative state labour market outcomes for wages and employment rates of the population. These relative labour market outcomes partly reflect demographic circumstances i.e. differences between states in the mix of population groups, and partly reflect economic circumstances i.e. differences between states in labour market outcomes for the same population groups. Equalisation for demographic circumstances can improve economic efficiency.

At the same time, differences between states in labour market outcomes for the same population groups (economic circumstances) act as a signal for economic migration in an efficiently operating national labour market. Fiscal equalisation for such differences can dull such signals, reducing efficiency. Further, free migration of labour may broadly equalise living standards between states, and the locational pattern of the population is in the long term voluntary. This prompts the question whether it is necessary to use fiscal equalisation for the same purpose. Migration can be thought of as facilitating horizontal equity because migrants can consider all factors that impact on living standards, including the effects of state budgets that are the focus of fiscal equalisation.

Given that equalising for economic circumstances (over and above demographic circumstances) can reduce the efficiency of the national labour market, and migration of labour is a way of achieving horizontal equity, there is a case for removing this factor from the HFE system. However, in practice economic circumstances make up a relatively small part of the equalisation system and so their removal would lead to relatively small changes, as shown later.

Operating efficiency

Fiscal advantages and disadvantages may also arise from differences in the operating efficiency of state governments. However, the CGC expressly does not equalise for such differences, as equalisation is based on state governments operating "at the same level of efficiency". While equalising for operating efficiency may assist horizontal equity, this argument is probably overwhelmed by the potential efficiency costs, so the CGC practice of not equalising for efficiency seems justified. Besides encouraging people to move to states with inefficient governments, equalisation for differences in state government efficiency would create highly perverse incentives: the more inefficient the state government, the larger the equalisation payments that it would receive.

Table A. Equalisation Factors

Factor	CGC	fully-efficient
natural endowments	yes	yes
demographic circumstances	yes	yes
geographic circumstances	partial	partial
economic circumstances	yes	no (a)
government efficiency	no	no

(a) In practice, the existing equalisation for economic/demographic circumstances would not be eliminated, but would be replaced with narrower equalisation for demographic circumstances.

The above analysis is summarised in Table A. It shows, for each of the five factors, whether the CGC applies equalisation. It compares this with the welfare-maximising or fully-efficient approach to equalisation. That fully-efficient approach is supported by the theoretical analysis in Appendix A.

Modelling Approach

The 2012 report developed the IE-HFE model and used it to simulate the impacts of the existing HFE system. The model makes extensive use of data from the CGC and the ABS state accounts. This report is based on the latest CGC (2015) assessment, for 2015/16. It considers a range of alternative policies and for the first time solves the model for the welfare-maximising HFE system, which is simulated.

The enhanced IE-HFE model takes into account differences between states in six areas:

- the capacity for the government to obtain revenue from natural endowments (as determined by mining production, land sales, property values);
- the influence of state demography on the capacity for the government to obtain revenue;
- government expenditure requirements driven by non-economic circumstances (demography, geography and natural factors);
- the amenity of a state for households, as influenced by population pressures;
- the efficiency of the state government in its service delivery; and
- the efficiency of the private sector.

The modelling takes the national supply of labour as given and simulates the decisions people make about the state in which they live. This is affected by the above factors and HFE payments.

Updated Results for Economic Impacts

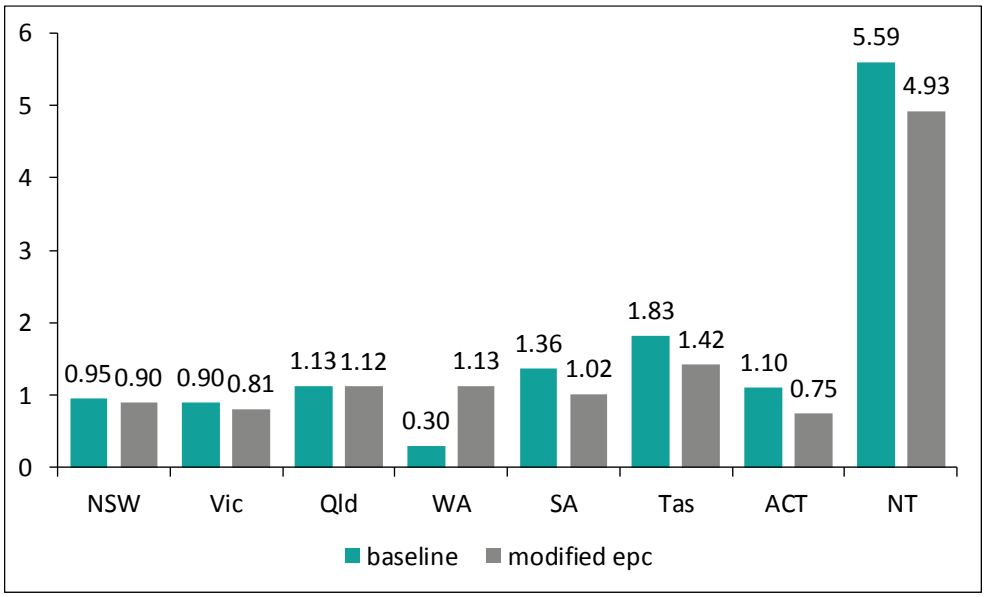
The IE-HFE model is first used to simulate a baseline scenario that reflects the existing situation. The HFE system is in place and is based on the latest CGC (2015) assessment, for 2015/16.

The IE-HFE model is then used to simulate an alternative policy under which the equalisation system is removed, with three exceptions noted below. That is, under the alternative policy, GST revenues are generally distributed between states on an equal per capita (EPC) basis. The exceptions where equalisation is retained are for:

- remoteness and regional costs;
- indigenous status; and
- small communities.

This modified EPC scenario recognises that without these or similar exceptions, the income of the Northern Territory would drop so dramatically that its viability as a separate jurisdiction would be highly questionable. Chart A compares the existing GST grants pool relativities for 2015/16 with those that would apply under the modified EPC system. GST grants pool relativities refer to the per capita GST grant received by a state relative to per capita GST revenue at the national level.

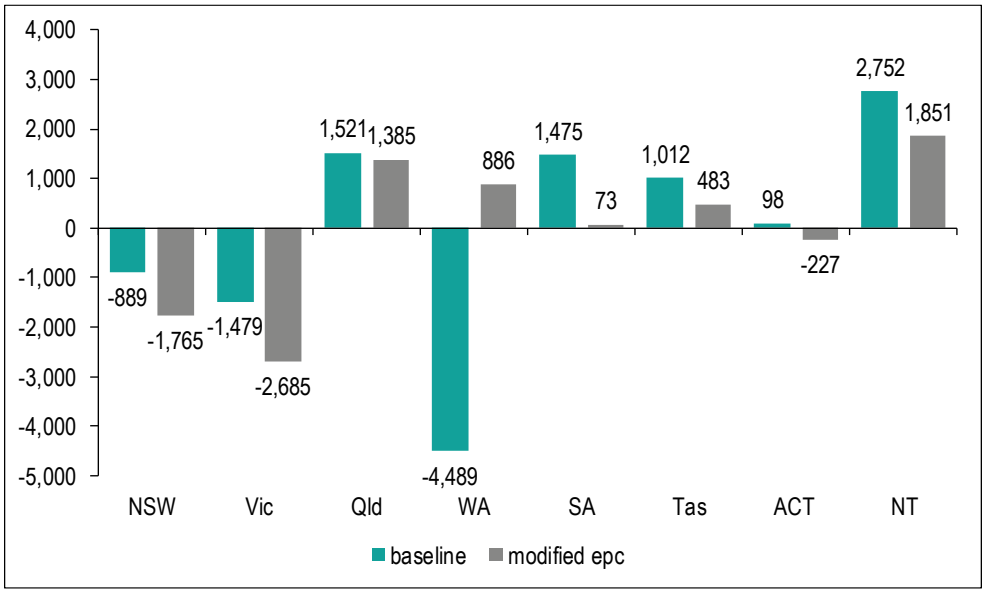
Chart A. Comparison of GST grants pool relativities for modified EPC compared to current HFE system



In the 2015/16 assessment, WA was assessed to have a high fiscal capacity because of booming mining royalties in the three assessment years (2011/12 to 2013/14), leading to a low GST grants pool relativity of 0.30 for the baseline scenario. In the modified EPC scenario most equalisation factors, including mining, are removed from the assessment. The only three remaining factors are in areas where WA is assessed to have a fiscal disadvantage, so its GST grants pool relativity is above unity, at 1.13.

In the 2015/16 assessment, NT was assessed to have a low fiscal capacity because of a low capacity across most areas, leading to a high GST grants pool relativity of 5.59 for the baseline scenario. In the modified EPC scenario, it loses some equalisation benefit and its GST grants pool relativity drops to 4.93. The GST grants pool relativities for the remaining six states also fall, but to a lesser extent.

Chart B. Comparison of GST transfers for modified EPC compared to current HFE system, $m



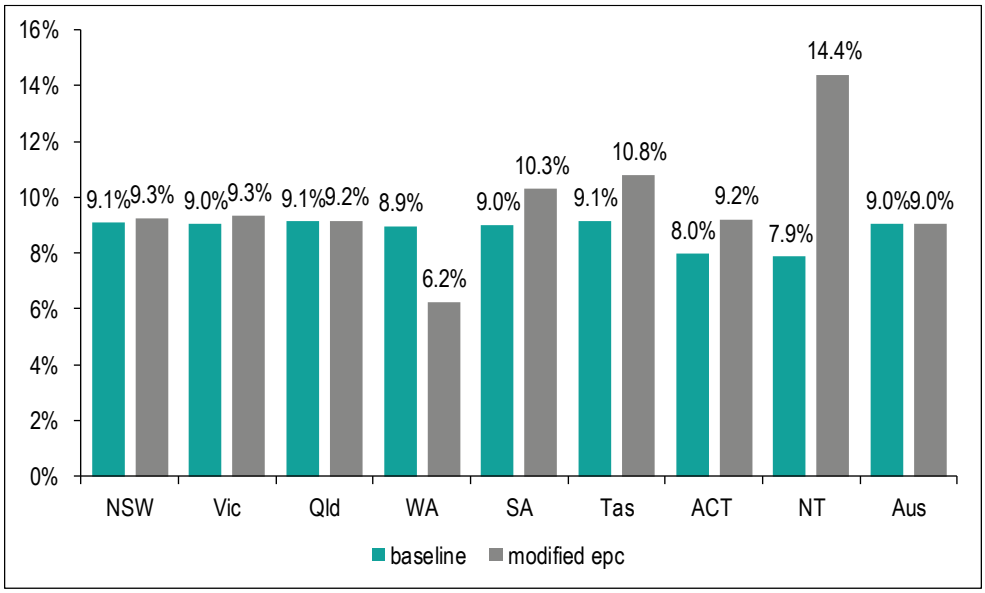
Source: Updated and Enhanced IE-HFE model

Chart B shows how these movements in GST grants pool relativities imply changes to equalisation transfers. As the only state with a higher GST grants pool relativity than before, WA is the only state that receives a more favourable equalisation transfer. Its equalisation payment changes from negative $4.5 billion to positive $0.9 billion. The equalisation transfer to the NT declines from $2.8 billion to $1.9 billion.

When its revenue from HFE transfers changes, a state government would need to adjust either its expenditure levels or its tax rates to maintain budget balance. In the IE-HFE model, a reduction in HFE transfers is addressed partly by government spending cuts, but mainly by tax increases.

Chart C compares standardised state tax rates under both scenarios. The standardised tax rates do not include mining royalties and other natural revenue sources and provide a measure of the required revenue raising effort or fiscal stress for each state to be funded through state taxes, such as payroll tax. The existing HFE system broadly equalises fiscal capacities. This leaves each state with a similar level of fiscal stress. Standardised tax rates range narrowly in the baseline scenario from 7.9 per cent in the NT to 9.1 per cent in Tasmania, compared to the standardised tax rate across all states of 9.0 per cent.

Chart C Comparison of standardised tax rates for modified EPC compared to current HFE system, per cent

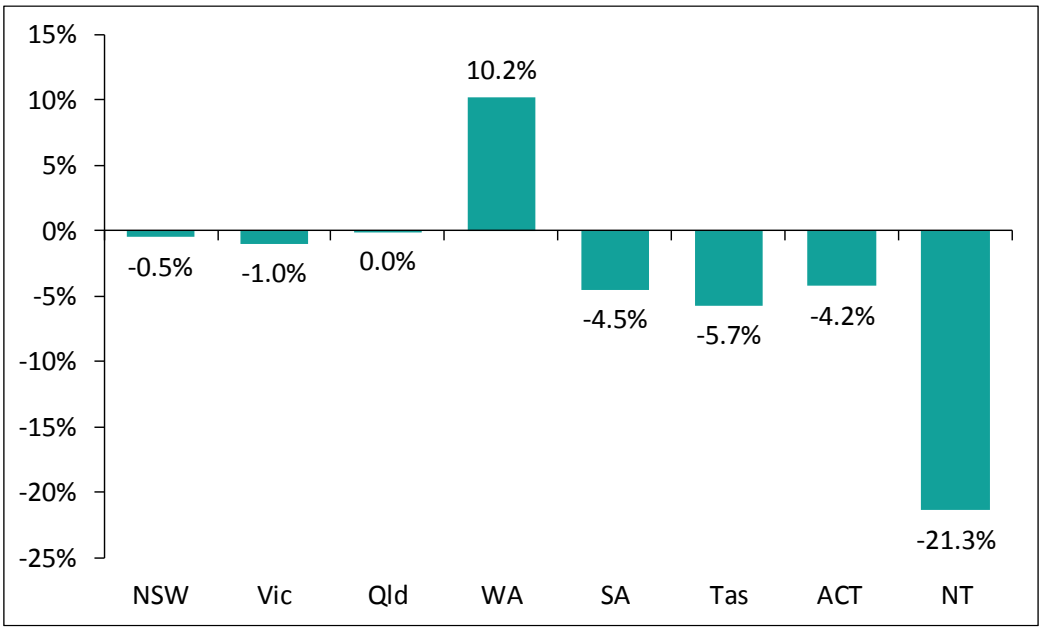


Source: Updated and Enhanced IE-HFE model

In the modified EPC scenario, equalisation for all but three factors is removed. This exposes the underlying large differences between states in their fiscal capacities. Fiscal stress varies greatly, with standardised tax rates varying from 6.2 per cent in WA to 14.4 per cent in the NT. WA's low fiscal stress arises because it no longer shares the benefit of its bountiful mining royalties with other states. SA and Tasmania also experience significant fiscal stress, with their standardised tax rates rising over 10 per cent, compared to 9 per cent as the nationwide average. In both cases, this partly reflects loss of equalisation for their lower endowments of mineral resources.

The economic impacts of hypothetically moving from the existing HFE system of the baseline scenario to the modified EPC system can be assessed by calculating the differences in modelled outcomes between the latter and the former. Because a long-run economic model is used, these impacts reflect the long-run or ongoing impacts from moving from HFE to modified EPC.

Chart D. Population impact of modified EPC system compared to current HFE system, per cent



Source: Updated and Enhanced IE-HFE model

The uneven landscape for tax rates (and government services) caused by the move away from HFE induces households to migrate from the now high-taxing states, particularly the NT, to the now low-taxing states, particularly WA. Chart D shows an estimated population gain of around 10 per cent for WA, and a population loss of around 21 per cent for the NT. The more modest, but still significant, increases in taxes in SA, Tasmania and the ACT lead to population losses of around 5 per cent.

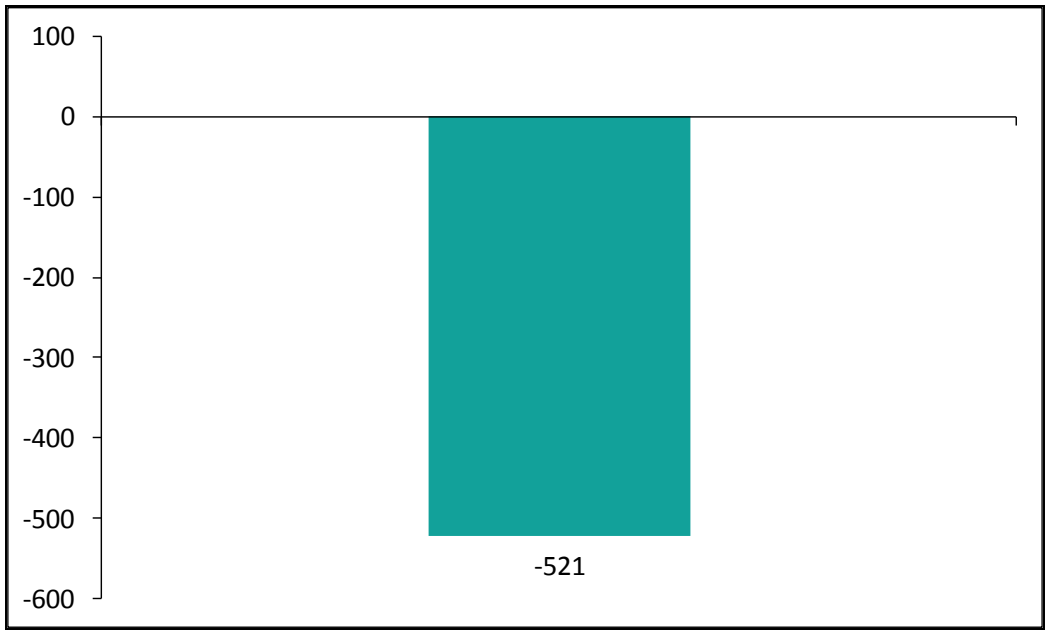
This inefficient, fiscally-induced migration leads to a loss in living standards, as the distribution of the population across states moves away from being determined by state economic environments. Abolishing the current HFE system and moving to a modified EPC system is estimated to lead to a permanent loss in annual living standards[2] of $521 million in 2015/16 terms, as shown in Chart E. Further, with households free to move between states, this loss will be shared across all states.

This estimate of the annual cost of largely abolishing the HFE system is consistent with our 2012 report estimate of $295 million, once two developments are taken into account. First, the previous cost estimate was on a 2009/10 basis whereas the new estimate is on a 2015/16 basis, and nominal incomes have risen substantially over that period. Second, equalisation has become more significant because the mining boom has added to equalisation transfers.

Estimates such as these are always surrounded by margins of error. Thus, the most recent estimate might be presented as an annual cost of around $500 million.

[2] The most appropriate measure of the effect of any government policy is its impact on household living standards. This is measured by its impact on consumer welfare, which takes into account changes in consumption of privately produced and government provided goods and services; and non-market amenity from population density.

Chart E. Welfare impact of modified EPC compared to current HFE system, $m, 2015/16 terms



Source: Updated and Enhanced IE-HFE model

This annual efficiency loss if full HFE were abandoned in favour of a modified EPC distribution of GST grants relates to current circumstances. As circumstances change, the quantification of the efficiency loss would change, depending positively on the scale of equalisation transfers. However, the continuing operation of full HFE clearly contributes to economic efficiency systematically. Most potential departures from full HFE will be efficiency reducing and adverse to horizontal equity, as demonstrated by the analysis of other policy options that follows.

Results for Other Scenarios

Various proposals have been made to vary the existing HFE system. Two policy options are captured in the following modelling of a "grants" scenario and a "floor" scenario for GST grants pool relativities.

Grants scenario

In the grants scenario, payments to the recipient states are made by the Federal Government from its taxation revenue instead of by the donor states. Such a scenario is designed to make it appear that the donor states would be better off, because they no longer make equalisation payments, while the recipient states would be no worse off, because there would still receive their equalisation payments.

Such a view of the "grants" scenario ignores the fact that the Federal Government would need to raise additional tax revenue to fund the grants. If the additional Commonwealth taxation revenue is raised on an EPC basis from residents of each state, the same net effect would also be achieved by funding the grants from the GST pool on an EPC basis, which is the approach modelled here.

Table B. Differences from EPC Distribution of GST, $m, 2015/16

	baseline	grants	modified epc	75c floor
NSW	-889	-2,182	-1,765	-1,892
Vic	-1,479	-1,706	-2,685	-2,263
Qld	1,521	139	1,385	886
WA	-4,489	-770	886	-1,693
SA	1,475	989	73	1,252
Tas	1,012	865	483	944
ACT	98	-14	-227	47
NT	2,752	2,680	1,851	2,719
Total	0	0	0	0

Source: Commonwealth Grants Commission (2015) and Independent Economics calculations.

Notes:

1. The baseline distribution is that recommended by the Commonwealth Grants Commission (2015).
2. In the "grants" scenario, payments to the recipient states are made by the Federal Government from its taxation revenue instead of by the donor states. It can be assumed that the additional Federal taxation revenue is raised on an EPC basis from residents of each state. The same effect is achieved by funding the grants from the GST pool on an EPC basis.
3. In the "modified epc" scenario, payments are not zero because three equalisation drivers are retained. The modification is that payments are retained for: remoteness and regional costs; indigenous status; and small communities.
4. In the "75c floor" scenario, the floor to payments reduces the donor amount from the WA by almost $3 billion. This funding gap is assumed to be closed by payments from the other seven states levied on an EPC basis.

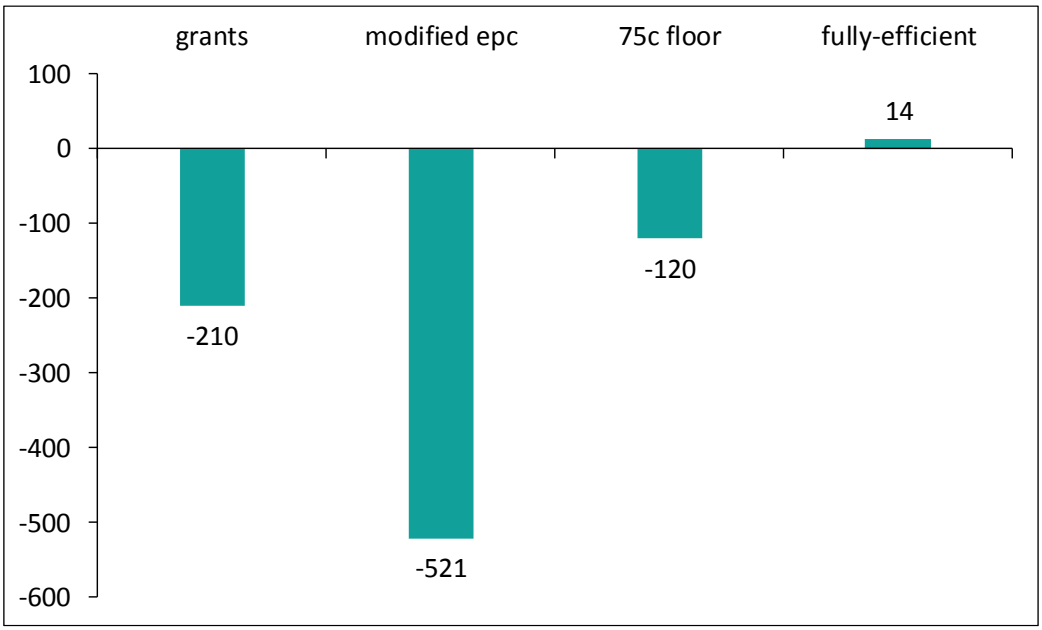
Table B shows that in the grants scenario all five recipient states (Qld, SA, Tas, ACT and NT) lose income compared to the existing HFE system. While they retain the same equalisation payment, they lose income because their citizens all need to contribute to the funding of the new Federal grant (either through the GST pool or through higher Federal taxes).

Turning to the donor states, only WA receives more income as a result of being relieved of making equalisation transfers. It no longer makes an equalisation payment of about $4.5 billion and this easily outweighs WA's per capita share of funding the new grants of about $0.8 billion. NSW and Victoria, while being donor states, both lose income. They no longer make equalisation transfers, but this is outweighed by their per capita contributions to the funding of the new grants to recipient states.

The income gain for WA from the grants scenario funds a drop in its standardised tax rate to 7.0 per cent, taking it well below the national average of 9.0 per cent. This results in fiscally-induced migration to WA. In the long run, the population of WA is estimated to be higher by about 7 per cent.

This inefficient, fiscally-induced migration leads to a loss in living standards, as the state distribution of the population moves away from being determined by state economic environments. Replacing the current HFE system based on transfers and moving to a grants scenario is estimated to lead to a permanent loss in annual living standards of $210 million in 2015/16 terms, as seen in Chart F.

Chart F. Welfare impact of alternative HFE systems compared to current HFE system, $m, 2015/16



Source: Updated and Enhanced IE-HFE model

75c Floor scenario

In the "75c floor" scenario, a floor of 75 cents is placed on each state's GST grants pool relativity. With a fixed pool of GST revenue, raising the GST grants pool relativity of WA from the assessed value of 0.30 to 0.75 would require reducing the GST grants pool relativities of other states. This scenario assumes this is achieved by the other seven states contributing on an equal per capita basis to the additional funding for WA. This raises each of their GST grants pool relativities by around 0.05.

The resulting equalisation transfers are shown in Table B in the "75c floor" column. Comparing this with the baseline and grants scenarios, it can be seen that the 75c floor scenario involves a smaller departure from the existing HFE system than does the grants scenario. The only state for which this is not the case is Victoria.

Given the smaller departure from the existing system, the welfare loss and other effects are also generally smaller. Chart F shows that the annual welfare loss is estimated at $120 million, compared to $210 million under the grants scenario.

Nonetheless, there is a welfare loss and it arises from the same cause as in the grants scenario. Moving away from the existing HFE system leads to inefficient, fiscally-induced migration. The population gain for WA is estimated at 5.4 per cent while the population loss for all other states is estimated at 0.7 per cent.

This policy's focus on the GST grants pool relativities also reflects a misunderstanding of the nature of the fiscal equalisation system. The heart of that system is a set of equalisation transfers that add to zero, such as those shown for five scenarios in Table B. The GST only serves as the current method of delivering those transfers. Thus, focussing on GST grants pool relativities confuses the fiscal equalisation policy with its current delivery mechanism. This highlights the completely arbitrary nature of setting a floor on GST grants pool relativities.

Fully-efficient scenario

The final scenario asks the IE-HFE model to design the equalisation policy that maximises consumer welfare. This welfare-maximising or fully-efficient system was set out in general terms in Table A. That is, the general design of the existing HFE system is welfare-maximising with the exception of equalisation for economic circumstances operating at the margin. Equalisation for economic circumstances such as the wages or labour productivity of comparable workers in different states is likely to the dull the market signals of economic opportunity that drive interstate migration in an efficient national labour market.

The CGC does not specifically identify the component of its recommended equalisation transfers that represents equalisation for economic circumstances. However, for the illustrative purposes of this report, the three equalisation drivers most associated with the idea of economic circumstances have been adjusted to simulate the fully-efficient scenario. On the expenditure side, equalisation for wage costs is removed.

On the revenue side, equalisation of both payroll tax and "other revenue effects" is narrowed from demographic/economic circumstances to demographic circumstances only. Equalisation for demographic circumstances is also extended to revenue areas that are currently excluded from equalisation for a range of reasons including, in some cases, difficulty in identifying policy neutral measures of individual tax base capacity and materiality.

This report treats the GST itself as a national tax, rather than a state tax, and as such it is outside of this report's analysis of the equalisation process.

With these small changes to the existing HFE system, fiscal stress is exactly equalised across states, with a uniform standardised tax rate of 9.0 per cent. Hence, fiscally-induced migration is completely eliminated.

There is an annual gain in consumer welfare of $14 million. The small nature of this gain is because the fully-efficient HFE scenario is quite close to the existing HFE system. This reflects the fact that the other HFE factors – natural endowments, demography and geography – play a more important part in the process than economic circumstances. This leads to the key conclusion that, while the existing HFE system is not be fully-efficient, for practical purposes it is close. This supports Spahn's (2007) contention that the Australian equalisation system is the unique international benchmark.

1. Introduction

In Australia, as in most other federations, a system of fiscal equalisation is used to address concerns that states have different fiscal capacities. A state with a bountiful endowment of mineral resources has a higher capacity to raise revenue from mining royalties, especially when commodity prices are high. By the same token, a state with a large indigenous population is likely to have a lower capacity to raise revenue and higher expenditure needs.

The idea of fiscal equalisation is to even out these differences in fiscal capacities so that each state government is in an equally strong position to provide services. At the same time, the actual services that are provided in each state remains the responsibility of each state government.

The method of implementing equalisation varies between jurisdictions, and in Australia it involves adjustments to the general purpose grants that states receive from the pool of GST revenue. The initial division of the GST pool is based on each states' share of the national population. Each share is then adjusted up or down depending on whether a state's fiscal capacity is assessed to be below or above the average for all states. These grant adjustments leave each state with the same assessed capacity to provide government services.

The economic impacts of the Australian equalisation system were estimated by Independent Economics (2012) for use by the South Australian Government in its submission to the GST Distribution Review (2012). Our report found that the existing Horizontal Fiscal Equalisation (HFE) system provided an annual consumer benefit of $295 million, compared to a situation in which all equalisation adjustments, except on account of indigeneity, were abandoned[3].

This benefit arises because the equalisation system removes the incentive for fiscally induced migration between states. For example, without equalisation, a state with a high endowment of mineral resources will have a fiscal advantage, allowing it to offer low taxes and high government services. Similarly, a state in which many citizens have a low socio-economic status will have a fiscal disadvantage, so taxes are likely to be high and services low. This leads to fiscally induced migration from states with low fiscal capacity to states with high fiscal capacity.

Australia's equalisation system aims to even out the differences in fiscal capacities between states. This allows interstate migration to be driven instead by economic opportunities, resulting in a better performing national labour market. Economically induced interstate migration leads to higher national income, while fiscally induced migration leads to lower national income.

While this benefit from fiscal equalisation is based on an efficient pattern of interstate migration, fiscal equalisation is also often supported on the grounds of fairness. By giving each state the same fiscal capacity to provide government services, it means that like individuals living in different states can be treated in the same way by government. This promotes horizontal equity.

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strengthened with the mining boom. The resulting larger downward adjustments to WA's share of GST revenue has led to proposals to modify the HFE system.

The South Australian Government has now commissioned this second modelling report from Independent Economics on HFE. This report:

- updates our 2012 report to provide contemporary estimates of the economic impacts of the existing HFE system;
- models possible new proposals to modify the HFE system; and
- designs and models an ideal HFE system.

This report is written in the context of the current Federal Government White Paper process for Reform of the Federation. It is set out as follows.

- **Section 2** reviews the aims of HFE, the factors used in generating HFE assessments, and the latest assessment, for 2015/16.
- **Section 3** sets out the modelling approach for the enhanced Independent Economics Horizontal Fiscal Equalisation (IE-HFE) model.
- **Section 4** presents and interprets the updated modelling results for the impacts of HFE.
- **Section 5** presents the modelling results for possible new proposals to modify the HFE system.
- **Appendix A** provides more detail on the modelling approach.

Disclaimer

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

The specific purposes of this report are to: (i) update the estimates in our 2012 report on the effects of the current system of Horizontal Fiscal Equalisation; (ii) provides estimates of new proposals to modify the HFE system; and (iii) designs and model an ideal HFE system.

The findings in this report are subject to unavoidable statistical variation. While all care has been taken to ensure that the statistical variation is kept to a minimum, care should be taken whenever using this information. This report only takes into account information available to Independent Economics up to the date of this report and so its findings may be affected by new information. The information in this report does not represent advice, whether express or inferred, as to the performance of any investment. Should you require clarification of any material, please contact us.

2. HFE: aims, factors and practice

This section analyses the aims of fiscal equalisation, the factors used by the CGC in formulating its equalisation recommendations, and its latest recommendations, which are for the state distribution of GST revenue in 2015/16.

While most federations have fiscal equalisation systems, this Australian equalisation principle and the associated adjustment system stands out as being particularly comprehensive. This earns praise from the prominent German economist, Paul Spahn (2007).

> Despite shortcomings such as a high degree of complexity, the Australia system has become *the* model for an ideal equalisation system. The basic approach is sound, complete, feasible, and reasonably transparent…the unique benchmark against which all equalisation mechanisms have to be compared in terms of their vulnerability to manipulation and perverse incentives.

2.1 Aims

The case for fiscal equalisation in federations can be traced back to the landmark work by the late US Nobel Laureate, James Buchanan. Buchanan (1950) first developed the case for equalisation based on horizontal equity (Buchanan, 1950) and then developed the case based on an efficient national labour market (Buchanan, 1952).

The equity case is as follows. By giving each state the same fiscal capacity to provide government services, it means that like individuals living in different states can be treated in the same way by government. This promotes horizontal equity.

In the absence of equalising transfers, it would fall on the residents of a particular state to bear the costs of any inherent fiscal disadvantages from the location of the borders to that state. For example:

- if a state has less access to natural resources and the associated revenue streams than other states, then it would need higher tax rates on other sectors to fund any given level of services; and
- if one state has a higher share of its population in demographic groups with high needs (such as elderly people who require greater hospital services) then it would face higher expenditures, and therefore higher taxes, in order to provide a given level of services to its population.

A useful benchmark for these considerations is the case of a unitary nation with no state boundaries inside it. In this case, the revenues from mining royalties and expenditure on health services would be shared across the national population. In this way, there would be 'equal treatment for equals' across the whole country[4]. To achieve this equity outcome in a federation with multiple states such as Australia, a system of equalisation transfers between states can be used.

The efficiency case is also based on equalisation of fiscal capacities. Giving each state the same fiscal capacity to provide government services negates fiscally induced migration. This allows interstate

[4] This would entail *horizontal* equity – a situation where "persons who are equally well-off before government policy should be equally well-off after it: equals should be treated equally" (Boadway, 2003, p2). In this case, fiscal differences between states from the location of state borders would not impact on an individual's standard of living. This is a separate objective to vertical equity, which seeks to address inequalities between high and low income earners. This is sometimes not well understood, and is explained in Hancock and Smith (2001, p. 97).

migration to be driven instead by economic opportunities, resulting in a better performing national labour market. Economically induced interstate migration leads to higher national income, while fiscally induced migration leads to lower national income.

Individuals make migration decisions by comparing the standard of living (utility or welfare) that they would attain by living in each of the states. The welfare of a household living in any particular state can be affected by a number of factors:

- the consumption of private goods and services that they can achieve in that state, which in turn depends on state wage levels, prices and taxes;
- the non-market amenity of living in that state, which may vary inversely with the state's population; and
- the state government services received in that state.

When the migration decisions of households lead to the highest possible level of welfare for the national population, then migration decisions are said to be *efficient*. In general, households will make migration decisions that work to maximise national welfare, because they will only move to another state if they judge that they will be better off by doing so. For example, they may be able to achieve a higher wage, or there may be better non-market amenity.

However, if there are factors distorting decisions to move, then households will make inefficient migration choices that do not maximise national welfare. Non-economic circumstances of each state give rise to differences in state capacities to raise tax revenue and differences in state expenditure needs. These differences can affect household migration decisions, leading to a lower level of welfare than would otherwise be the case.

State government access to revenue from a natural endowments, such as royalties raised from minerals, provides a relevant example of how differences in net fiscal benefits can reduce national welfare. If a state experiences a mining boom, then it would be efficient for households to move to that state to take advantage of higher mining prices. This will occur because greater demand for labour in the mining industry will lead to higher wages in the state, which will encourage migration from other states. However, as more labour moves into the state, its productivity falls and non-market amenity falls as the state becomes more congested. Eventually, the benefits of moving to the state diminish. If inward migration stops when there are no more overall gains from moving to the state, then the welfare of the national population would be at its highest possible level, and migration would be efficient.

However, the HFE literature points out that migration would not stop at this efficient level because high minerals prices would also create an 'artificial' fiscal incentive to move to the state. The state would now have higher revenue from mining royalties; these economic rents allow it to lower taxes such as payroll tax. This fiscal incentive would attract additional migrants to the state, only because they would "effectively acquire a share of regional rent revenues" (Boadway 2003, p12). These additional migrants would reduce national welfare, because they further reduce the productivity of labour, along with the wage. They also reduce the amenity from living in the state, for example, commute times or pollution may be higher in the state when the population is larger. In this way, differences between states in their ability to raise tax revenues interfere with migration decisions and reduce national welfare.

In general, migration is efficient, and leads to the highest possible level of welfare, when it is responding to underlying economic opportunities, such as a mining boom or differences in amenity levels or productivity. On the other hand, migration is inefficient, and reduces welfare, if it is responding to differences in the economic rents available to different state government. These differences are beyond the control of state governments, and are not related to the underlying economic circumstances in each state. For example, households may have an incentive to move away from a state with a relatively large population of elderly people, simply to avoid paying higher taxes to fund their hospital care.

Importantly, the HFE literature does not argue that equalisation should aim for all state governments to have the same taxation or expenditure policies. Households in some states may have a preference for a higher level of government services and the requisite higher level of taxation. Therefore, allowing policy differences between states will be important for maximising national welfare and promoting efficiency. Boadway (2003) summarises the literature which contends that a decentralised system of government is better able to cater for the divergent needs and preferences of their populations, and at a lower cost. Boadway (2003) also notes that, to allow for differences between state preferences, the HFE system aims to equalise "the potential of regions to provide public services, while tolerating differences in regional fiscal behaviour" (Boadway 2003, p17). Consistent with this, the aim of HFE is put simply by Walsh:

> *"If there are differences between States in the standards of services they provide to their citizens, it should be the result of differences in decisions by democratically elected governments, not the result of differences in their fiscal capacity to provide services of similar standards." (Walsh 2011 p10)*

The method suggested in the literature for achieving this is to base equalisation on 'representative' or national average tax rates and expenditure behaviour. That is, transfers between the states should be calculated so that if the state levied the average tax rates, then it could provide the average level of services. In this case, the actual actions of all state governments combined set the benchmark for the standard policies that are equalised for.

Because both the equity case and the efficiency case are based on equalisation of fiscal capacities, they lead to generally similar conclusions about the factors that should be included in formulating fiscal equalisation transfers. In particular, both approaches generally imply that there should be equalisation for non-economic circumstances that affect fiscal capacity. However, while fiscal equalisation for economic circumstances may promote horizontal equity it may hamper economic efficiency. This is because efficient migration is driven by differences between states in economic opportunities, and the market signals of such differences may be dulled by fiscal equalisation for economic circumstances operating at the margin.

To consider the contribution that fiscal equalisation can make to improving horizontal equity and the efficiency of the national labour market, the factors that drive fiscal equalisation need to be analysed.

2.2 Factors

The general equalisation principle used by the CGC (2015) is as follows.

> State governments should receive funding from the pool of goods and services tax such that, after allowing for material factors affecting revenues and expenditures, each would have the fiscal

> capacity to provide services and the associated infrastructure at the same standard, if each made the same effort to raise revenue from its own sources and operated at the same level of efficiency.

This rules out equalising for differences between states in the operating efficiencies of their governments. The CGC (2015) also lists the broad range of factors it uses in assessing fiscal capacity.

> The fiscal positions of the States differ because of differences in their natural endowments, their economic, demographic and geographic circumstances and the policy choices they make. The Commission calculates what the fiscal capacities of the States would be if the policy differences were removed. We call these the assessed fiscal capacities of States and they are central to our recommended GST distribution. This distribution is designed to equalise the assessed fiscal capacities of the States.

Thus, the equalisation transfers between states recommended by the CGC are driven by four factors:

- natural endowments;
- demographic circumstances;
- geographic circumstances; and
- economic circumstances.

Further, as made clear by the earlier CGC statement of its equalisation principle, the CGC does *not* equalise for differences in the operating efficiency of state governments. All five factors are now considered in turn.

Natural endowments

Higher natural endowments of mining resources and prime land provide a state with a clear fiscal advantage in collecting mining royalties, land tax and conveyancing duties. Equalising for this fiscal advantage can be expected to promote both equity and efficiency. It promotes equity by making it possible for citizens of states with lower natural endowments to receive comparable government services and pay comparable taxes to citizens of states with higher natural endowments. It promotes efficiency by eliminating fiscally induced migration caused by differences in natural endowments. Fully eliminating this fiscally-induced migration requires the maintenance of full equalisation for mining endowments or mining capacity.

In equalising for the capacity to raise mining royalties, there are three principles for achieving a fully-efficient outcome. First, full equalisation is required. Second, to the extent practical, equalisation should be based on mining capacity rather than mining effort. Third, to the extent that state government revenue raising from mining royalties involves expenditure costs such as costs incurred in project approval processes, these should be offset against the revenue gains.

Demographic circumstances

Demographic circumstances can significantly affect a state's fiscal capacity. If a high proportion of a state's population is in a low socio-economic group or elderly, revenue-raising capacity will be lower and expenditure needs higher. Equalising for this fiscal disadvantage can be expected to promote both equity and efficiency. It promotes equity by making it possible for citizens of states with a high proportion of citizens in a low socio-economic group or elderly to receive comparable government services and pay comparable taxes to citizens of states with a different socio-economic mix.

It also promotes efficiency by eliminating fiscally induced migration caused by demographic differences. This can involve migration away from economic opportunities; such migration does nothing to reduce the size of the low socio-economic group or elderly. More generally, demographic circumstances do not respond to migration flows but they may induce them in the absence of equalisation.

Geographic circumstances

Geographic circumstances can also affect a state's fiscal capacity. The CGC equalises for geographic factors, including the higher costs associated with both remoteness and large urban centres. Notwithstanding its statement above, in practice the CGC partially rather than fully equalises for geographic factors. Boadway (2007) explains the process as follows.

> Rural and urban areas have different levels of health care and roads because it costs more to provide such services in rural areas. Equalisation systems typically do not try to fully equalise differences in costs. One way of dealing with the problem is to take as given differences in levels of public services in different geographic locations and to equalise the costs of providing those services for like areas across regions. This is the approach taken in Australia.

Arguably this mimics the approach that the Federal Government would take if it were responsible for providing the same services i.e. it would provide like services in like areas. In that sense, this form of partial equalisation for geographic circumstances can be regarded as equitable and efficient.

Economic circumstances

The CGC also equalises for the effects of economic circumstances on a state's budget. Examples involving economic circumstances include the CGC assessments for payroll tax revenue and the wage costs of expenditures.

In effect, the CGC assesses a state's relative capacity to raise payroll tax revenue from two state labour market outcomes: the average wage and the employment to population ratio. However, these outcomes are affected by both demographic and economic circumstances. It is efficient to equalise for the effects on the two outcomes from demographic circumstances i.e. the effects of the composition of the population, including its age-gender composition. However, it is not efficient to equalise for economic circumstances operating at the margin i.e. differences between states in labour market outcomes for the same population group.

Differences between states in labour market outcomes for the same population group act as a market signal for economic migration in an efficiently operating national labour market. Fiscal equalisation for such differences can dull such signals and so would not be undertaken if the aim of fiscal equalisation is to promote efficiency.

In this report, in analysing this issue, we make the simplifying assumption that differences between states in wages reflect economic circumstances while differences in employment to population ratios reflect demographic circumstances. In the event that it was decided to remove economic circumstances as a basis for equalisation to promote efficiency, a systematic detailed examination would be required and that would lead to a more sophisticated, detailed decomposition of labour market outcomes into demographic and economic circumstances.

In equalising for the wage costs of expenditures, the CGC appropriately seeks to obtain a pure measure of wage costs by controlling for a wide range of demographic and other factors that lead to differences in average wage rates between states. However, if the aim is to promote efficiency, any equalisation for differences in wage costs would be removed.

Equalising for like for like wage differences as part of the payroll tax and wage cost assessments may be intended to improve horizontal equity, but this outcome seems unlikely. With free migration of labour between states, people are likely to move to states that are more attractive to live until resulting population pressures and downward pressure on wages neutralise that attraction. This means that differences for a demographic group in standards of living between states are likely to be small and temporary.

So if a state has persistently high wages for a demographic group, this is likely to be compensation for other factors such as high housing costs or low amenity e.g. undesirable climate or population pressures. Thus, free migration of labour means that state like for like differences in wages are an unreliable indicator of differences in broader living standards and so should not be equalised. However, as noted above, in assessing revenue raising capacity, it is appropriate to equalise for differences in overall labour market outcomes that reflect demographic composition rather than economic circumstances.

The idea that free migration of labour may broadly equalise living standards between states, and the locational pattern of the population is in the long term voluntary, prompts the question whether it is necessary to use fiscal equalisation for the same purpose. Migration can be thought of as facilitating achieving horizontal equity because migrants can consider all factors that impact on living standards, including the effects of state budgets that are the focus of fiscal equalisation.

Given that equalising for economic circumstances (over and above demographic circumstances) can reduce the efficiency of the national labour market, and migration of labour is a way of achieving horizontal equity, there is a case for removing this factor from the HFE system. However, in practice economic circumstances make up a relatively small part of the equalisation system and so their removal would lead to relatively small changes, as shown later.

Operating efficiency

Fiscal advantages and disadvantages may also arise from differences in the operating efficiency of state governments. However, the CGC expressly does not equalise for such differences, as equalisation is based on state governments operating "at the same level of efficiency".

The CGC position is correct from an efficiency perspective. If some state governments operate more efficiently than otherwise, some people may have a preference for living in the jurisdictions with the more efficient governments so they can enjoy better services and/or lower taxes. This is a welfare enhancing choice that should not be distorted by equalisation. Further, equalisation for differences in state government efficiency would create highly perverse incentives: the more inefficient the state government, the larger the equalisation payments that it receives.

From a horizontal equity perspective, there would be a case for equalisation for differences in operating efficiency. Otherwise, individuals living in states with less efficient governments may face lower government services and higher taxes than individuals living in other states.

However, equalising for operating efficiency is likely to involve particularly high efficiency costs through the perverse incentives it would create and the feasibility of doing so is highly questionable. Moreover, as noted above, interstate migration facilitates horizontal equity. Hence there is a strong case for continuing with the present practice of not equalising for state government operating efficiency.

The above analysis is summarised in Table 2.1. It shows, for each of the five factors, whether the CGC applies equalisation. It compares this with the recommended approach to equalisation. That recommended approach is supported by theoretical analysis presented in Appendix A of this report.

Table 2.1. Equalisation Factors

Factor	CGC	fully-efficient
natural endowments	yes	yes
demographic circumstances	yes	yes
geographic circumstances	partial	partial
economic circumstances	yes	no (a)
government efficiency	no	no

(a) In practice, the existing equalisation for economic/demographic circumstances would not be eliminated, but would be replaced with narrower equalisation for demographic circumstances.

2.3 2015/16 assessment

In practice, the equalisation process used by the CGC is more complex than it may appear from the five factors listed in Table 2.1. This is seen in the latest CGC assessment, which relates to the distribution of GST revenue in 2015/16. The table below is drawn directly from the CGC (2012) report and shows 18 separate components or drivers that are aggregated to reach the final recommended transfers. Those recommended equalisation transfers appear in the final row of the table. By design, they sum to zero when added across states.

For modelling purposes, these drivers are aggregated to the five broader categories shown in Table 2.1. A final column has been added to the table showing, for each driver, the broader category (or categories) into which it has been classified.

On the revenue side, three sources of revenue are classified to the "natural endowments" category: mining royalties, conveyancing duty and land tax. Their revenue is derived from the fixed factors or natural endowments of mining resources and land. If a state has high natural endowments delivering a large stream of economic rents, it is important to equalise for this. Otherwise, the resulting low state tax burden will lead to inefficient, fiscally induced inward migration.

The two other sources of revenue are classified to both the "economic" and demographic categories. These other revenue sources are payroll tax and "other revenue effects", which refer to insurance taxes and motor vehicle taxes. They are driven by state incomes, which are influenced by demographic circumstances such as the proportion of the population of prime working age, and economic circumstances such as the wages and productivity of different groups of workers.

Table S4-6 Drivers of illustrative difference from EPC distribution of GST, 2015-16 ($ million)										
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Redist	category
	$m	$m	$m	$m	$m	$m	$m	$m	$m	
Effects of revenue raising capacity	2 253	2 981	- 273	-5 888	527	208	204	- 12	6 173	
Mining production	2 262	2 993	-274	-5 911	529	209	205	-12	6 197	natural
Payrolls paid	-145	460	205	-1 114	387	208	-18	16	1 276	economic/demog
Property sales (a)	-762	-25	247	-174	483	177	10	44	961	natural
Land values	36	-122	-31	-269	229	81	53	23	422	natural
Other revenue effects	247	60	-104	-246	-31	19	40	15	382	economic/demog
Total revenue raising capacity	1 638	3 366	43	-7 714	1 598	694	291	85	7 714	
Effects of expenditure requirements										
Demographic features										
Remoteness and regional costs (b)	-1 336	-1 113	696	508	130	377	-153	890	2 601	geographic
Indigenous status (c)	-118	-1 298	594	190	-120	84	-55	722	1 591	demographic
Socio-economic status (d)	376	-79	-64	-293	310	36	-210	-76	722	demographic
Other SDC (e)	-43	-368	326	-111	96	27	-35	108	557	demographic
Wage costs (f)	348	-629	-464	842	-164	-111	84	93	1 368	economic
Population growth (g)	-737	-151	157	1011	-268	-156	-37	181	1 349	demographic
Urban centre size (h)	323	744	-563	25	-152	-211	-54	-112	1 092	geographic
Administrative scale	-443	-280	-173	42	118	225	237	273	896	natural
Natural disaster relief	-216	-236	661	-75	-89	-25	-17	-3	661	natural
Small communities (i)	-311	-274	95	187	63	22	-19	238	605	geographic
Non-State sector (j)	-332	-229	25	428	-35	62	59	21	595	demographic
Other expense effects	-476	-990	262	491	119	24	-43	613	1 510	demographic
Total expense and capital effects	-2 965	-4 904	1 552	3 247	9	356	-243	2 948	8 112	
Effects of Commonwealth payments	438	59	-74	-22	-132	-38	51	-282	547	
Total	-889	-1 479	1 521	-4 490	1 475	1 012	98	2 752	6 858	
Note: The redistribution is the total difference from the EPC distribution. It is the sum of positive (or negative) items in each row.										
(a) Stamp duty on conveyances only. Excludes stamp duty on motor vehicles.										
(b) The effects of remotenesss on the use and cost of services.										
(b) The effects of Indigenous status on the use and cost of services. It does not include the effects Indigenous SES status.										
(d) The effects of socio-economic status on the use and cost of services. In most catgeories, we have used area based measu										
(e) Includes the effects of interstate differences in age structure (including number of students in the Schools assessment), NE										
(f) The effect of differences between States in wage costs on the cost of providing services across States.										
(g) The effects of population growth on State investment in infrastructure including urban public transport, net borrowing and										
(h) The effects of urban centre size on urban transport subsidies and investment in urban transport infrastructure. Excludes th										
(i) The effects of concentrations of people living in small, remote and very remote communities on utility sudsidies.										
(j) The effect of the provision of services by the non-State sector on the demand for State education and health services.										

There is also a final category of revenue, "other revenue" (not to be confused with "other revenue effects") that the CGC does not assess, and therefore implicitly assumes is driven simply by population size. Accounting for 38 per cent of state government revenues, this category includes gambling taxes, user charges and interest and dividends. It seems likely that the bulk of revenue in this category will also be driven by state incomes and therefore will be affected by both demographic and economic circumstances.

For modelling purposes, these final three categories of revenue – payroll tax, other revenue effects and other revenue – are treated as being determined by both economic and demographic circumstances. As indicated in section 2.2, for the illustrative purposes of this report, the demographic circumstances of a state are approximated by its employment to population ratio.

This approach only captures the influence of demographic circumstances to a first approximation. While employment to population ratios will be heavily influenced by the age structure of the population, economic circumstances will also exert some influence. Further, demographic circumstances will also exert some influence on revenue to employment ratios, which has not been taken into account. Thus, as noted earlier, in the event that it was decided to remove economic circumstances as a basis for equalisation to promote efficiency, a systematic detailed examination would be required and that would lead to a more sophisticated, detailed decomposition of the contribution of demographic and economic circumstances to revenue raising capacity.

Finally, it can be noted that the GST itself is not included in the CGC table. This report treats the GST itself as a national tax, rather than a state tax, and as such it is outside of this report's analysis of the equalisation process.

Turning to the expenditure side, many of the drivers, such as indigenous status, are demographic-related. If a state has a high concentration of people from a demographic group that requires a high level of government services or contributes little to tax revenue, it is important to equalise for this. Otherwise, the resulting high state tax burden will lead to inefficient, fiscally induced outward migration.

Three of the drivers are geographic, the most important being remoteness and regional costs. As noted above, the CGC does not fully equalise for geographic circumstances but rather funds like services in like areas, just as the Federal Government would do if it were providing the same services. Geographic circumstances do not fit neatly into the model but, so as not to distort the analysis, the equalisation transfers based on them are assumed to reflect fixed differences between states.

Two of the expenditure drivers can be regarded as "natural", namely administrative scale and natural disaster relief. Administrative scale refers to the fixed costs of providing state government services. The division of Australia into eight states and territories with eight sets of fixed costs is a given or "natural" feature of the political environment in which equalisation is designed to operate. Similarly, natural disaster relief relates to the given natural environment of each state so long as the approaches to land use planning are in principle similar across states.

The final expenditure driver of wage costs is clearly part of the "economic circumstances" of each state. As discussed above and in more detail in Appendix A, it ought not to be equalised for in the modelling framework from a full efficiency perspective.

2.4 Previous estimates of gains from HFE

Before describing our estimates of the welfare impacts of HFE, this section considers estimates made by other authors. There is not a large body of work in this area, but this section first considers some work on the Canadian system, and then discusses the only estimates for Australia, by Dixon et al.

Watson (1986) estimates the efficiency gains from Canada's equalisation system. Although he agrees with the underlying theory that equalisation is efficiency-enhancing, he finds that the size of these gains are small. In his modelling, Watson assumes that migrants move until the welfare gain from doing so is zero. Making use of estimates of annual migration flows induced by equalisation payments, Watson finds that the efficiency benefits of changes to the Canadian equalisation system between 1971 and 1977 were $1.4m (in 1971 dollars).

However, in a critique of Watsons work, Wilson (2003) concludes that Watson's estimates understate the benefits of equalisation. The reason is that Watson uses estimates of annual migration flows over a short time period. Since migration is long-term in nature, Wilson argues: "Using only one year's migration, as Watson did, seriously underestimates the full gains from our system of equalization payments." (Wilson 2003, p386) Wilson recalculates the benefits using Watson's method but instead basing the estimates on a measure of the "full migration" caused by changes to the equalisation system. This lifts the estimated annual efficiency benefit to $60.3m (in 1971 Canadian dollars). Notably this only captures a part of the efficiency benefits of the Canadian system, because it refers to the efficiency gains from growth in the system in the mid 1970s, not the system as a whole. Further, Canada only practices partial equalisation. Hence, the efficient benefit of the entire Australian system expressed in today's dollars, and taking into account that it is based on full equalisation, would be expected to be considerably larger.

The only previous Australian modelling of HFE is by Dixon et al. (2002), in which they model repealing the current HFE system and distributing the GST on a purely equal per capita (EPC) basis. To do so, they use a "general equilibrium model that was tailor-made for examining the welfare effects of variations in the Commonwealth/State funding arrangements". This MONASH-CSF model is not directly related to the well-known multi-sector, dynamic MONASH model. The modelling by Dixon et al. has been a useful reference point for constructing our own model, and we have incorporated a number of features from MONASH-CSF into the modelling in the 2012 report. However, we have also been able to make a number of improvements on their method.

Surprisingly, rather than finding a welfare gain from equalisation, Dixon et al. (2002) estimate that there is a welfare *loss* from the Australian HFE system, which is contrary to the economic literature. In particular, they estimate that there would be a welfare gain of $169 million, in 2000/01 terms, from moving from the HFE system to an EPC distribution of GST revenues. They suggest that "the major source of gain from reducing subsidisation in the allocation of Commonwealth grants is that it will take money away from State governments that do not spend it in accordance with household preferences" (Dixon et al. 2002, p19).

In fact, the most important driver of their surprising result is the inconsistent way that Dixon et al. estimate welfare. In modelling interstate migration decisions, Dixon et al. include an amenity effect under which consumer welfare is reduced by an increase in a state's population. However, when calculating the change in consumer welfare resulting from that interstate migration, they include no such amenity effect. This leads them to report a welfare gain from abolishing HFE, contrary to the literature. If instead they had avoided this miscalculation by correctly and consistently applying the same measure of consumer welfare throughout, approximate replication of their modelling shows that they would have found a welfare loss, not a welfare gain, from moving away from HFE. This replication and correction to the Dixon et al. (2002) modelling is at Appendix B of our 2012 report.

There are also a number of other issues with the modelling in the Dixon et al. (2002) report to note.

1. They understate the extent of labour mobility through a strong effect that reduces households' standard of living as the population increases in a state. Specifically, if the population of a state is 1 per cent higher, then individual living standards are lower by 1 per cent. This is a much stronger effect on living standards from population gain than estimated by Glaeser and Gottileb (2008).

2. They understate the extent to which equalisation is required for different expenditure needs in each state. The literature, including Dixon et al., generally agrees that differences in per capita government expenditure requirements due to demographic and governmental features of the state should be fully equalised for. However, Dixon et al. only take into account some of the differences in per capita spending needs assessed by the Commonwealth Grants Commission (CGC).

3. Mining royalty revenues are now much higher than they were at the time of the study of Dixon et al. (2002), which is based on data for the year 2000/01. This means that in the current circumstances, there would be much larger benefits from equalisation for differences in mining revenue raising capacities, because the differences between states are much larger than they were before.

The above issues with the Dixon et al. modelling were discussed in detail in Appendix B of our 2012 report (Independent Economics, 2012).

The following section discusses the features of IE-HFE. Additional information on the IE-HFE model is also included in Appendix A.

3. Modelling approach

This section summarises the main aspects of the model used to simulate fiscal equalisation policy options for Australia. IE-HFE is a multi-regional Computable General Equilibrium (CGE) model in which there are eight state economies, each with its own state government, and a Federal Government. It draws on the literature on fiscal equalisation, the CGE modelling of Dixon at al. (2002) and our own assessment of the equalisation factors used by the CGC. The model makes extensive use of data from the CGC (2015) and the ABS state accounts.

Compared to the modelling approach of our 2012 report, this report makes enhancements as follows.

- The 2012 report was based on the CGC assessment for 2011/12, whereas this report is based on the latest CGC (2015) assessment, for 2015/16.
- The previous report compared the existing HFE policy with only one alternative policy under which all equalisation adjustments, except on account of indigeneity, are abandoned. The modelling approach of this report enables us to consider a broader range of three alternative policies, each of which have been proposed by different parties in recent times.
- The 2012 report used numerical simulation to assess the impacts of policy alternatives, as does this report. However, this report also streamlines the model to remove peripheral aspects so that it can now be solved analytically for the welfare-maximising HFE system. This provides clear and precise conclusions on how the HFE system should be designed to maximise consumer welfare under the modelling assumptions.

In the modelling, it is important to take into account the main differences between states that are related to equalisation. The enhanced IE-HFE model takes into account differences between states in six areas:

- the capacity for the government to obtain revenue from natural endowments (as determined by mining production, land sales, property values);
- the influence of state demography on the capacity for the government to obtain revenue;
- government expenditure requirements driven by non-economic circumstances (demography, geography and natural factors);
- the amenity of a state for households, as influenced by population pressures;
- the efficiency of the state government in its service delivery; and
- the efficiency of the private sector.

All six of these factors, along with equalisation payments, can affect the choices people make about the state in which they live.

The main economic assumptions in the enhanced model are carried over from the original 2012 model:

- for the national labour market, labour is homogeneous and mobile between states but total employment is fixed; and
- for state governments, they take the income of their state as given and set the level of their pure public services in line with consumer preferences between private consumption and those public services, taking into account the cost of provision of both.

This section discusses these various aspects in more detail. It begins with the general assumptions made in the model, band then outlines the behaviour of each of the agents in the model – households, state governments and producers. Full detail on the IE-HFE model is available in Appendix A.

3.1 General assumptions

The IE-HFE model makes a number of general assumptions that are shared with most long-run CGE models.

Long-term model

The IE-HFE model is a long-term model, meaning that results from the model refer to the economy after it has fully adjusted to economic shocks. In keeping with this, all markets are assumed to have reached equilibrium. As discussed in section 2.1, one of the main aims of HFE is to achieve efficiency in interstate settlement patterns, which is a long-run policy objective. Thus, a long-term model is an appropriate tool for modelling the impacts of HFE.

Labour Supply

In effect, the national supply of labour is fixed. This is a consequence of holding fixed both the national population and its propensity to supply labour. However, labour is fully mobile between states.

Under this approach, labour income tax does not distort the supply of labour at the national level. However, differences in rates of labour income tax between states can distort the allocation of labour between states. This is in keeping with the focus of the model, which is the design of fiscal equalisation between states. If the focus of the model were the design of the tax system, it would be important to take into account that labour income tax can distort the supply of labour at the national level.

Optimising behaviour

The agents in the IE-HFE model optimise, while still remaining within the constraints of their budgets.

- Households choose their state of residence to maximise their standard of living, or utility. The level of real private incomes, government services and amenity of each state all affect utility levels.
- Governments in each state choose taxation levels and the supply of government goods and services to maximise household welfare, subject to the budget constraint of state income.
- Businesses in each state choose the level of various inputs and outputs to maximise their profits.

More details on these decisions are included in sections 3.2 to 3.4.

Budget constraints

In a sustainable equilibrium, governments and households must meet their budget constraints. For simplicity, we assume that each state government budget and the federal budget are balanced in the long run. Governments choose their level of expenditure and taxation consistent with achieving this outcome. In the private sector, households spend their real after-tax labour income on the private good.

3.2 Household behaviour

Households choose their state of residence to maximise their well-being (or utility). Their utility is affected by their consumption of the private good and state government services. It is also affected by

the level of amenity in each state, which varies inversely with state population. Thus, households choose a state of residence to gain the highest possible utility, after taking into account:

- after-tax labour incomes and consumer prices in each state, which together determine the amount that can be purchased of a bundled 'private consumption good';
- the level of state government services in each state; and
- the population size and its effects on amenity in each state.

While households derive utility from government services, they are not able to choose the amount of these services that are provided. Instead, governments make this choice, but they are assumed to do this in line with household preferences. Real after-tax household income determines state consumption of the private good. It is equal to state labour income net of state government labour income tax (e.g. payroll tax), relative to the state price of the consumption good.

Households make migration decisions by comparing the level of utility that they would attain by living in each of the states, and a household will move to the state where it would attain the highest level of utility. This will depend on the level of amenity in that state, and the consumption of both the private and government goods that can be attained.

When households move into a state attracted by a higher level of utility, they negatively impact on the utility of the other households who are already living there. A term that relates the population size to the amenity from living in the state dampens the utility of all households in the state as the population grows. This captures the idea that households have lower amenity when they are required to share space with more neighbours because of factors such as higher pollution and longer commute times. The choice of parameter value for this term has been informed by the urban economics literature. More explanation of this term is included in Appendix A.

This means that population movements triggered by an increase in the utility from living in a certain state cannot continue without limit. As the population of that state grows, lower amenity will work to reduce the utility from moving to that state. By the same logic, the associated population outflow from other states will cause the utility from living in other states to rise. Population movements will cease once population flows have equated utility levels across states.

Through this mechanism, over the long-term, households distribute themselves between states in such a way that there would be no gain from moving to any other state. This means that, in equilibrium, the level of utility for the representative household would be the same irrespective of the state they live in.

To correctly measure the impact that a policy change has on welfare, the utility function used to model households' location decisions should be the same as the function used to measure the impact of those location decisions on welfare. This way, households make migration decisions to maximise their own living standards, and the welfare results are consistent with this. IE-HFE takes this consistent approach to modelling location decisions and measuring the resulting changes in welfare[5]. This is one of the

[5] In this report, the impact of a policy on household welfare is measured using the *equivalent variation* (EV), which is the income transfer that would have to be given to households before the policy change to enable the same level of utility as they would have after the policy change. A similar concept is the compensating variation (CV). This is the income transfer that would need to be given to households after the policy change to return them to their initial utility level.

major differences between the IE-HFE model and the model used by the Dixon et al. in their 2002 study. The utility function used in IE-HFE is described in detail in Appendix A.

3.3 State Government behaviour

The state government takes state income as given and chooses the combination of the private and government good that maximises household utility, given the prices of both goods.

Households consume two 'goods' in IE-HFE – a privately-produced consumption good, and state government services. This consumption is funded out of state income, after the fixed costs of government have been met. State income consists of labour income received by households, rental income from fixed factors received by government, the net revenue effect of demographic circumstances, and the equalisation transfers, which may be positive or negative, received from the Federal Government.

State governments choose the amount of state government services that they provide. A labour income tax is used to fully fund the gap between state government spending and the income that state governments receive from the fixed factor.

The modelling takes into account that the Federal Government, in effect, undertakes part of this fund raising on behalf of state governments by raising tax revenue in each state and returning it as state government grants. However, this has no net effect on the modelling.

Importantly, state governments base decisions on their level of spending/taxation on household preferences between the private and government goods. This means that state income is allocated between the private and government goods to maximise the utility or welfare of households, taking into account the level of state income and the costs/prices of the two goods.

3.4 Producer behaviour

There are three goods produced in the IE-CGE model, namely an intermediate good, a private consumption good and government services. Labour is used to produce the intermediate good, while the intermediate good is in turn used to produce the private and government goods.

Labour is used with the same technology in each state to produce an intermediate good. That intermediate good serves as the numeraire in the model. The wage equals the number of units of output of the intermediate good produced per unit of labour. While capital does not appear explicitly as an input, it is possible to interpret the labour input as a labour-capital bundle.

The intermediate good is used in producing both the private and government goods. In both cases the efficiency of the transformation processes can vary from state to state, so each state has its own price for both the private and state government goods. This is so the model can address the issue of how differences in productivity between the private and public sectors and between states should be taken into account in designing fiscal equalisation arrangements.

In producing state government services using the intermediate good, an additional distinction is made between fixed and marginal costs. This is to take into account that the case for fiscal equalisation is stronger for differences between states in their fixed costs than for differences in their marginal costs.

A fixed factor that is owned by the state government also appears in the model. It has a given rental price. The most plausible interpretation of this is that the fixed factor transforms into a tradeable good with a given price; this could describe the mining industry. Another interpretation is that the fixed factor is used as an input in the production of the intermediate good and is perfectly substitutable with labour, thus fixing its relative price. These two assumptions can be applied selectively to cover different cases of fixed factors.

As this model is concerned with fiscal equalisation transfers between states, the Federal Government's own services are not the focus. For data construction purposes, Federal Government services are included in the private consumption good. This means that implicitly the Federal Government provides part of a state's private consumption in exchange for labour tax revenue.

3.5 The baseline scenario

The IE-HFE model is first used to simulate a baseline scenario that reflects the existing situation in which the HFE system is in place. Under that system, GST revenues are distributed between states in a way that equalises for certain differences in fiscal capacities. In particular, it fully equalises for differences in natural endowments, demographic circumstances and economic circumstances, and partially equalises for differences in geographic circumstances. The baseline scenario serves as the point of reference in modelling the various HFE policy options that have been proposed and are simulated in sections 4 and 5.

The baseline scenario is fully consistent with the CGC's (2015) HFE assessment for 2015/16. That reflects CGC assessments of state fiscal capacities in each of the three years of 2011/12, 20012/13 and 2013/14, projected forward to 2015/16 using forecasts for population and GST revenue. The detailed drivers used by the CGC have been aggregated into broader expenditure and revenue categories driven by natural endowments, demography, geography and state economic circumstances, as discussed in section 2.

The modelling of each state economy refers to the same year, 2015/16. It uses CGC (2015) projections of state populations and GST revenue for 2015/16. It also uses ABS data for employment and GDP by expenditure for 2013/14, uprated to 2015/16 using the Treasury forecasts published in the 2014/15 Mid-Year Economic and Fiscal Outlook (Australian Government, 2014).

This data, together with the assumed parameter values set out in Appendix A, were used in calibrating the model. The model was then simulated to generate the baseline scenario, which accurately reproduces the 2014/15 data on which the model is calibrated.

4. Updated Results for economic impacts

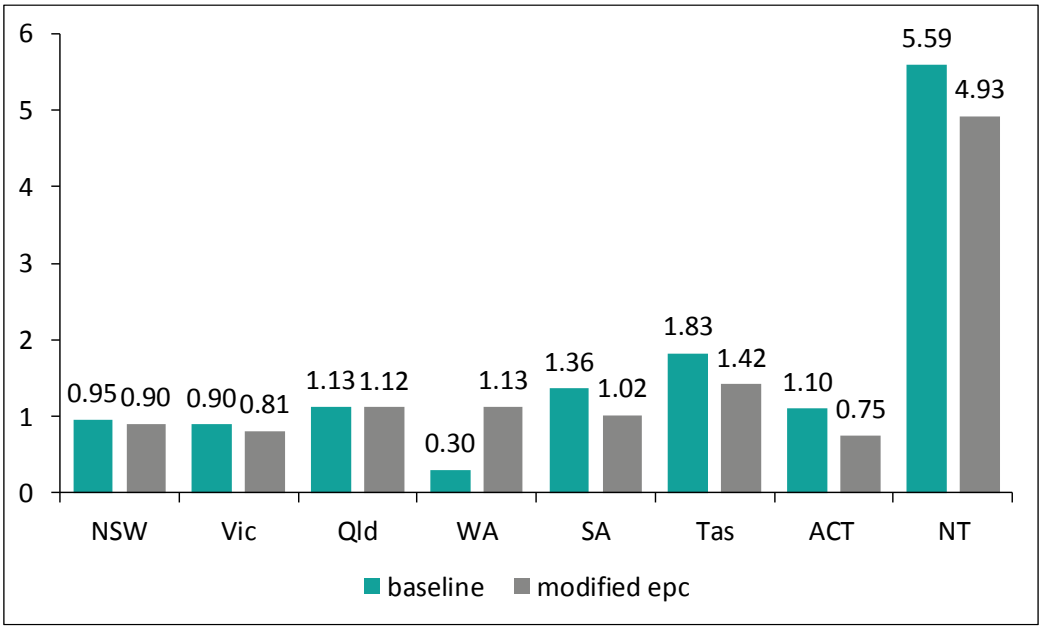
The IE-HFE model is then used to simulate an alternative policy under which the equalisation system is removed, with three exceptions noted below. That is, under the alternative policy, GST revenues are generally distributed between states on an equal per capita (EPC) basis. The exceptions where equalisation is retained are for:

- remoteness and regional costs;
- indigenous status; and
- small communities.

This alternative policy is referred to as a **modified EPC** system of distributing GST revenues. This specification of a modified EPC system can be interpreted in various ways. The literal interpretation is that the HFE system is removed, except in the three specified areas. An alternative interpretation is that HFE is fully removed, but that the Commonwealth Government takes over funding of the three areas. Either way, the modified EPC scenario recognises that it would be quite unrealistic to simulate a situation in which government funding arrangements no longer recognise the differences between states in government expenditure needs in these areas. Further, without these or similar exceptions, the income of the Northern Territory would drop so dramatically that its viability as a separate jurisdiction would be highly questionable.

Chart 4.1 compares the existing GST grants pool relativities for 2015/16 with those that would apply under the modified EPC system. GST grants pool relativities refer to the per capita GST grant received by a state relative to per capita GST revenue at the national level. This means that a state which is assessed to have the national average fiscal capacity has a GST grants pool relativity of unity, while states with above or below average fiscal capacity have GST grants pool relativities of below or above unity.

Chart 4.1. Comparison of GST grants pool relativities for modified EPC compared to current HFE system



Source: Updated and Enhanced IE-HFE model

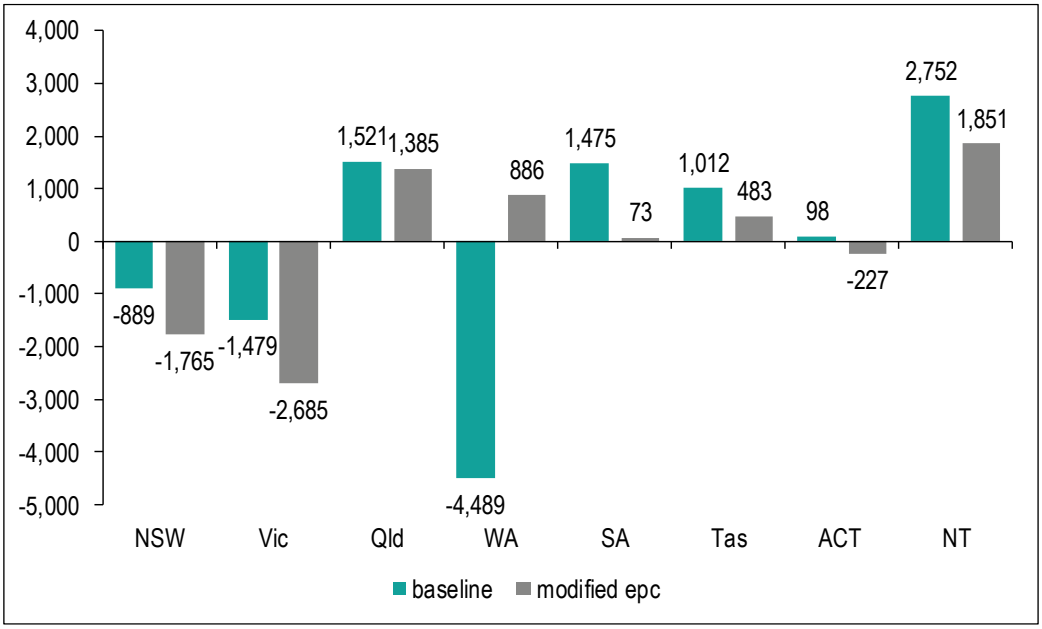
In the 2015/16 assessment, WA was assessed to have a high fiscal capacity because of booming mining royalties in the three assessment years (2011/12 to 2013/14), leading to a low GST grants pool relativity of 0.30 for the baseline scenario. In the modified EPC scenario most equalisation factors, including mining, are removed from the assessment. The only three remaining factors as in areas where WA is assessed to have a fiscal disadvantage, so its GST grants pool relativity is above unity, at 1.13.

In the 2015/16 assessment, NT was assessed to have a low fiscal capacity because of a low capacity across most areas, leading to a high GST grants pool relativity of 5.59 for the baseline scenario. In the modified EPC scenario, three of the more significant equalisation factors for the NT are retained, which limits the drop in its GST grants pool relativity to 4.93 in the modified EPC scenario. The GST grants pool relativities for the remaining six states also fall, but to a lesser extent.

Chart 4.2 shows how these movements in GST grants pool relativities imply changes to equalisation transfers. As the only state with a higher GST grants pool relativity than before, WA is the only state that receives a more favourable equalisation transfer. Its equalisation payment changes from negative $4.5 billion to positive $0.9 billion. This positive amount reflects the fiscal disadvantage that it is assessed to have in the three areas where equalisation is retained. The equalisation transfer to the NT declines from $2.8 billion to $1.9 billion. This is a large fall relative to the size of the NT economy.

When its revenue from HFE transfers changes, a state government would need to adjust either its expenditure levels or its tax rates to maintain budget balance. In the IE-HFE model, the state budget is set in an optimal way. This means that a reduction in HFE transfers is addressed partly by government spending cuts, but mainly by tax increases, which result in lower consumer spending. In this way, there is an optimal proportionate reduction in both consumer and government spending, which recognises that the base level of consumer spending is higher than the base level of government spending.

Chart 4.2. Comparison of GST transfers for modified EPC compared to current HFE system, $m



Source: Updated and Enhanced IE-HFE model

Chart 4.3 compares standardised state tax rates under both scenarios. These standardised tax rates show the amount of revenue, relative to state income, that needs to be raised to balance each state budget. This revenue raising requirement is after already allowing for the revenue contributions from Federal Government grants and from natural endowments (mining royalties, land taxes and conveyancing duty). It therefore provides a measure of the required revenue raising effort or fiscal stress for each state to be funded through other state taxes, such as payroll tax.

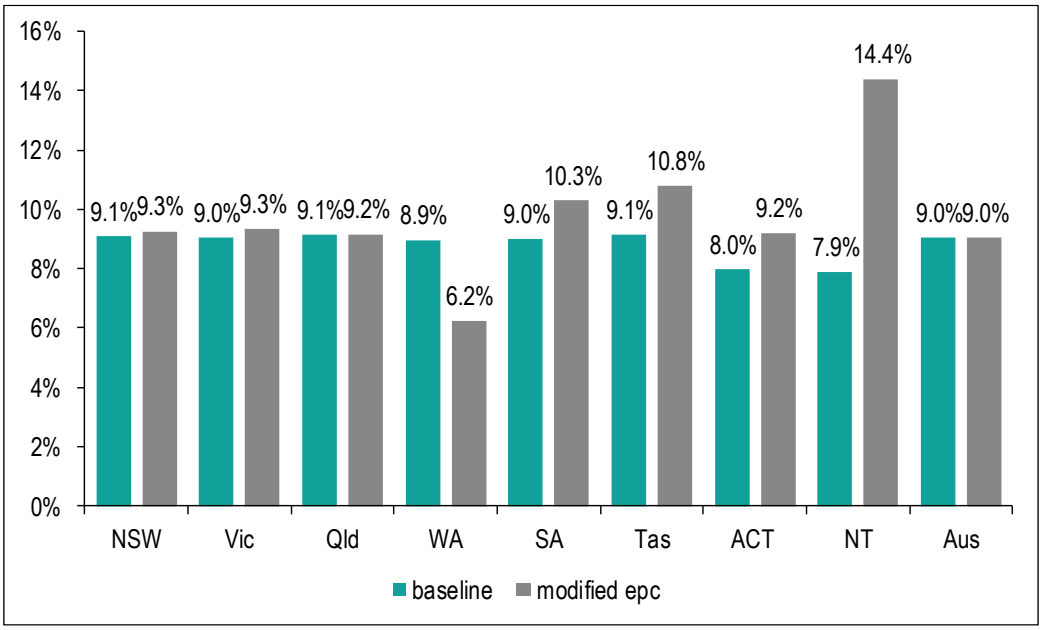
The existing HFE system broadly equalises fiscal capacities. This leaves each state with a similar level of fiscal stress. Standardised tax rates range narrowly in the baseline scenario from 7.9 per cent in the NT to 9.1 per cent in Tasmania, compared to the standardised tax rate across all states of 9.0 per cent.

SA and Tasmania also experience significant fiscal stress, with their standardised tax rates rising over 10 per cent, compared to 9 per cent as the nationwide average. In both cases, this partly reflects loss of equalisation for their lower endowments of mineral resources.

In the modified EPC scenario, equalisation for all but three factors is removed. This exposes the underlying large differences between states in their fiscal capacities. Fiscal stress varies greatly, with standardised tax rates now varying from 6.2 per cent in WA to 14.4 per cent in the NT. WA's low fiscal stress arises because it no longer shares the fiscal benefit of its bountiful mineral resources with other states.

NT's high fiscal stress arises despite the fact that the three areas in which equalisation is retained are all important to the NT. One factor leading to this stress is removing equalisation for sharing the fixed costs of running a state government across a small population. Equalisation is also removed for the high costs of maintaining rural and local roads with a dispersed population.

Chart 4.3 Comparison of standardised tax rates for modified EPC compared to current HFE system, per cent



Source: Updated and Enhanced IE-HFE model

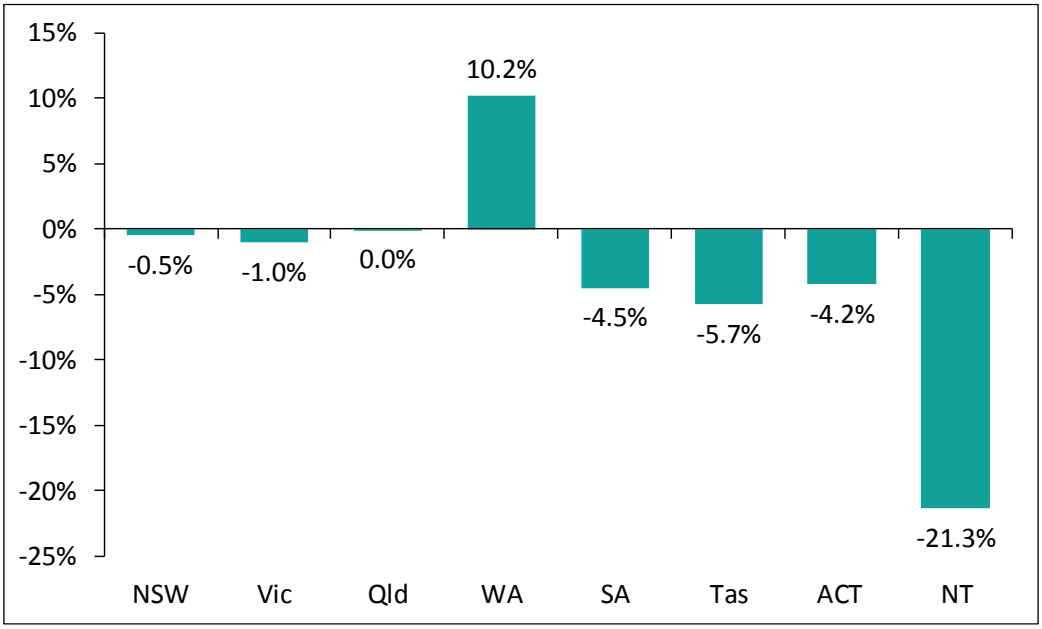
SA and Tasmania also experience significant fiscal stress, with their standardised tax rates rising over 10 per cent, compared to 9 per cent as the nationwide average. In both cases, this partly reflects loss of equalisation for their lower endowments of mineral resources. Tasmania is also affected from removing equalisation for sharing the fixed costs of running a state government across a small population. Tasmania and SA no longer receive equalisation for the lower value of their property sales.

The economic impacts of hypothetically moving from the existing HFE system of the baseline scenario to the modified EPC system can be assessed by calculating the differences in modelled outcomes between the latter and the former. Because a long-run economic model is used, these impacts reflect the long-run or ongoing impacts from moving from HFE to modified EPC.

Given the pattern of fiscal stress, economic activity would be expected to receive a major boost in WA as it becomes the tax haven state. It would be expected to decline heavily in NT under the weight of very high, uncompetitive tax rates and also decline in other states of high fiscal stress, especially SA, Tasmania and the ACT.

This is confirmed by Chart 4.4, which shows the long-run impacts on state populations of a move to modified EPC. The uneven landscape for tax rates (and government services) caused by the move away from HFE induces households to migrate away from the now high-taxing states, particularly the NT, and toward the now low-taxing states, particularly WA. Chart 4.4 shows an estimated population gain of around 10 per cent for WA, and a population loss of around 21 per cent for the NT. The more modest, but still significant, increases in taxes in SA, Tasmania and the NT lead to population losses of around 5 per cent.

Chart 4.4. Population impact of modified EPC system compared to current HFE system, per cent



Source: Updated and Enhanced IE-HFE model

This sensitivity of state populations to changes in equalisation grants is consistent with the literature. Albouy (2012) cites a long-run elasticity of state population to state income, when state income is changed by changes to equalisation grants, of 3.23. Similarly, the IE-HFE model used here is calibrated using an assumed long-run elasticity of 3. These long-run population effects could take a decade or more to fully develop through a gradual process of interstate migration.

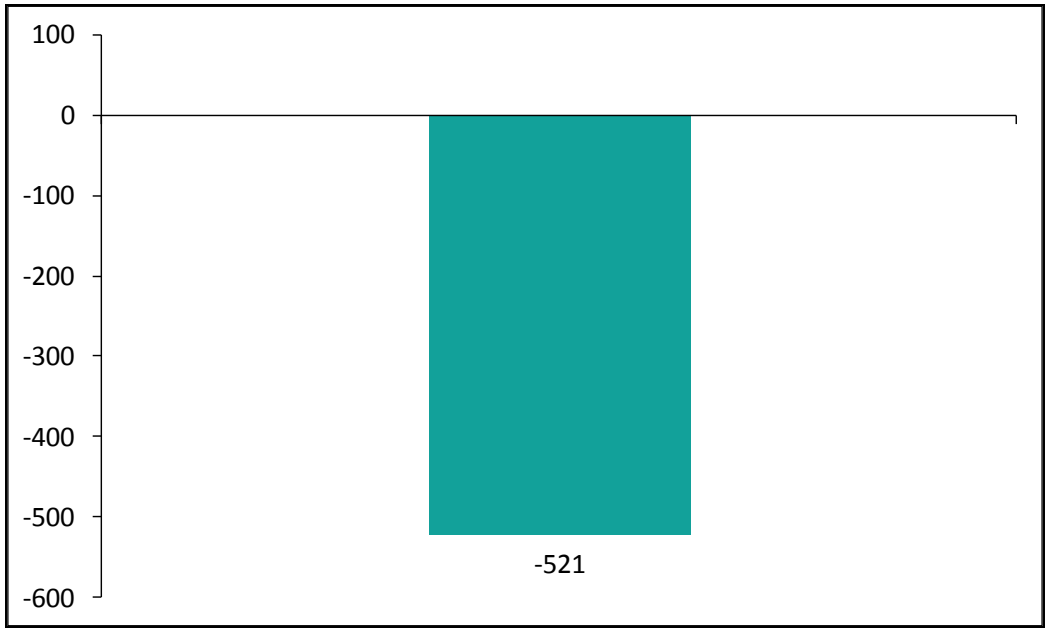
Superficially, it may seem from this that, under the modified EPC system, the residents of the fiscally advantaged state, Western Australia, would be better off, while the residents of the other states would be worse off. However, this ignores the crucial point that households are free to migrate between states. Following a move away from full equalisation, households can be expected to move from the fiscally disadvantaged states to the fiscally advantaged states. These population movements would be expected to continue until living standards across states re-equalise.

Further, this inefficient, fiscally-induced migration leads to a loss in living standards, as the distribution of the population across states moves away from being determined by state economic environments. Specifically, abolishing the current HFE system and moving to a modified EPC system is estimated to lead to a permanent loss in annual living standards[6] of $521 million in 2015/16 terms, as shown in Chart 4.5. Further, with households free to move between states, this loss will be shared across all states. The only apparent benefit to offset against this loss would be a saving in the costs of administering the HFE system. However, the annual cost of running the CGC is only around $7 million.

This estimate of the annual cost of largely abolishing the HFE system of $521 million is broadly consistent with our 2012 report estimate of $295 million, once two developments are taken into account. First, the previous cost estimate was on a 2009/10 basis whereas the new estimate is on a 2015/16 basis, and nominal incomes have risen substantially over that period. Second, equalisation has become more significant because the mining boom has added to equalisation transfers. These two factors account for the increase in the estimate.

Estimates such as these are always surrounded by margins of error. Thus, the most recent estimate might be presented as an annual cost of about $500 million.

Chart 4.5 Welfare impact of modified EPC compared to current HFE system, $m, 2015/16 terms

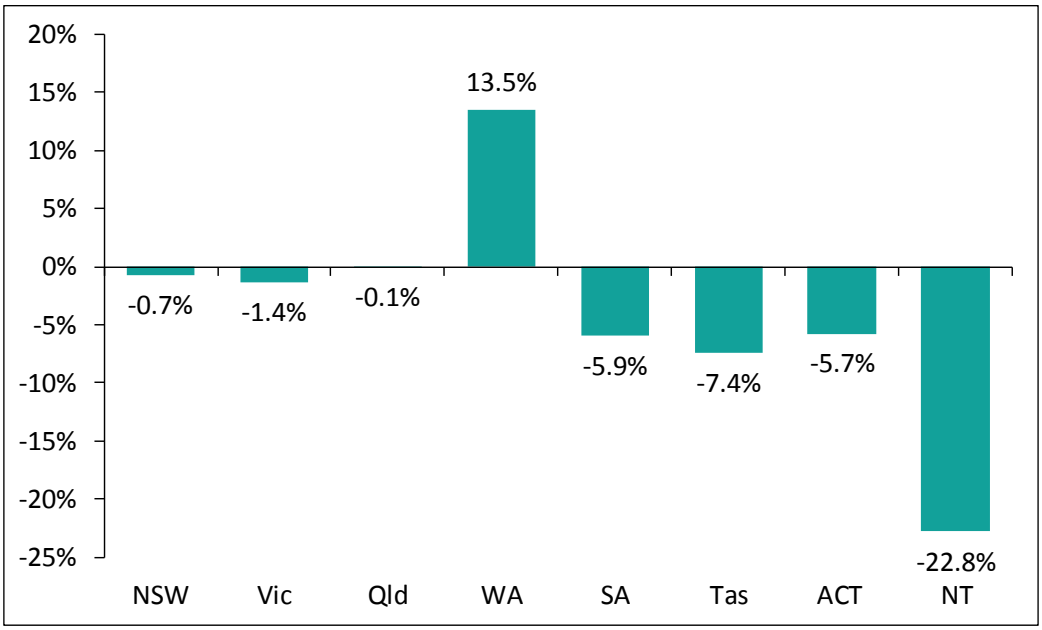


Source: Updated and Enhanced IE-HFE model

[6] The most appropriate measure of the effect of any government policy is its impact on household living standards. This is measured by its impact on consumer welfare, which takes into account changes in consumption of privately produced and government provided goods and services; and non-market amenity from population density.

The population movements shown in Chart 4.4 are associated with even larger percentage movements in state GSP, which follow the same pattern. These movements are shown in Chart 4.6.

Chart 4.6. GSP impact of modified EPC system compared to current HFE system, per cent



Source: Updated and Enhanced IE-HFE model

To summarise, welfare is lower in *all states* if the current HFE system were changed to a system that distributed GST revenue on a modified EPC basis (i.e. equal per capita except for the three retained areas of equalisation listed earlier)[7]. That is, all states contribute to the negative national welfare impact presented in Chart E. The free movement of population between states works to close inter-state gaps in living standards, so in the long-term living standards in all states move together.

In Western Australia it may appear that there would be a gain in consumer welfare because, under modified EPC, the fiscal advantages from its large mining tax base leads to lower taxes and higher levels of state government services. However, the population increase from the inward migration that this fiscal advantage attracts, lowers household's amenity, resulting in a loss in consumer welfare that outweighs the gain from fiscal advantage. So if the objective of a policy to move away from HFE were to raise living standards in donor states, it can be expected to fail.

[7] In fact, the per capita welfare would be lower by the same amount in all states. As discussed in section 3.2, households distribute themselves between states until there is no gain from moving to any other state. In other words, the standard of living would be the same in all states in any given scenario. Therefore, the change in welfare between the scenarios must also be the same in all states.

5. Results for other scenarios

Various parties have proposed two ways in which the existing HFE system might be varied. These two policy options are captured in the following modelling of a "grants" scenario and a "floor" scenario for GST grants pool relativities.

5.1 The grants scenario

In the grants scenario, payments to the recipient states are made by the Federal Government from its taxation revenue instead of by the donor states. Such a scenario is designed to make it appear that the donor states would be better off, because they no longer make equalisation payments, while the recipient states would be no worse off, because there would still receive their equalisation payments.

Such a view of the "grants" scenario is superficial. By ignoring the fact that the Federal Government would need to raise additional tax revenue to fund the new grants, it fails to achieve horizontal equity and introduces incentives for inefficient interstate migration. A reasonable assumption is that the additional Commonwealth taxation revenue is raised on an EPC basis from residents of each state. The same net effect would also be achieved by funding the grants from the GST pool on an EPC basis. We have used the later approach in the modelling as a simple way of taking into account that, ultimately, the new Federal grant would need to be funded by taxpayers in each state.

Chart 5.2 shows that in the grants scenario all five recipient states (Qld, SA, Tas, ACT and NT) lose income compared to the existing HFE system. While they retain the same equalisation payment, they lose income because their citizens all need to contribute to the funding of the new Federal grant (either through the GST pool or through higher Federal taxes).

Turning to the donor states, only WA receives more income as a result of being relieved of making equalisation transfers. It no longer makes an equalisation payment of about $4.5 billion and this easily outweighs WA's per capita share of funding the new grants of about $0.8 billion. NSW and Victoria, while being donor states, both lose income. They no longer make equalisation transfers, but this is outweighed by their per capita contributions to the funding of the new grants to recipient states.

Overall, it can be seen that the "grants" proposal involves a larger movement from the existing HFE system than might appear to be the case at first glance. This is because it is necessary to take into account that the new grants need to be funded by taxpayers in each state.

As shown in Chart 5.3, the income gain for WA from the grants scenario funds a drop in its standardised tax rate to 7.0 per cent, taking it well below the national average of 9.0 per cent. This results in fiscally-induced migration to WA from all other states. In the long run, the population of WA is estimated to be higher by about 7 per cent, a seen in Chart 5.4.

This inefficient, fiscally-induced migration leads to a loss in living standards, as the distribution of the population across states moves away from being determined by state economic environments. Specifically, replacing the current HFE system based on transfers and moving to a grants scenario is estimated to lead to a permanent loss in annual living standards of $210 million in 2015/16 terms, as shown in Chart 5.5.

Further, the population movements shown in Chart 4.4 lead to a similar pattern of percentage movements in GSP, as shown in Chart 4.6.

Chart 5.1. Comparison of GST grants pool relativities for grants scenario compared to current HFE system

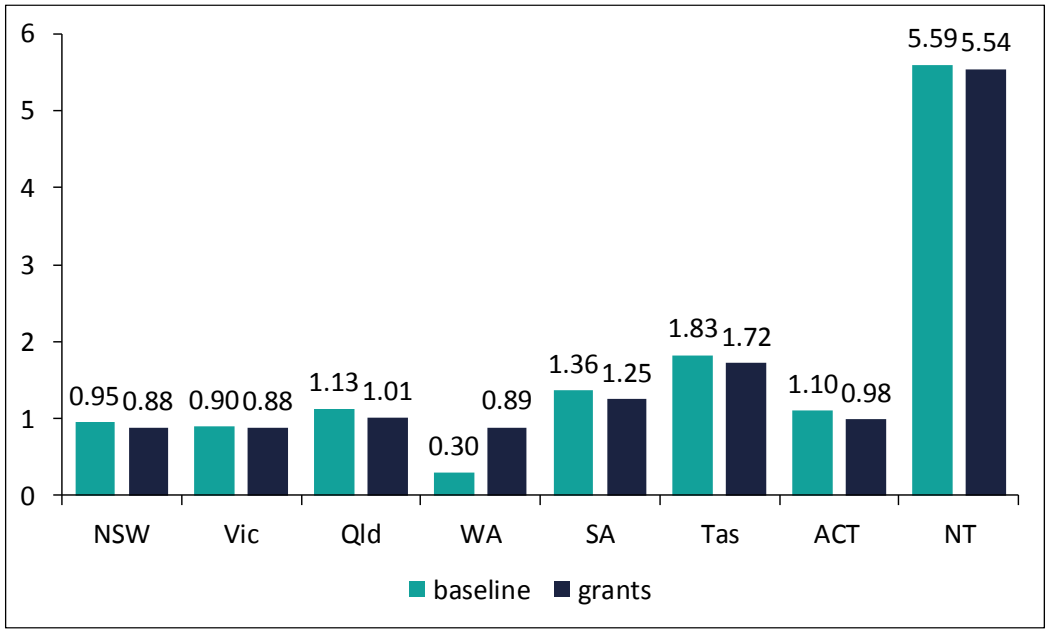


Chart 5.2. Comparison of GST transfers for grants scenario compared to current HFE system, $m

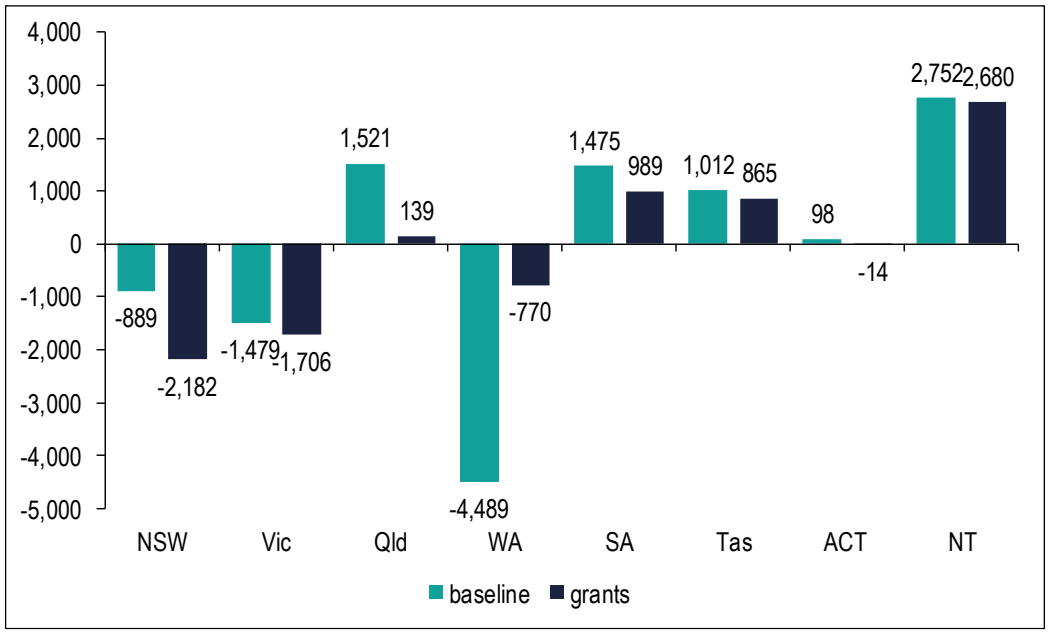


Chart 5.3 Comparison of standardised tax rates for grants scenario compared to current HFE system, per cent

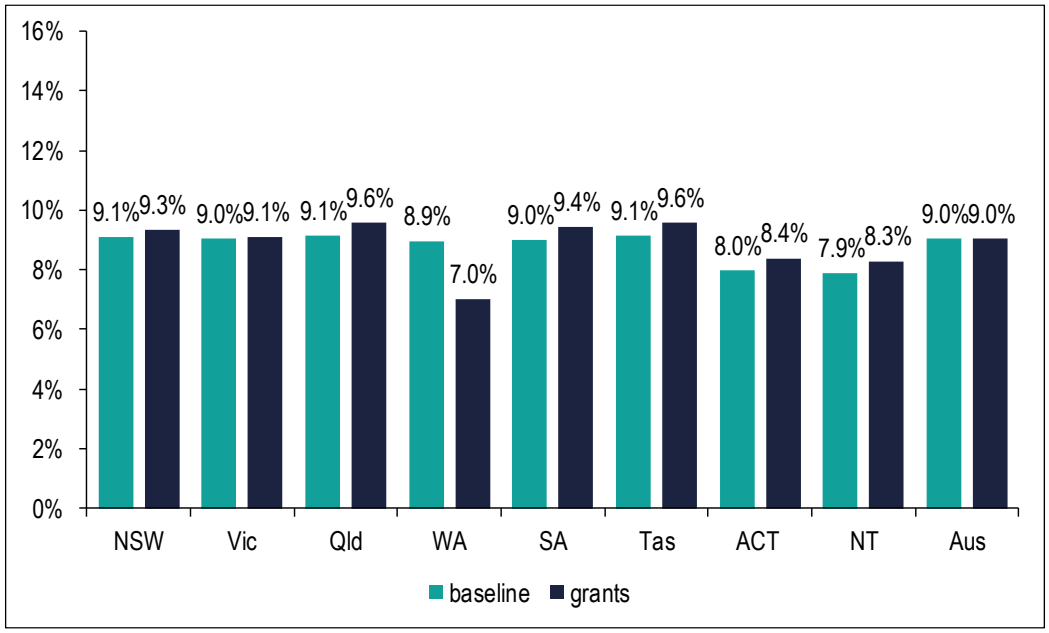


Chart 5.4. Population impact of grants scenario compared to current HFE system, per cent

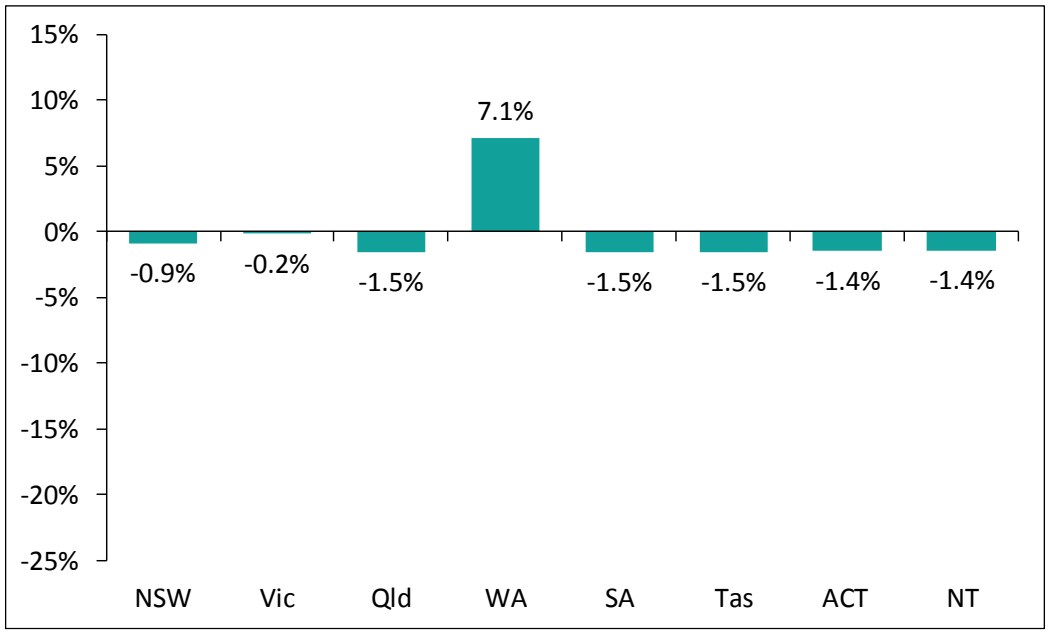


Chart 5.5 Welfare impact of grants scenario compared to current HFE system, $m, 2015/16 terms

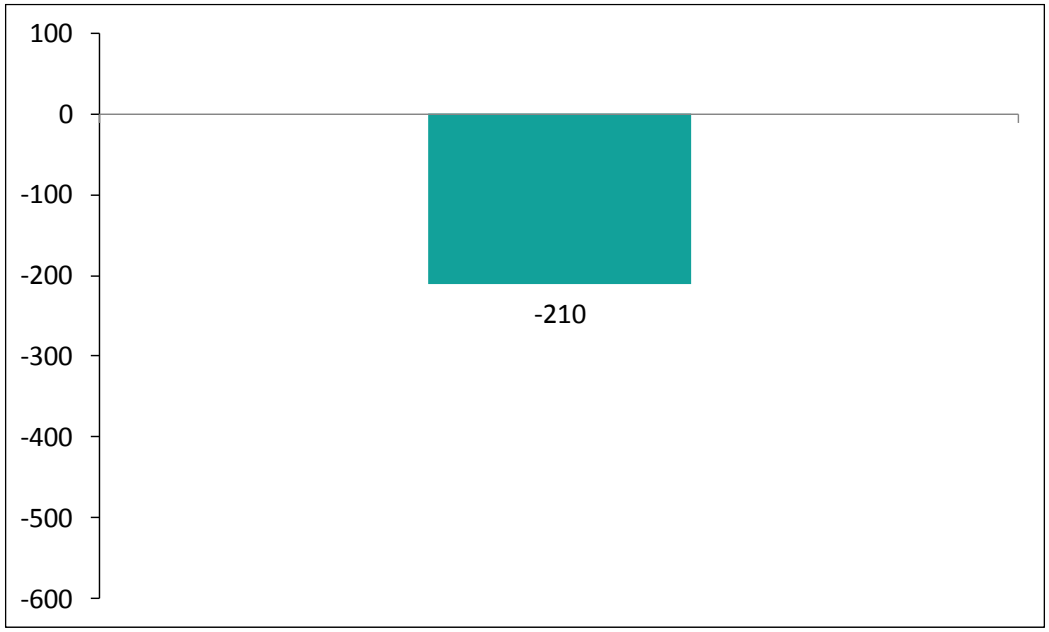
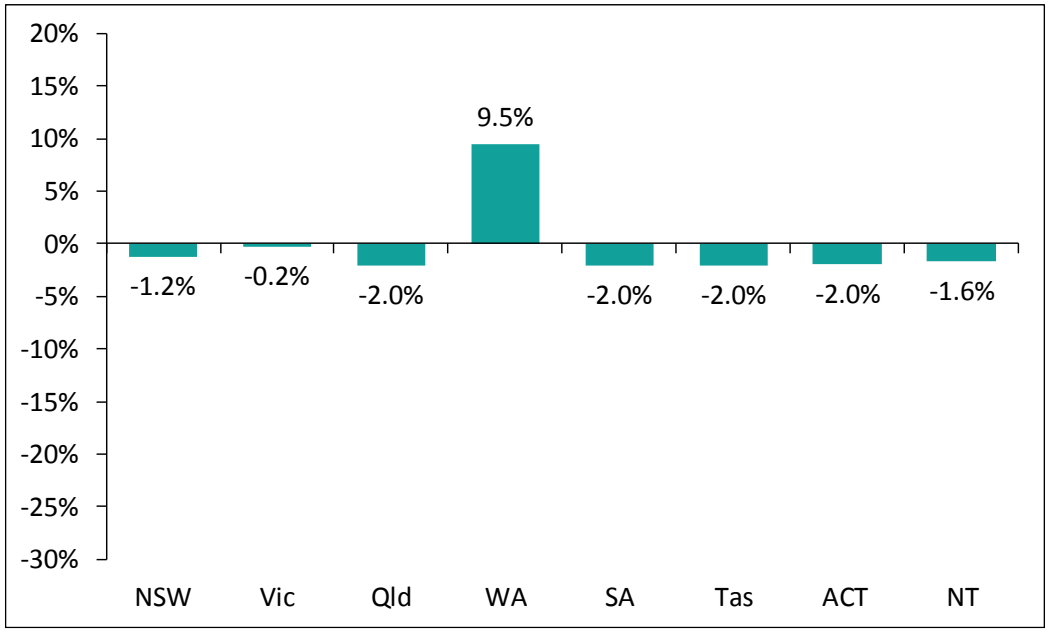


Chart 5.6. GSP impact of grants scenario compared to current HFE system, per cent



As noted above, this modelling assumes that the new grants in this scenario are funded from the existing GST pool. However, the idea of the proposal appears to be that the Federal Government would fund the new grant. That would involve additional revenue raising by the Federal Government. In that case, besides having the welfare loss modelled above, there would be two further sources of welfare loss.

First, higher Federal taxes to fund the new grants will increase the distortions to decision making resulting from the tax system. Second, the greater dependence of state governments on Federal Government grants will exacerbate the existing vertical fiscal imbalance. Twomey and Withers (2007) show that this leads to duplication of services between governments and over-prescription of state government services by the Federal Government, at significant economic cost.

In short, by introducing three new economic costs, the grants proposal puts both tax reform and federalism reform into reverse gear.

5.2 The 75c floor scenario

In the "75c floor" scenario, a floor of 75 cents is placed on each state's GST grants pool relativity. Chart 5.7 shows that WA is the only state that was under this floor in the 2015/16 CGC assessment. With a fixed pool of GST revenue, raising the GST grants pool relativity of WA from the assessed value of 0.30 to 0.75 would require reducing the GST grants pool relativities of other states. This scenario assumes this is achieved by the other seven states contributing on an equal per capita basis to the additional funding for WA. This raises each of their GST grants pool relativities by around 0.05, as seen in Chart 5.7.

The resulting equalisation transfers are shown in Chart 5.8. Comparing this with the baseline and grants scenarios presented earlier, it can be seen that the 75c floor scenario involves a smaller departure from the existing HFE system than does the grants scenario. The only state for which this is not the case is Victoria.

Given the smaller departure from the existing system, the welfare loss and other effects are also generally smaller. Chart 5.11 shows that the annual welfare loss is estimated at $120 million, compared to $210 million under the grants scenario.

Nonetheless, there is a welfare loss and it arises from the same cause as in the grants scenario. Moving away from the existing HFE system leads to inefficient, fiscally-induced migration. The population gain for WA is estimated at 5.4 per cent while the population loss for all other states is estimated at 0.7 per cent, as seen in Chart 5.10.

This policy's focus on the GST grants pool relativities also reflects a misunderstanding of the nature of the fiscal equalisation system. The heart of that system is a set of equalisation transfers that add to zero, such as those shown in Chart 5.8. The GST only serves as the current method of delivering those transfers. As noted earlier, the GST distributions are initially formulated on a per capita basis, and then the equalisation transfers are superimposed.

The equalisation transfers could alternatively be completely separated from the GST system. Donor states would then contribute to a special pool and recipient states would draw from the same pool. GST distributions would be made on an EPC basis. This separated system would lead to exactly the same outcome for each state as the existing system. Thus, focussing on GST grants pool relativities confuses the fiscal equalisation policy with its current delivery mechanism. This highlights the completely arbitrary nature of setting a floor on GST grants pool relativities.

Chart 5.7 Comparison of GST grants pool relativities for 75c floor scenario compared to current HFE system

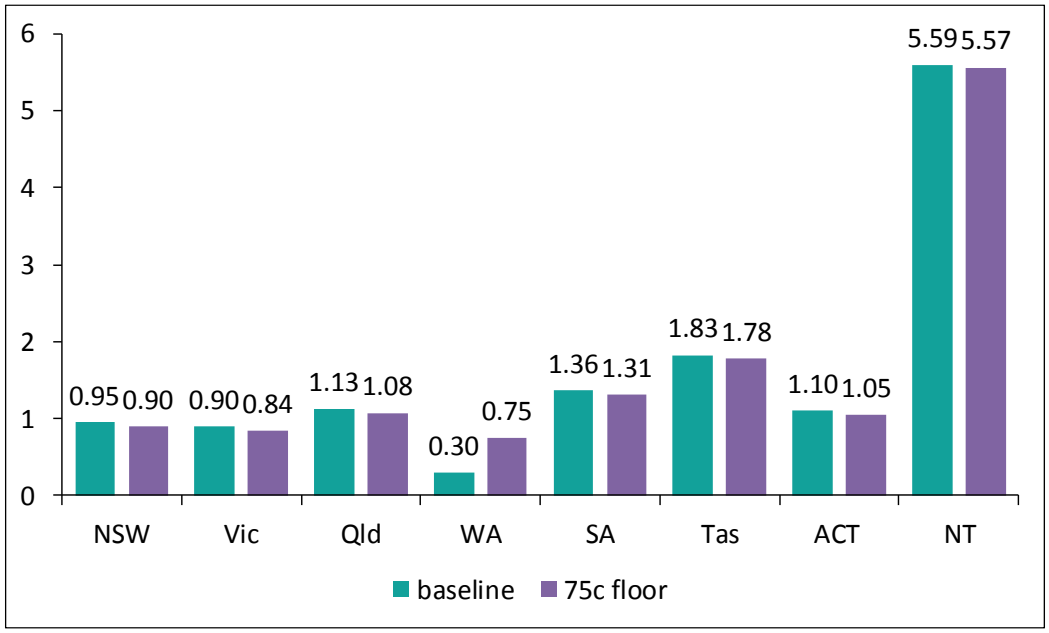


Chart 5.8. Comparison of GST transfers for 75c floor scenario compared to current HFE system, $m

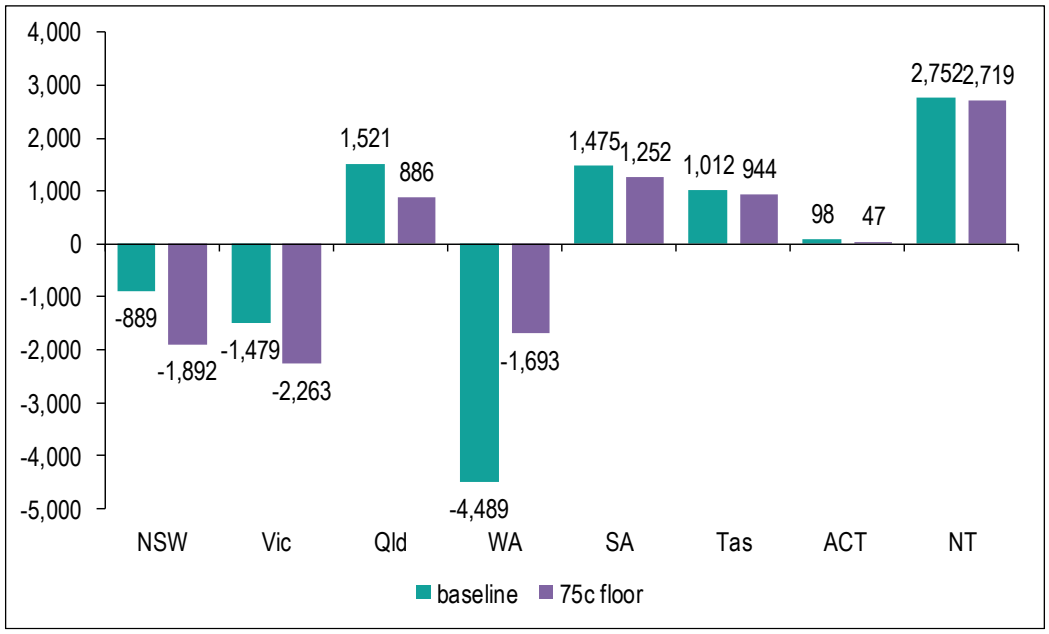


Chart 5.9 Comparison of standardised tax rates for 75c floor scenario compared to current HFE system, per cent

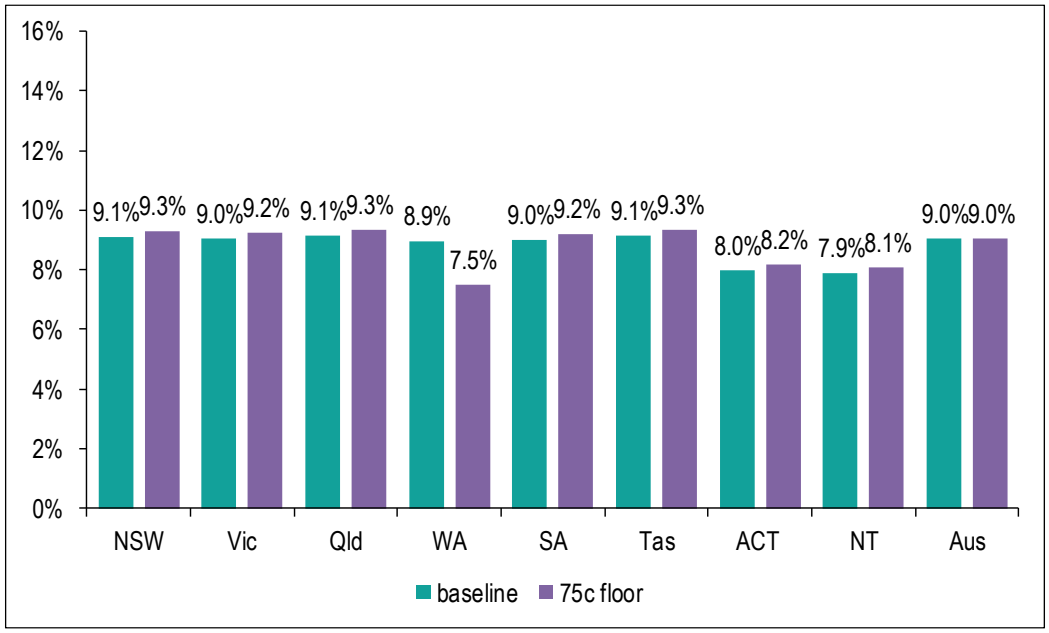


Chart 5.10. Population impact of 75c floor scenario compared to current HFE system, per cent

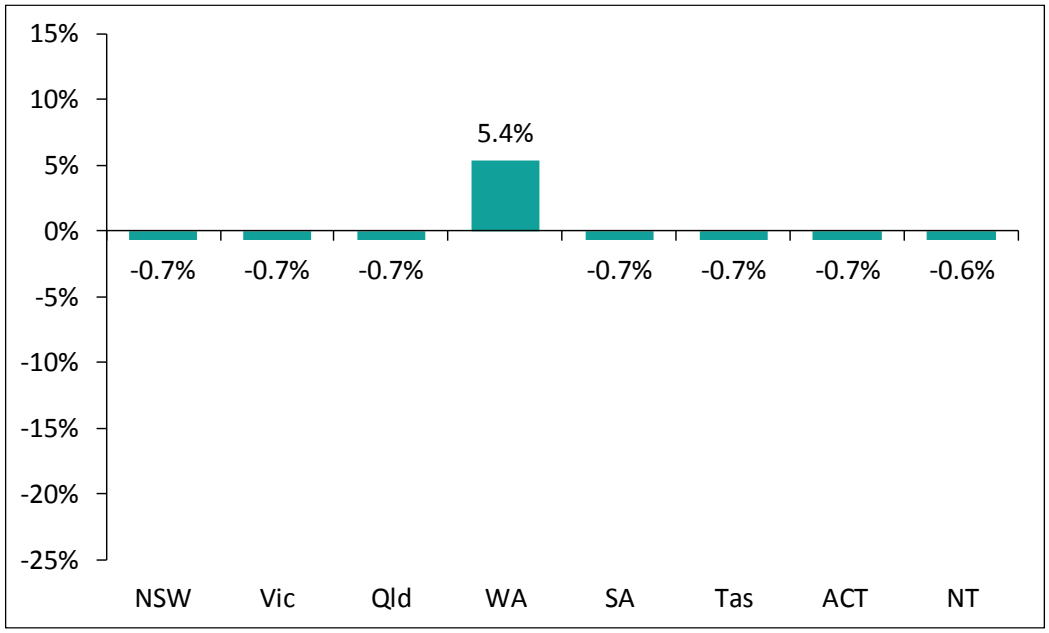


Chart 5.11 Welfare impact of 75c floor scenario compared to current HFE system, $m, 2015/16 terms

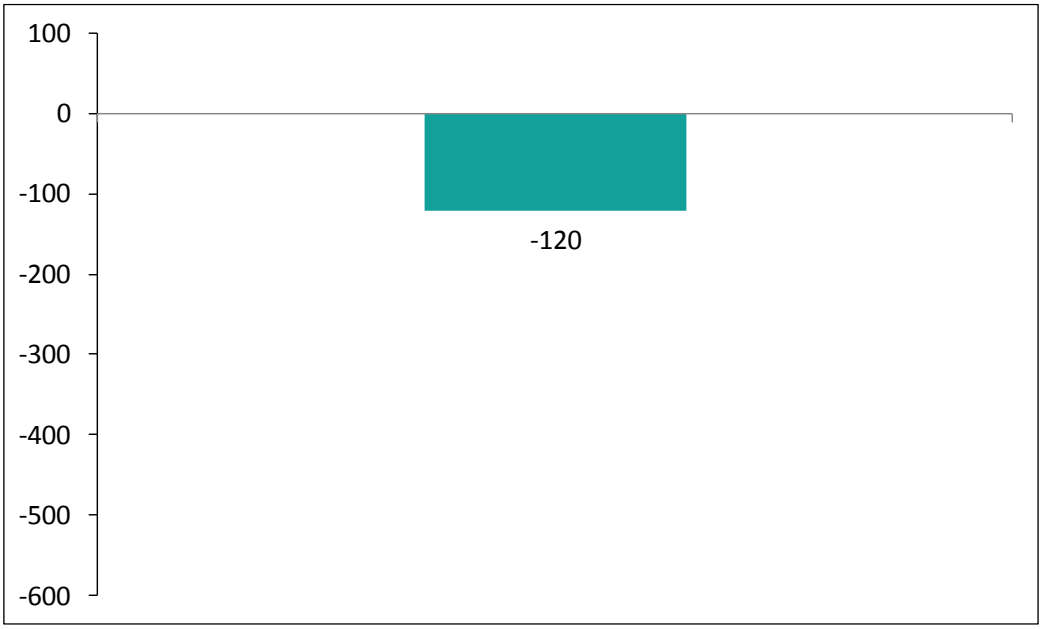
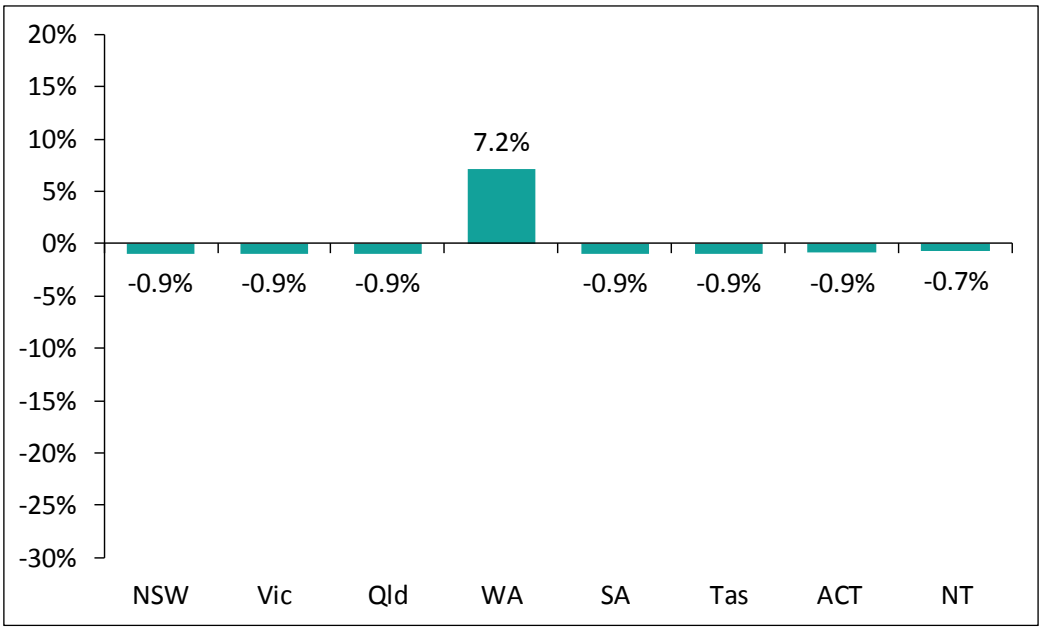


Chart 5.12. GSP impact of 75c floor scenario compared to current HFE system, per cent



5.3 The fully-efficient scenario

The previous scenarios are based on the existing HFE system and various alternative policies that have been proposed. This final scenario takes a different approach. It asks the IE-HFE model to design the equalisation policy that maximises consumer welfare. This involves analytically deriving the HFE formula that maximises consumer welfare subject to the constraints of the economy as represented by the IE-HFE model.

The detailed workings are in Appendix A, where the welfare-maximising fiscal equalisation formula appears as equation (22). However, in general terms, the welfare-maximising or fully-efficient solution is as presented earlier in Table 2.1.

That is, the general design of the existing HFE system is fully-efficient except that equalisation for economic circumstances operating at the margin should be removed. Such equalisation is likely to dull the market signals of economic opportunity that drive interstate migration in an efficient national labour market.

The CGC does not specifically identify the components of its recommended equalisation transfers that represents equalisation for economic circumstances. The modelling approaches taken on the revenue and expenditure sides are as follows.

On the revenue side, as discussed in more detail in section 2.3, three categories of revenue – payroll tax, other revenue effects and other revenue – are treated as being determined by both economic and demographic circumstances. The modelling of the fully-efficient scenario only includes equalisation for the contribution of demographic circumstances, in line with the welfare-maximising equalisation formula. This is in contrast to the existing HFE approach, which fully equalises payroll tax and other revenue effects but does not equalise other revenue.

On the expenditure side, the only variation to the existing HFE approach is that equalisation for wage costs is removed. This is because wage costs reflect economic circumstances, which are not part of the welfare-maximising equalisation formula.

If the CGC were to remove economic circumstances as a basis for equalisation to promote efficiency, a systematic detailed examination would be required and that would lead to a more sophisticated, detailed decomposition of the contribution of demographic and economic circumstances.

This fully-efficient HFE scenario is quite close to the (baseline) existing HFE system. This reflects the fact that the other HFE factors – natural endowments, demography and geography – play a more important part in the equalisation process than economic circumstances.

With these small changes to the existing HFE system, fiscal stress is exactly equalised across states, with a uniform standardised tax rate of 9.0 per cent, as seen in Chart 5.13. Hence, fiscally-induced migration is completely eliminated.

With these small changes, there is a similarly small annual gain in consumer welfare of $14 million, as seen in Chart 5.14. This leads to the key conclusion that, while the existing HFE system is not fully-efficient, for practical purposes it is close. This supports Spahn's (2007) contention that the Australian equalisation system is the unique international benchmark.

Chart 5.13 Comparison of standardised tax rates for the optimal scenario compared to current HFE system, per cent

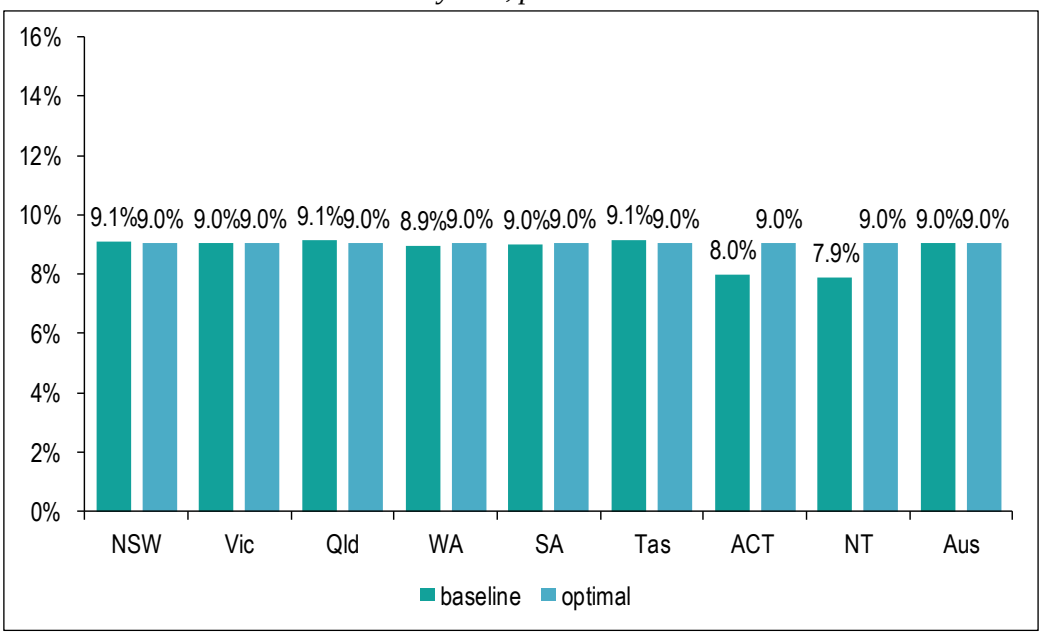
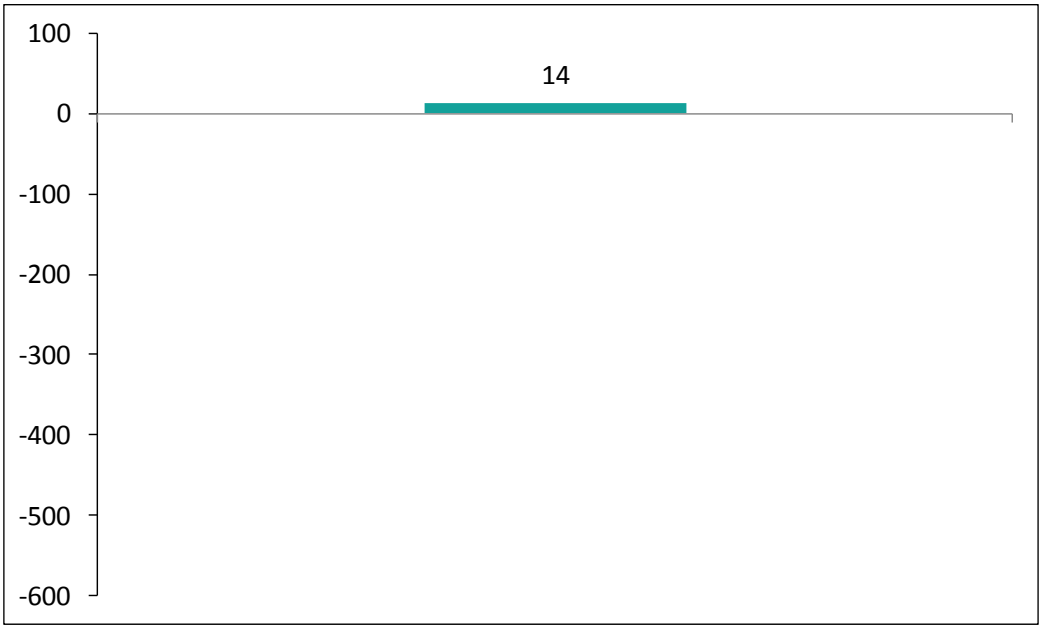


Chart 5.14 Welfare impact of the optimal scenario compared to current HFE system, $m, 2015/16 terms



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A. Modelling Appendix

This section provides additional detail to support Section 3 of the report, which describes the model used, the Updated and Enhanced Independent Economics Horizontal Fiscal Equalisation (IE-HFE) model. For a full understanding of the model, this appendix should be read alongside Section 3 of the report.

A.1 Households

A.1.1 Household utility function

The utility function used in IE-HFE is for a representative individual in a given state who consumes two goods – a private consumption good and state government services. For functional form, a constant elasticity of substitution (CES) utility function is used, augmented by an effect of state population on utility.

$$(1) \qquad U_s = \left[\frac{N_s}{\widehat{N_s}}\right]^{-\delta} \cdot \left[(\beta_c c_s)^{\rho} + \left(\beta_g g_s\right)^{\rho}\right]^{\frac{1}{\rho}}$$

Where:

- U_s is the utility of a representative individual in state *s*
- N_s is the population of state *s*
- $\widehat{N_s}$ is the notional carrying capacity of state *s*
- $-\delta$ is a parameter governing how utility levels are directly affected as population levels change relative to the notional carrying capacity; this is based on the literature that finds that higher population in a region reduces its amenity for households
- c_s is consumption of the private good in state *s* by a representative individual of that state
- g_s is consumption of state government services in state *s* by a representative individual of that state
- β_c is a parameter governing preferences for c_s; this is calibrated to fit the projected data for 2015/16, and is the same across all states
- β_s is a parameter governing preferences for g_s; this is calibrated to fit the projected data for 2015/16, and is the same across all states
- ρ is related to the elasticity of substitution (σ_1) between the two consumption goods. The relationship is $\sigma_1 = \frac{1}{1-\rho}$

As can be seen from (1), the utility function is made up of two parts:

- The second bracketed term describes the utility gained by the representative individual from consumption of the two goods –private consumption and state government services. It is a standard CES utility function. Individuals substitute between the two goods as their relative prices change.

- The first term is an addition to the standard CES utility function that is taken from the urban economics literature and represents how the population level affects the utility of each person in the state. This is discussed in section A.1.2 below.

Households supply labour according to equation (2). It models labour supply in state s as a fixed proportion of that state's population.

(2) $L_s = \pi \cdot N_s$

Where:

π is a parameter governing the proportion of the population that works. It is set at close to 0.5, the projected national proportion of the population that is employed in 2015/16.

In presenting the model, we move between expressing quantities in levels and in per capita terms (where levels have been divided by N_s). To distinguish the two forms, upper case is used for levels and lower case for per capita. For example, the per capita version of equation (2) would be written as follows.

(2a) $l_s = \pi$

As discussed in Section 3.2, in the IE-HFE model households move towards states where they can achieve higher utility. Migration equilibrium will be achieved when the utility of the representative household is the same in all states. That is, over the long run, households distribute themselves between states in such a way that there would be no gain from moving to any other state. Labour mobility is discussed in the following section.

A.1.2 Labour mobility and congestion in IE-HFE

The urban economics literature emphasises that individuals will move while there is an incentive to do so. That is, individuals will move if they can attain a higher utility in a new location. This *perfect migration* assumption implies that households move until utilities are equal across all regions.

Therefore, the utility function used in the IE-HFE model needs to capture two aspects. First, it needs to capture the main factors that affect utility from living in a state, including those factors that may be influenced by fiscal advantages and disadvantages and equalisation payments. Second, the model also needs to take into account that population movements to a higher-utility location have negative feedback effects on utility in that location, so that utilities eventually equalise across locations and population movements do not continue without limit.

In the context of this report, a state with fiscal advantages that are not equalised through transfers, can offer higher utility through some combination of lower taxes and higher government services. From Knapp and Graves (1989), we expect this to result in migration towards that state. However, it also follows that the extent of this state's population gain will reach a limit, once its population has risen sufficiently to reduce the amenity of the location by enough to balance the benefit of the fiscal advantage.

Glaeser and Gottlieb (2008) in a similar vein postulate an indirect utility function in which utility is positively affected by labour income, negatively affected by consumer prices, and positively affected by amenity. To describe amenity, they include a term that causes utility to be lower when the population of the area is higher, and this report follows the same approach. This amenity effect is modelled in the first term of the utility function used in the IE-HFE model (see equation (1)):

$\left[\frac{N_S}{\widehat{N_S}}\right]^{-\delta}$.

This term directly reduces the utility of all individuals in the state when the state population is higher, relative to a notional carrying capacity. This amenity effect dampens population movements in response to economic shocks because as migrants move to a state, the population grows and the utility that can be attained there is directly reduced.

The value of $-\delta$ governs the direct sensitivity of utility to population. This report uses a value for $-\delta$ of -1/3. Importantly, this value implies a sensitivity of state populations to changes in equalisation grants that is consistent with the literature. For utility to remain unchanged (at the same level as in other states), this value for $-\delta$ implies that a 1 percent loss in real incomes must be balanced by a 3 per cent loss in population. Similarly, Albouy (2012) cites a long-run elasticity of state population to state income, when state income is changed by changes to equalisation grants, of 3.23. These long-run population effects could take a decade or more to fully develop through a gradual process of interstate migration.

A.1.3 Elasticity of substitution between private consumption and state government services

The elasticity of substitution between private consumption and state government services, σ_1, governs how readily individuals would be willing to substitute between government-provided services and privately produced goods when their relative prices change. As explained in Section 3.3.3, this parameter is important because it influences the extent to which equalisation is necessary for differences in the cost of government services between states. This substitution elasticity has been estimated by a number of econometricians.

Kwan (2006) estimated the substitution elasticity between government and private goods in nine East Asian countries. The countries which are most like Australia – China, Hong Kong, Japan, and Korea – have substitution elasticities of around 0.5. They range from 0.41 in Hong Kong to 0.65 in China.

In constructing a general equilibrium model for the Australian economy, Piggott and Whalley (1991) use an elasticity of substitution of 0.5 between government and private goods. They use this value because it is in the mid-point of a range of studies which estimate the elasticity.

The own price elasticity of demand is related to the elasticity of substitution between public and private goods. Sanz and Velazquez (2007) use data from OECD countries to estimate the long-run price elasticity of demand for government services. They find that demand is relatively inelastic at -0.766. They note that "relative prices have indeed been a factor pushing up government spending. Results reveal own-price inelasticity for most of the functions and aggregate government spending." (Sanz and Velazquez, 2007, p922). If the budget share of government services is not too large, then the elasticity of substitution will be close to the negative of the own-price elasticity of demand. That is, the result from Sanz and Velazquez (2007) implies that the elasticity of substitution between government and private goods is around 0.8.

After taking all of these studies into account, we follow Piggott and Whalley (1991) and adopt an elasticity of substitution between private and public goods at 0.5. This is also consistent with Kwan (2006). Sanz and Velazquez obtain a higher estimate.

A.1.4 Consumer Demand functions in IE-HFE

In IE-HFE, state governments know the preferences (i.e. utility function) of individuals over the private good and state government services, and allocate state income accordingly. They do this by choosing the optimising rate of state tax on labour income. The higher this tax rate, the higher will be the level of state government services that can be funded, but the lower will be the after-tax private incomes from which the consumption of the private good is funded. The optimal tax rate delivers the utility-maximising combination of state government services and private good consumption, out of a given level of state income.

As a result of this behaviour by state governments, the utility function of the representative individual in each state is maximised. This leads to the following demand equations, reflecting the underlying preferences of individuals.

(3a) $$c_s = \frac{1}{\beta_c}\left[\frac{PC_s/\beta_c}{P_s}\right]^{-\sigma_1} \cdot \frac{m_s}{P_s}$$

(3b) $$g_s = \frac{1}{\beta_g}\left[\frac{PG_s/\beta_g}{P_s}\right]^{-\sigma_1} \cdot \frac{m_s}{P_s}$$

Where:

PC_s	is the price (cost) of private services in state *s*
PG_s	is the price (cost) of government services in state *s*
P_s	is the ideal consumption price index for the state which combines the prices of the two goods
m_s	is state income per capita

The ideal consumption price index P_s is as follows.

(4) $$P_s = \left\{(PC_s/\beta_c)^{(1-\sigma_1)} + \left(PG_s/\beta_g\right)^{(1-\sigma_1)}\right\}^{\frac{1}{(1-\sigma_1)}}$$

The determination of the prices of each of the goods is discussed in section A.2.

A.1.5 Labour Mobility and Household Welfare

As noted earlier, in IE-HFE migration equilibrium will be achieved when the utility of a representative individual is the same in all states. That is, over the long run, households distribute themselves between states in such a way that there would be no gain from moving to any other state.

The economic implications of this are most easily seen by considering the indirect utility function. The direct utility function was given earlier by equation (1), which is re-parameterised below by substituting out for ρ in terms of σ_1.

$$(1) \qquad U_s = \left[\frac{N_s}{\widehat{N}_s}\right]^{-\delta} \cdot \left[(\beta_c c_s)^{\frac{(\sigma_1-1)}{\sigma_1}} + (\beta_g g_s)^{\frac{(\sigma_1-1)}{\sigma_1}}\right]^{\frac{\sigma_1}{(\sigma_1-1)}}$$

The indirect utility function is then obtained by first using the demand relationships given by equations (3a) and (3b) to substitute for the consumer quantities, and then simplifying to obtain the following.

$$(5) \qquad V_s = \left[\frac{N_s}{\widehat{N}_s}\right]^{-\delta} \cdot \frac{m_s}{P_s}$$

The cost of living in a location adjusted for the amenity of that location, Q_s, can then be defined as follows.

$$(6) \qquad Q_s = P_s \Big/ \left[\frac{N_s}{\widehat{N}_s}\right]^{-\delta}$$

Using this definition in the indirect utility function gives the following expression for indirect utility.

$$(7) \qquad V_s = \frac{m_s}{Q_s}$$

This shows that utility in a state equals state per capita income deflated by that state's amenity-adjusted cost-of-living.

The national population, N, is taken to be given.

$$(8) \qquad \text{N} = \sum_s N_s$$

Individuals move between states until the utility of a representative individual is the same in all states at some level, V.

$$(9) \qquad V_s = V \text{ for all s}$$

To take an example, suppose that, initially, utility is higher in state s than in other states, perhaps because of a fiscal advantage that is not equalised. This leads individuals to migrate from other states to state s. This reduces the indirect utility in state s through the population-based amenity effect. Conversely, the out-migration from other states causes indirect utility to rise there by the same logic. Migration continues until utility of a representative individual is equated across states.

Using the indirect utility function of equation (5), it can be shown that the change in aggregate economic welfare from an economic change, as measured by the equivalent variation (EV) from welfare economics, is given by equation (10).

(10) $$EV = \frac{\Delta V}{V^0} \cdot \sum_s M_s^0$$

That is, the change in economic welfare from an economic change is given by the proportionate change in utility applied to the initial level of national income, where a zero superscript is used to denote the initial levels of the variables before the policy change. This measure of welfare change is used frequently in this report. For example, the result that a move from the existing HFE system to a modified EPC system would result in a loss in economic welfare of $451 million was calculated using equation (10).

A.2 Producers

Modelling of production is straightforward. Labour is used with the same technology in each state to produce an intermediate good. That intermediate good serves as the numeraire in the model. The wage equals the number of units of output of the intermediate good produced per unit of labour. Since the technology is the same in each state, so is the wage.

(11) $Y_s = W.L_s$

While capital does not appear explicitly, it is possible to interpret labour, L_s, as a labour and capital bundle using the following reasoning. Under constant returns to scale and perfect competition, the cost of capital services and the real wage are inversely related through the zero pure profits condition. Hence, if the cost of capital is fixed on the world capital market, then the real wage is also determined. Under the reasonable assumption that HFE arrangements do not affect either the world cost of capital or the zero pure profits condition, then the relative price of labour and capital will be unaffected by changes to HFE arrangements. Thus, the labour-capital ratio will also be fixed. Hicks's composite commodity theorem, that goods with fixed relative prices can be aggregated, can be applied to redefine N as a labour-capital bundle.

The intermediate good is used in producing both the private and government goods. In both cases the efficiency of the transformation processes can vary from state to state, so each state has its own price for both the private and state government goods.

Thus, in producing the private consumption good, the requirement for the intermediate good depends on both the quantity of the private good and the efficiency of the transformation process as reflected (inversely) in the price of the private good.

$PC_s \cdot C_s$

In producing state government services using the intermediate good, an additional distinction is made between fixed and variable costs.

$\theta_s + PG_s \cdot G_s$

Fixed costs are represented by θ_s, and do not vary with the level of government services that are provided, G_s. Variable costs depend on the marginal cost of services, PG_s and the level of services G_s.

A.3 State Incomes

A.3.1 State Government objectives

As noted earlier, in IE-HFE, state governments know the preferences (i.e. utility function) of individuals over the private good and state government services. They choose the optimal tax rate on income from labour that delivers the utility-maximising combination of state government services and private good consumption, out of a given level of state income.

If individuals in different states have different preferences, then the federal system allows these individuals to have a different level of government services in each state (with corresponding different taxation levels). As noted in Section 2.1, HFE is designed so that states can have different government service levels if this reflects the preferences of state residents.

The modelling in IE-HFE has been simplified so that individuals in all states have the same preferences. This means that differences in per capita government service levels between states would only be driven by differences in the costs of providing private and government services, and in the incomes of residents. It also means that the model does not show the benefits from HFE related to allowing different service levels when preferences differ. Instead, it focuses on the use of HFE to give states the *capacity* to provide the same level of services, if they chose to do so.

A.3.2 State income constraint

Expenditure in a state on the private and government goods is constrained by the income of the state. The most important source of state income is production of the intermediate good with labour, as described by equation (11). The overall budget constraint for a state is given by equation (12).

$$W.L_s + PF_s.F_s + H_s = PC_s \cdot C_s + \theta_s + PG_s \cdot G_s \quad (12)$$

The sources of state income are shown on the left-hand side of equation (12). Besides the income from the production of the intermediate good, it also includes state government revenue from a fixed factor, $PF_s.F_s$, and the equalisation transfer from the Federal Government, H_s.

In modelling government revenue from the fixed factor, the rental price of the fixed factor (relative to the price of the numeraire, the intermediate good) is taken as given. The most plausible interpretation of this is that the fixed factor transforms into a tradeable good with a given price; this could describe the mining industry. Another interpretation is that the fixed factor is used as an input in the production of the intermediate good and is perfectly substitutable with labour, thus fixing its relative price. These two assumptions can be applied selectively to cover different cases of fixed factors.

The fixed factor revenue of the state government includes revenue it derives from mining resources and land. This can be taken to include mining royalties, land tax and conveyancing duties. The net revenue effect of demographic circumstances is also included here.

While equation (12) assumes that only the government sector receives fixed factor income, the model can readily be extended to include fixed factor income in the private sector. This does not affect the modelling of HFE as long as it is assumed that individuals own shares in the national stock of fixed factors, rather than shares in the state stock.

The right hand side of equation (12) shows uses of state income. These consist of the two uses identified above in section A.2, namely consumption of the private good and expenditure on the state government good, including fixed costs.

The income, M_s that is available to a state to fund private and government services is the total income given by the left-hand side of equation (12), net of the fixed costs that must be covered before government services can be provided.

(13) $$M_s = W.L_s + PF_s.F_s + H_s - \theta_s = PC_s \cdot C_s + PG_s \cdot G_s$$

This budget constraint can be re-expressed in per capita terms.

(14) $$m_s = PC_s \cdot c_s + PG_s \cdot g_s$$

The state government is assumed to maximise utility (the direct utility function of equation (1) or the indirect utility function of equation (5)) subject to this budget constraint to determine the optimal solution for state private and government consumption. This solution, as a function of prices and state income, was given in equations (3a), (3b) and (4). Making the implicit assumption that the state government balances its budget using a tax on labour, for modelling HFE, the state government budget does not need to be further articulated. However, it is nonetheless of interest to do so.

A.3.3 State government budget

The first step is for the state government to set its own spending equal to the optimal level. The second step is to raise tax revenue in the state that is sufficient to fund this level of spending. In the third step, the income remaining in the private sector will exactly fund the optimal level of private consumption. These three steps are now considered in more detail through the state government budget constraint.

Having determined its optimal level of its spending, $\theta_s + PG_s \cdot G_s$, the state must raise the necessary funding. Part of this funding is its income from the fixed factor, $PF_s.F_s$ and its equalisation payment, H_s, from the Federal Government, which may be positive or negative. Re-arranging equation (13), this leaves the following state revenue-raising requirement, TT_s.

(15) $$TT_s = W.L_s - PC_s \cdot C_s = \theta_s + PG_s \cdot G_s - PF_s \cdot F_s - H_s$$

Equation (15) shows that state revenue raising must equal the gap between labour income and private consumption. Taxing away this gap means that the optimal levels of government and private consumption are both funded exactly.

In effect, the Federal Government does part of this revenue raising on behalf of the states. It raises GST and other taxes in each state then returns all of the GST through general purpose grants and part of the other taxes through tied grants. The remainder of the state revenue requirement is covered through other taxes collected by state governments (besides the economic rent-based taxes already included under government fixed factor revenue, namely, mining royalties, land tax and conveyancing duties). In practice, the largest of these other taxes is payroll tax. This is consistent with the implicit assumption in the modelling that state governments balance their budgets using a tax on labour.

A.4 Federal Governments

The Federal Government raises revenue to fund its own services and to make grants and equalisation transfers to state governments to partially fund their services. Although not explicitly modelled, this revenue can be thought of as being sourced from a national tax on labour. The three areas of Federal Government spending are now considered in turn – federal government services, state per capita grants and state equalisation transfers.

A.4.1 Federal Government services

As this model is concerned with fiscal equalisation transfers, the Federal Government's own services are not the focus. For data construction purposes, Federal Government services are included in the private consumption good. Thus, implicitly, the Federal Government provides part of a state's private consumption in exchange for labour tax revenue.

A.4.2 Per capita grants

Federal grants to the states can be divided into per capita grants and equalisation transfers.

This is readily apparent in the case of the general purpose grants made from GST revenue. They are explicitly calculated for each state as a base grant based on a state's population share plus an equalisation transfer (which can be positive or negative) based on an assessment of a state's fiscal capacity compared to the national average.

Tied grants from the Federal Government are not necessarily divided between states on a per capita basis. However, to the extent that they are not, this is reversed via an offsetting adjustment made to the equalisation transfers made from GST revenue. Thus, tied grants can be considered to be made on a per capita basis.

An overall distinction can therefore be made between per capita grants in the form of base GST grants and tied grants, and equalisation transfers made to offset the differences between states in their fiscal capacities. For modelling purposes, the effects on state incomes of the per capita grants is cancelled out by the national tax on labour needed to finance them. This means that the only component of the Commonwealth Budget that needs to be modelled is equalisation transfers.

A.4.3 Equalisation transfers

Equalisation transfers aim to offset the differences between states in their fiscal capacities. In the model, three types of differences in state fiscal capacities are distinguished. These are:

1. state government fixed costs; and
2. state government endowments of economic rents from fixed factors;
3. state government efficiency in providing government services.

There are also two other areas, not directly related to fiscal capacities, in which state economies can differ:

4. their amenity as measured by their actual population relative to their notional carrying capacity; and
5. private sector efficiency in providing private services.

In principle, equalisation could be undertaken for any or all of these five differences between states. In practice, the CGC focusses on fiscal capacities, factors (1)-(3). It equalises for factors (1) and (2), as well as some other factors not listed, but it expressly does not equalise for factor (3), as stated in the CGC (2015) equalisation principle.

> State governments should receive funding from the pool of goods and services tax such that, after allowing for material factors affecting revenues and expenditures, each would have the fiscal capacity to provide services and the associated infrastructure at the same standard, if each made the same effort to raise revenue from its own sources and operated at the same level of efficiency.

In the model, equalisation for factors (1) and (2) involves the following per capita HFE transfers.

$$\frac{H_s}{N_s} = \left(\frac{\theta_s}{N_s} - \frac{\sum_s \theta_s}{N} \right) - \left(\frac{PF_s.F_s}{N_s} - \frac{\sum_s PF_s.F_s}{N} \right) \tag{16}$$

The first term shows that each state receives from the funding pool its own per capita fixed costs of government, and then pays back into the pool based on the per capita fixed costs for all states considered together. In this way, each state bears the same per capita fixed costs of government, which are calculated at the national level. Similarly, the second equalisation term puts each state on an equal per capita footing in relation to the economic rents it receives from fixed factors.

Equation (16) has the property that the equalisation transfers sum to zero across states, as made explicit in equation (17). The payments by the donor states match the receipts of the recipient states. This also means that in our model the Federal Government, like the state governments, balances its budget.

$$\sum_s H_s = 0 \tag{17}$$

As will be seen in section A.5, it turns out that in this model the welfare maximising system of HFE is given by equation (16). The two factors appearing in equation (16) represent "fixed" drivers of fiscal costs and revenues. It is efficient to equalise for differences in such fixed drivers. In keeping with the principles of marginal analysis, for migration to be efficient, the drivers of migration should be marginal rather than fixed in nature. Failure to equalise for fixed drivers will result in fiscally induced migration that reduces welfare.

Notably, it is not efficient to equalise for factor (3), differences in state government efficiency. As noted above, the CGC approach is consistent with this.

The CGC equalises for a broader range of factors than those listed above. The CGC (2015) explains the factors as follows.

> The fiscal positions of the States differ because of differences in their natural endowments, their economic, demographic and geographic circumstances and the policy choices they make. The Commission calculates what the fiscal capacities of the States would be if the policy differences were removed. We call these the assessed fiscal capacities of States and they are central to our recommended GST distribution. This distribution is designed to equalise the assessed fiscal capacities of the States.

Thus, the CGC equalises for four factors:

- natural endowments;
- demographic circumstances;
- geographic circumstances; and
- economic circumstances.

These factors are now considered in turn.

Natural endowments and demographic circumstances fall under the heading of fixed drivers. They do not respond to migration flows but they may induce them in the absence of equalisation. Thus, it is efficient for the CGC to equalise for these drivers.

Notwithstanding its statement above, in practice the CGC does not fully equalise service levels for geographic circumstances. Boadway (2007) explains the process as follows.

> Rural and urban areas have different levels of health care and roads because it costs more to provide such services in rural areas. Equalisation systems typically do not try to fully equalise differences in costs. One way of dealing with the problem is to take as given differences in levels of public services in different geographic locations and to equalise the costs of providing those services for like areas across regions. This is the approach taken in Australia.

Arguably this mimics the approach that the Federal Government would take if it were responsible for providing the same services i.e. it would provide like services in like areas. In that sense, this form of equalisation can be regarded as efficient.

The final equalisation driver used by the CGC is economic circumstances. These are relatively unlikely to be fixed and, indeed, may be important drivers of efficient, economically-motivated interstate migration. A key example of economic circumstances used by the CGC is wage costs. Wage rate differences influence both the CGC assessment of capacity to raise revenue from payroll tax as well as its assessment of the cost of providing state government services. Given that wages apply to a variable and mobile factor of production, it is reasonable to suppose that wage differences are an efficient driver of migration and so it is inappropriate to equalise for them. This was investigated further.

In the model, wage rates are the same in each state, being determined by the same marginal product of labour. This raises the issue of how equalisation for differences in wage rates should be modelled. This issue was explored by generalising the model so that it did produce differences in wages between states. In particular, the fixed factor was made imperfectly substitutable for labour in production.

In this generalised model, migration into a state leads to lower wages. This occurs because the rise in the ratio of labour to the fixed factor reduces the marginal product of labour. At the same time, mobile labour means that in equilibrium utility is the same in every state. Thus, in states with higher real wages, the benefit to this from utility must be fully offset by other factors such as lower amenity from population pressures.

In the generalised model, the expression for the optimal HFE transfers continues to include the same two terms obtained from the simpler model; those terms in equation (16). This confirms the case for fully equalising for fixed drivers. The expression also includes two further terms, but neither of these terms involve equalisation for wage differences. Thus, equalisation based on differences in wage rates

between states does not appear to be justified. The welfare advantage of living in a state with a higher wage is exactly offset by other disadvantages, such as lower state amenity. More generally, equalisation should be based on drivers that are fixed rather than variable in relation to migration decisions.

Returning to the simpler model used here, this suggests that equalisation for wages or other differences in variable costs or revenues can be treated as an arbitrary variation to the equalisation process. More generally, this may be true for most equalisation for economic circumstances operating at the margin. Thus, the final equation for modelling equalisation transfers under the existing HFE system includes an additional term for these arbitrary transfers, X_s.

$$(18) \qquad \frac{H_s}{N_s} = \left(\frac{\theta_s}{N_s} - \frac{\sum_s \theta_s}{N} \right) - \left(\frac{PF_s.F_s}{N_s} - \frac{\sum_s PF_s.F_s}{N} \right) + \left(\frac{X_s}{N_s} - \frac{\sum_s X_s}{N} \right)$$

Data for the variables appearing in equation (18) was obtained from the CGC (2015) assessment for GST grants pool relativities in 2015/16. That assessment is based on analysis of the three assessment years 2011/12, 2012/13 and 2013/14, and a projection of the population and GST revenue in 2015/16.

To use the CGC information, the first step is to categorise each of the drivers into the CGC's four equalisation categories. The following table is taken directly from the CGC assessment. A final column has been used showing, for each driver, the equalisation category (or categories) into which it has been classified.

On the revenue side, three sources of revenue are classified to the "natural endowments" category: mining royalties, conveyancing duty and land tax. Their revenue is derived from the fixed factors or natural endowments of mining resources and land. In the modelling, they are included in $PF_s.F_s$.

The two other sources of revenue are classified to both the "economic" and demographic categories. These other revenue sources are payroll tax and "other revenue effects", which refer to insurance taxes and motor vehicle taxes. They are driven by state incomes, which are influenced by demographic circumstances such as the proportion of the population of prime working age, and economic circumstances such as the wages and productivity of different groups of workers.

There is also a final category of revenue, "other revenue" (not to be confused with "other revenue effects") that the CGC does not assess, and therefore implicitly assumes is driven simply by population size. Accounting for 38 per cent of state government revenues, this category includes gambling taxes, user charges and interest and dividends. It seems likely that the bulk of revenue in this category will also be driven by state incomes and therefore will be affected by both demographic and economic circumstances.

For modelling purposes, these final three categories of revenue – payroll tax, other revenue effects and other revenue – are treated as being determined by both economic and demographic circumstances. As indicated in section 2.2, for the illustrative purposes of this report the demographic circumstances of a state are approximated by its employment to population ratio.

This approach only captures the influence of demographic circumstances to a first approximation. While employment to population ratios will be heavily influenced by the age structure of the population,

economic circumstances will also exert some influence. Further, demographic circumstances will also exert some influence on revenue to employment ratios, which has not been taken into account. Thus, as noted earlier, if the CGC were to remove economic circumstances as a basis for equalisation to promote efficiency, a systematic detailed examination would be required and that would lead to a more sophisticated, detailed decomposition of the contribution of demographic and economic circumstances to revenue raising capacity.

Finally, it can be noted that the GST is not included in the CGC table. This is consistent with the view that the GST is a Federal tax, and is therefore outside of the equalisation process. Alternatively, if it viewed as a state tax, then its treatment in the equalisation process needs to be considered.

The GST revenue sourced from a state would broadly reflect a state's share of household consumption expenditure and so is affected by demographic and economic circumstances. However, the base GST grant received by each state instead reflects a state's share of population. This means that GST is fully equalised for differences in both demographic and economic circumstances. However, as with the three previous revenue sources, if efficiency is the aim of equalisation there is a case for separating the contribution of demographic and economic circumstances and then restricting equalisation to demographic circumstances.

Table S4-6 Drivers of illustrative difference from EPC distribution of GST, 2015-16 ($ million)

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Redist	category
	$m	$m	$m	$m	$m	$m	$m	$m	$m	
Effects of revenue raising capacity	2 253	2 981	- 273	-5 888	527	208	204	- 12	6 173	
Mining production	2 262	2 993	-274	-5 911	529	209	205	-12	6 197	natural
Payrolls paid	-145	460	205	-1 114	387	208	-18	16	1 276	economic/demog
Property sales (a)	-762	-25	247	-174	483	177	10	44	961	natural
Land values	36	-122	-31	-269	229	81	53	23	422	natural
Other revenue effects	247	60	-104	-246	-31	19	40	15	382	economic/demog
Total revenue raising capacity	1 638	3 366	43	-7 714	1 598	694	291	85	7 714	
Effects of expenditure requirements										
Demographic features										
Remoteness and regional costs (b)	-1 336	-1 113	696	508	130	377	-153	890	2 601	geographic
Indigenous status (c)	-118	-1 298	594	190	-120	84	-55	722	1 591	demographic
Socio-economic status (d)	376	-79	-64	-293	310	36	-210	-76	722	demographic
Other SDC (e)	-43	-368	326	-111	96	27	-35	108	557	demographic
Wage costs (f)	348	-629	-464	842	-164	-111	84	93	1 368	economic
Population growth (g)	-737	-151	157	1011	-268	-156	-37	181	1 349	demographic
Urban centre size (h)	323	744	-563	25	-152	-211	-54	-112	1 092	geographic
Administrative scale	-443	-280	-173	42	118	225	237	273	896	natural
Natural disaster relief	-216	-236	661	-75	-89	-25	-17	-3	661	natural
Small communities (i)	-311	-274	95	187	63	22	-19	238	605	geographic
Non-State sector (j)	-332	-229	25	428	-35	62	59	21	595	demographic
Other expense effects	-476	-990	262	491	119	24	-43	613	1 510	demographic
Total expense and capital effects	-2 965	-4 904	1 552	3 247	9	356	-243	2 948	8 112	
Effects of Commonwealth payments	438	59	-74	-22	-132	-38	51	-282	547	1851
Total	-889	-1 479	1 521	-4 490	1 475	1 012	98	2 752	6 858	

Turning to the expenditure side, many of the drivers are demographic-related. If a state has a high concentration of people from a demographic group that requires a high level of government services or contributes little to tax revenue, it is important to equalise for this. Otherwise, the resulting high state tax burden will lead to inefficient, fiscally induced outward migration. In the modelling, the "demographic circumstances" drivers are included in θ_s.

Three of the drivers are geographic. As noted above, the CGC does not fully equalise for geographic circumstances but rather funds like services in like areas, just as the Federal Government would do if it were providing the same services. Geographic circumstances do not fit neatly into the model but, so as not to distort the analysis, are included in θ_s.

Two of the expenditure drivers can be regarded as "natural", namely administrative scale and natural disaster relief. Administrative scale refers to the fixed costs of providing state government services. The division of Australia into eight states and territories with eight sets of fixed costs is a given or "natural" feature of the political environment in which equalisation is designed to operate. Similarly, natural disaster relief relates to the given natural environment of each state. In the modelling on the expenditure side, these "natural" drivers are included in θ_s.

The final expenditure driver of wage costs is clearly part of the "economic circumstances" of each state. As discussed above, there is no justification for equalising for it in the modelling framework so it is included in X_s.

A.5 Optimal HFE

The IE-HFE model can be used in two different ways. First, it can be solved numerically to show the economic impacts of any particular HFE policy. That approach is employed extensively in the body of this report. Second, the latest model can also be solved analytically for the optimal HFE policy. This section presents the analytical solution for the optimal HFE policy.

In the literature, equalisation policy is analysed from the two perspectives of efficiency and equity. Here, both perspectives are used in alternative solutions of the model.

Utility for a representative individual in a state, V_s, can be written in its indirect form after converting equation (13) for income to its per capita form, and then using it to eliminate per capita income from equation (5) for indirect utility.

$$(19) \qquad V_s = \left(W \cdot \pi + \left[PF_s.F_s + H_s - \theta_s\right]/N_s\right) \cdot \left[\frac{N_s}{\hat{N}_s}\right]^{-\delta} \Big/ P_s$$

This relates utility of the individual to state per capita income, state amenity and the state cost of living.

In choosing its equalisation transfers, H_s, the Federal Government faces two constraints, which have been introduced earlier.

$$(17) \qquad \sum_s H_s = 0$$

$$(9) \qquad V_s = V \text{ for all s}$$

The first constraint is that the equalisation transfers sum to zero across the states. In the context of this model, this is equivalent to requiring that the Federal Government balances its budget.

The second constraint is that the utility of each state's representative individual is the same across states. As Boadway (2003) notes, this constraint has two alternative justifications.

If labour is mobile, it can be expected that labour will move between states in response to opportunities for higher utility. Ultimately, this process will result in utility being equalised across states. This is referred to as the efficient migration solution. Alternatively, if labour is immobile, under the principle of horizontal equity, the Federal Government may wish to equate the utility of like individuals in different states. This is referred to as the horizontal equity solution.

In either case, equation (9) can be used to eliminate V_s from equation (19).

$$(20) \qquad V = \left(W \cdot \pi + \left[PF_s.F_s + H_s - \theta_s\right]/N_s\right) \cdot \left[\frac{N_s}{\hat{N}_s}\right]^{-\delta} \Big/ P_s \qquad \text{for all s}$$

Under the case of immobile labour (horizontal equity solution), the population of each state, N_s, is fixed. The Federal Government chooses its equalisation transfers, H_s, to maximise utility, V, subject to the constraints of equations (17) and (20).

On the other hand, if labour is mobile (efficient migration solution), it also optimises the population of each state, N_s, subject to the constraint of a given national population.

(8) $$N=\sum_s N_s$$

The solutions for the optimal HFE system are given below. Equation (21) is the horizontal equity solution based on immobile labour, while equation (22) is the efficient migration solution.

(21)

$$\frac{H_s}{N_s}=\left(\frac{\theta_s}{N_s}-\frac{\sum_s \theta_s}{N}\right)-\left(\frac{PF_s.F_s}{N_s}-\frac{\sum_s PF_s.F_s}{N}\right)+\left(\frac{Q_s}{\sum_s \frac{N_s}{N}Q_s}-1\right)\cdot\left(W.\pi+\frac{\sum_s PF_s.F_s}{N}-\frac{\sum_s \theta_s}{N}\right)$$

(22) $$\frac{H_s}{N_s}=\left(\frac{\theta_s}{N_s}-\frac{\sum_s \theta_s}{N}\right)-\left(\frac{PF_s.F_s}{N_s}-\frac{\sum_s PF_s.F_s}{N}\right)$$

In both cases there is full equalisation for the fixed costs of government, θ_s and for the economic rents received by government, $PF_s.F_s$. In the case of efficient migration, no further equalisation is required. In the case of the horizontal equity solution based on immobile labour, there is a further equalisation factor.

This further factor depends on the amenity-adjusted cost of living, Q_s. In particular, this factor requires that there is full equalisation for differences between states in their amenity-adjusted cost-of-living. Specifically, the proportionate deviation in a state's amenity-adjusted cost-of-living from the national average is calculated and then applied to total state income. The implications of this can be seen by using equations (4) and (6) to see the determinants of the amenity-adjusted cost of living.

(23) $$Q_s=\left\{(PC_s/\beta_c)^{(1-\sigma_1)}+\left(PG_s/\beta_g\right)^{(1-\sigma_1)}\right\}^{\frac{1}{(1-\sigma_1)}}\Bigg/\left[\frac{N_s}{\hat{N}_s}\right]^{-\delta}$$

Thus, a state may have a high amenity-adjusted cost of living if it has an inefficient public sector (high PG_s), an inefficient private sector (high PC_s) or has low amenity ($N_s > \hat{N}_s$). Thus, horizontal equity

with immobile labour requires very broad compensation that extends well beyond components of the state government budget. Further, it involves highly perverse incentives: the more inefficient are the public and private sectors in a state, the larger the equalisation payments that it receives. Finally, it is based on the strong assumption that labour is completely immobile. These observations call seriously into question the usefulness of a pure horizontal equity approach.

When labour is mobile and HFE is optimal, differences in utility between states are dealt with in two distinct ways, depending on their source. As noted in section A.4, there are five sources of differences between states in the model.

1. state government fixed costs, θ_s
2. state government endowments of economic rents from fixed factors, $PF_s \cdot F_s$
3. state government efficiency in providing government services, PG_s
4. state amenity as measured by actual population relative to notional carrying capacity, $\left[\frac{N_s}{\hat{N}_s}\right]^{-\delta}$
5. private sector efficiency in providing private services, PC_s.

In the situation of mobile labour and optimal HFE, factors (1) and (2) are fully equalised through HFE. Further, the potential state divergence in the amenity-adjusted cost-of-living from factors (3), (4) and (5) is completely eliminated by interstate migration. Fiscal equalisation for such divergences becomes redundant. This produces a higher level of welfare than when the Federal Government is constrained by completely immobile labour.

At a practical level, even if labour is not perfectly mobile, in a federation it will always have some mobility that involves some response to the economic environment. This is likely to contain the extent of divergences between states in the amenity-adjusted cost of living, reducing even further the case for making such divergences a consideration for equalisation.

Continuing with the solution in the case of efficient migration, with fiscal equalisation according to equation (22), the solutions for per capita state income, utility and state population are as follows.

$$m = \left(W.\pi + \frac{\sum_s PF_s.F_s}{N} - \frac{\sum_s \theta_s}{N} \right) \tag{24}$$

$$V = \left(\sum_s \left[\frac{\hat{N}_s}{N} \cdot P_s^{-1/\delta} \right] \right)^{\delta} \cdot m \tag{25}$$

$$N_s = \hat{N}_s \cdot \frac{P_s^{-1/\delta}}{\sum_s \frac{\hat{N}_s}{N} \cdot P_s^{-1/\delta}} \tag{26}$$

The solution for per capita state incomes is the same for every state. This occurs through optimal fiscal equalisation. Utility is also the same in each state. This occurs through migration. Finally, if the cost of living is the same in each state, the population of each state will equal its carrying capacity. Otherwise, the population of a state varies inversely with its relative cost of living.