THE ECONOMIC IMPACT OF A GENERAL INCREASE IN SKILLED IMMIGRATION

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The paper uses MONASH, a dynamic computable general equilibrium model, to investigate the impact on the Australian economy of a 50 per cent increase in the skilled migrant intake over the period 2005–2025. The main effect of the policy is to increase the scale of the economy. There is a small transient gain in the average income of incumbents. Underlying this average are large distributional effects.

INTRODUCTION

The paper uses MONASH, a model of the Australian economy, to investigate the economic effects over the period 2005–25 of a hypothetical policy in which the level of skilled visa immigration is increased by 50 per cent over its 2004–05 level.[1] This is equivalent to increasing the migrant intake by approximately 39,000 persons per annum. The paper proceeds as follows. The section below describes the MONASH model, and presents two diagrams (Figures 1 and 2) describing the macroeconomic linkages in the model that are important in the present analysis. These diagrams are used in the results section to discuss the key features of the simulation results. As we shall see, the main effect of the policy is to increase the long-run size of the economy (relative to the size it would otherwise have been) approximately in proportion to the increase in skilled labour. But for this to happen, investment must grow strongly so that the capital stock can grow approximately in proportion to employment growth.

With the economy larger, so too are export volumes. The expansion in export volumes causes the terms of trade to decline. The boom in investment causes the prices of inputs to capital formation to rise. Together, these two effects cause the cost of capital to rise relative to that of labour, resulting in a long-run increase in the labour/capital ratio. This causes average wages to fall relative to what they would otherwise have been. However average capital income rises. Together, these effects lift average income of the incumbent[2] population by approximately $60 per annum for the first sixteen years of the policy.

SIMULATING A SKILLED MIGRATION PROGRAM USING MONASH

Overview of the MONASH model

MONASH[3] is a dynamic computable general equilibrium (CGE) model of the Australian economy. It features detailed sectoral disaggregation, with the version employed in this paper covering 106 industries and commodities. Familiar neoclassical assumptions govern the behaviour of the model's economic agents. Decision-making by firms and households is governed by maximising behaviour. Each representative industry is assumed to minimise costs subject to constant returns to scale production technologies and to given input prices. Household commodity demands are modelled via a representative utility-maximising household. Units of new industry-specific capital are assumed to be cost minimising combinations of commodities sourced from Australia and overseas. Imperfect substitutability between imported and domestic varieties of each commodity are modelled using the CES (constant elasticity of substitution) assumption of Armington. The export demand for any given Australian commodity is assumed to be inversely related to its foreign-currency export price.

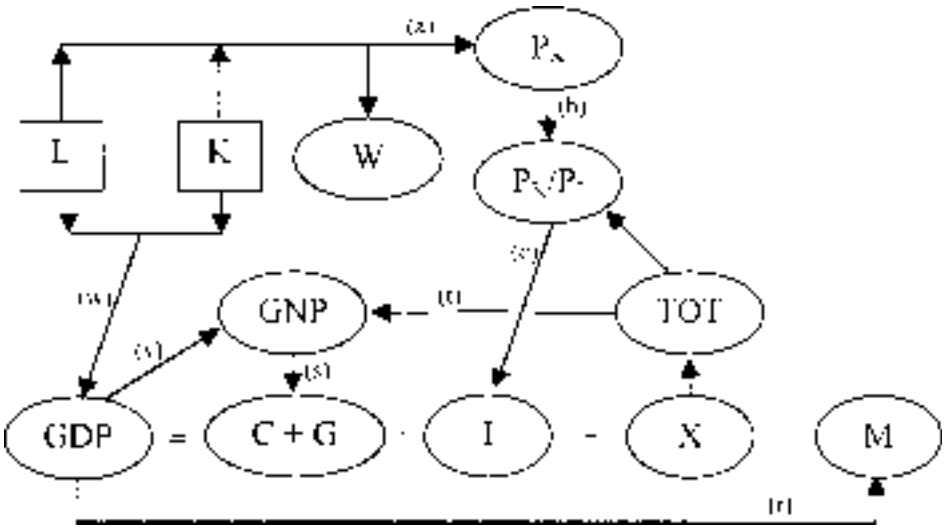
The model recognises the consumption of commodities by government, and a variety of direct and indirect taxation instruments. In general, markets are assumed to clear and to be competitive. Purchasers' prices differ from basic prices by the value of indirect taxes and margin services. Dynamic equations describe stock-flow relationships, such as those between capital and investment, and debt and savings.

Since MONASH is too large and detailed to describe in a paper of this size, Figures 1 and 2 are provided as a guide to the model's main routes of macroeconomic causation in the short-run and long-run.[4] These diagrams will be used in the results section to describe the MONASH results. The arrows show the direction of causation between variables. Variables within boxes are determined outside of the model (that is, they are exogenous). Variables within ovals are determined by the model (that is, they are endogenous). The economic mechanisms represented by each arrow are described, as required, in the results section.

Implementing the skilled migration policy in MONASH

The skilled immigration policy is implemented in MONASH through a set of shocks that can be broadly divided into three components. First, the intake of skilled migrants is increased by 39,000 persons per annum above basecase.[5] In terms of Figures 1 and 2, this is represented as an increase in effective employment, L.[6] However the implementation of this shock in MONASH is far more disaggregated than a simple increase in aggregate effective

Figure 1: Short-run relationships in MONASH



Notes to Figures 1 and 2

Variables within boxes are exogenous; those within ovals are endogenous. The variables are:

C	Real private consumption spending	M	Import volumes
G	Real public consumption spending	NFL	Net foreign liabilities
GDP	Real gross domestic product	PK	Real rental price of capital
GNP	Real gross national product	PI	Price of investment
I	Real investment	TOT	Terms of trade
INA	Immigrants' net assets at arrival	W	Real wage
K	Capital stock	X	Export volumes
L	Employment		

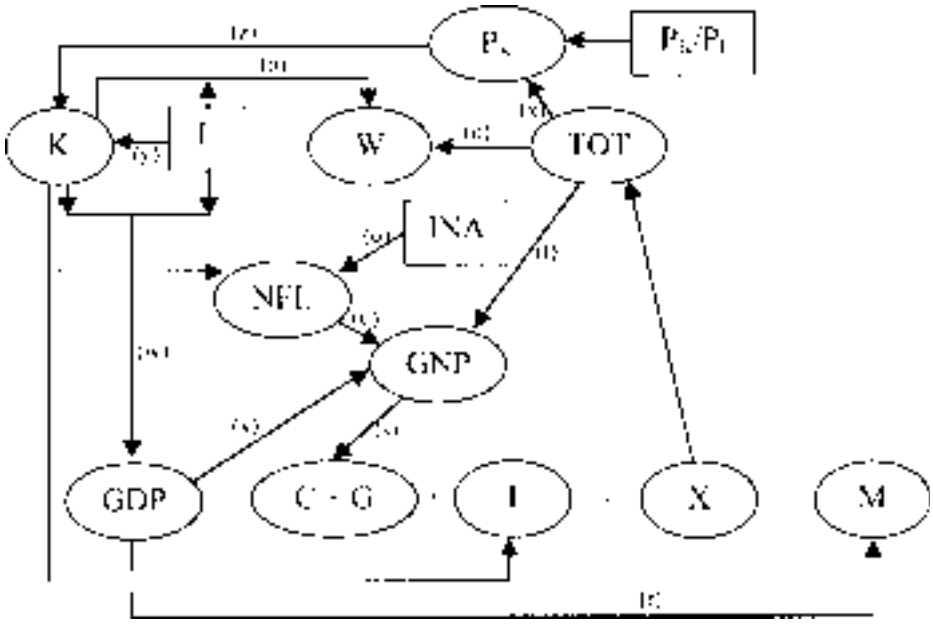
employment; employment of labour distinguished by 64 skill categories is increased. Here a skill category is defined as a qualification level (for example, post graduate degree, bachelor degree, graduate diploma) cross-classified by a qualification field (for example, information technology, health, education). Holders of each of the 64 types of skill can potentially apply their skill to the supply of labour distinguished by 81 types of occupation,[7] although the ease with which this can be done is constrained by a recognition that some skills are more relevant to some occupations than others.[8] Economy-wide labour supply to any one of the model's 81 occupations is the sum of labour supplies to that occupation by all 64 skill types. The model's 106 industries use labour distinguished by occupation. Each industry faces imperfect substitution possibilities between labour distinguished by occupation.[9]

Economy-wide demand for labour distinguished by any one of the model's 81 occupations is the sum of demands for that occupation across all 106 industries. Economy-wide occupation-specific labour demands and labour supplies are equated via endogenous occupation-specific wage rates.

The second component of the shocks relates to the speed of short-run capital accumulation. Connection (c) in Figure 1 describes a positive relationship between the rate of return on capital (P_K/P_I) and investment (I). The strength of this relationship is increased in the first few years of the simulation to give added impetus to capital formation. This reflects a scenario of cautious acceptance on the part of investors that the labour supply shock is permanent. The third component relates to the net assets of skilled migrants at the time they enter the country.

The Productivity Commission provided an estimate of net assets per skilled immigrant. This is used as the basis for calculating a shock to net foreign liability accumulation each year to reflect the net asset position of each cohort of new arrivals.

Figure 2: Long-run relationships in MONASH



In terms of Figure 2, this is represented by a positive shock to INA (immigrants' net assets) which, via connection (o), reduces the accumulation of net foreign liabilities (NFL) relative to what would otherwise have occurred.

RESULTS

Selected results from the MONASH simulation are shown in Figures 3 to 12. All results are expressed as changes away from where the economy would otherwise have been in the absence of the increase in skilled immigration (that is, the basecase). Using Figures 1 and 2 as summary descriptions of the operation of MONASH, the remainder of this section discusses these results via a sequence of cross-referenced points.

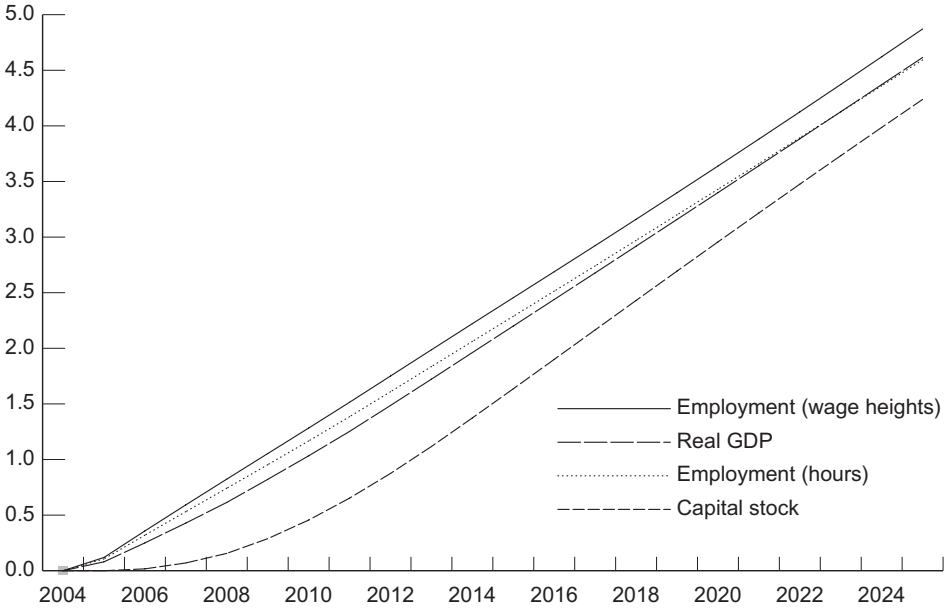
Employment rises, causing investment and capital to rise

The level of immigration is above basecase throughout the simulation period. Hence, relative to basecase, the level of employment (hours) is positive and increasing (Figure 3). The 50 per cent increase in the skilled migration intake lifts average annual employment growth by 0.21 percentage points. This lifts employment (hours) relative to the basecase by 4.6 per cent by 2025.

By design, the policy encourages the immigration of workers with post graduate degrees, bachelor degrees and advanced diplomas, relative to workers with, inter alia, graduate diplomas, and no post-school qualifications (Figure 4).[10] On average, the former workers receive higher wage rates than the latter workers. Hence, growth in wagebill-weighted employment exceeds growth in total hours (see Figure 3).

Capital stocks take time to begin adjusting to the rise in employment. In terms of Figure 1, there is little scope for a material change in K (physical capital) in the short-run. However L (employment) is rising. Hence the number of units of labour per unit of physical capital (the labour/capital ratio) rises in the first years of the policy (Figure 5). This reduces the amount of idle time on the existing capital stock and allows capital

Figure 3: Employment, capital stock and real GDP (per cent deviation from basecase)



to be used more intensively than it would have been otherwise. Hence the real rental (or 'profit') per unit of capital begins to rise.

This accounts for connection (a) in Figure 1, where the real rental per unit of capital is described as P_K. The increase in the rents on existing capital has only an indirect effect on the cost of building new capital (described by P_I in Figure 1) hence the rise in P_K must cause the ratio P_K/P_I (the rate of return) to rise. This accounts for connection (b) in Figure 1. In Figure 5, the ratio P_K/P_I is described as the rate of return index.11 As expected, it rises in the first years of the policy.

The increase in the rate of return signals to investors the presence of profitable investment opportunities. This causes investment to rise (Figure 6). In Figure 1 this mechanism is represented by connection (c). Over time, the rise in investment adds to the capital stock. This accounts for the rising capital stock in Figures 3 and 6. In the long-run, capital accumulation occurs until the rate of return is reduced back to what it would otherwise have been (Figure 6). In terms of Figure 2, this is represented by expressing the rate of return (P_K/P_I) as exogenous. Figure 2 shows two long-run determinants of the capital stock: the cost of renting a unit of capital (connection z) and the level of employment (connection y). With P_K/P_I exogenous in the long-run, our first expectation is that the real return on capital (P_K) will be largely unaffected by the policy. If so, then via connection (y) the capital stock (K) will grow by the same amount as employment (L), thus leaving the long-run rate of return on capital unaffected by the policy, as required.

However, despite the exogenous status of the long-run rate of return on capital (P_K/P_I), the real cost of capital (P_K) can change, thus affecting the amount of capital that employers desire to use per unit of labour. Figure 2 shows two long-run avenues via which the real cost of capital can rise. Firstly, since the ratio (P_K/P_I) is fixed in the long-run, if P_I rises then so too must P_K. Secondly,

Figure 4: Employment outcomes by qualification (per cent deviation from basecase)

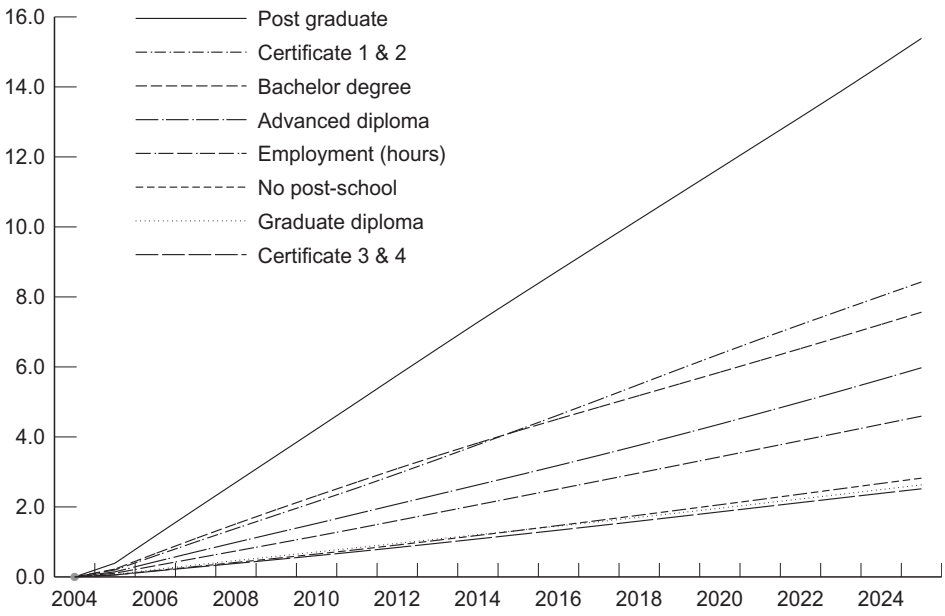


Figure 5: Labour/capital ratio, the terms of trade and relative factor prices (per cent deviation from basecase)

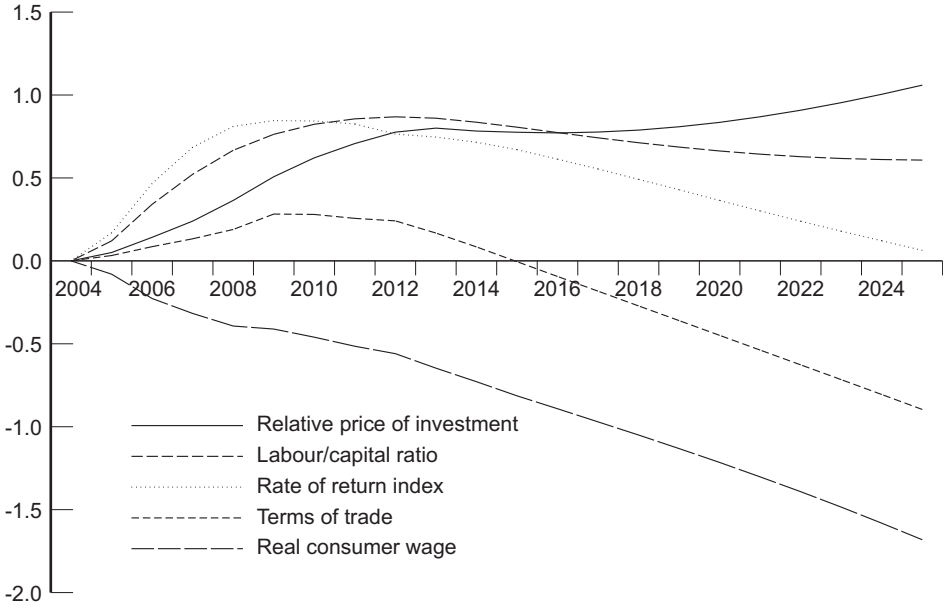
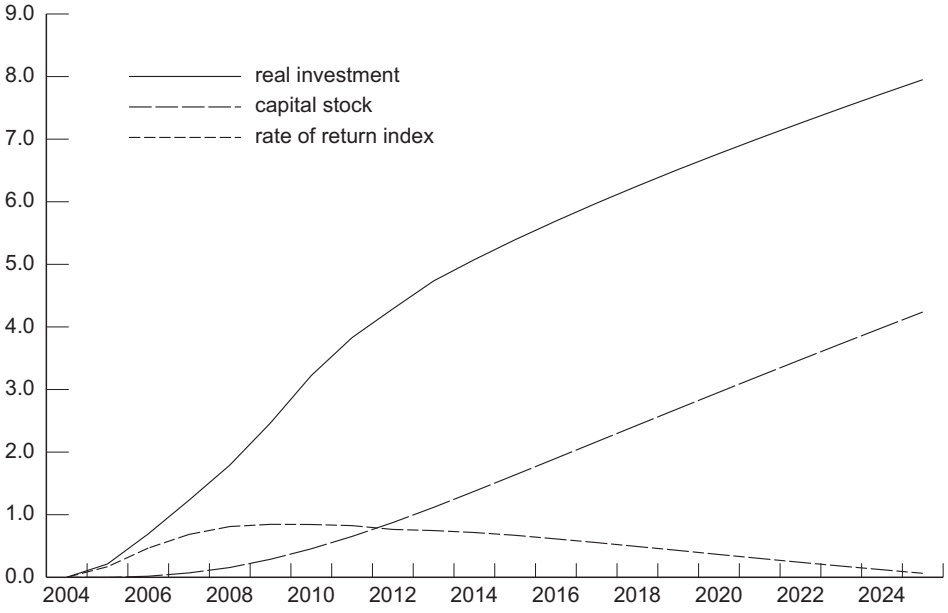


Figure 6: Rate of return on capital, investment and capital stock (per cent deviation from basecase)



P_K is the 'real' rental cost of capital: that is, the nominal rental price of a unit of capital divided by the price of output. The price of output can fall (thus driving up the real rental cost of capital) if the terms of trade fall. This accounts for connection (x) in Figure 2.

The long-run labour/capital ratio rises

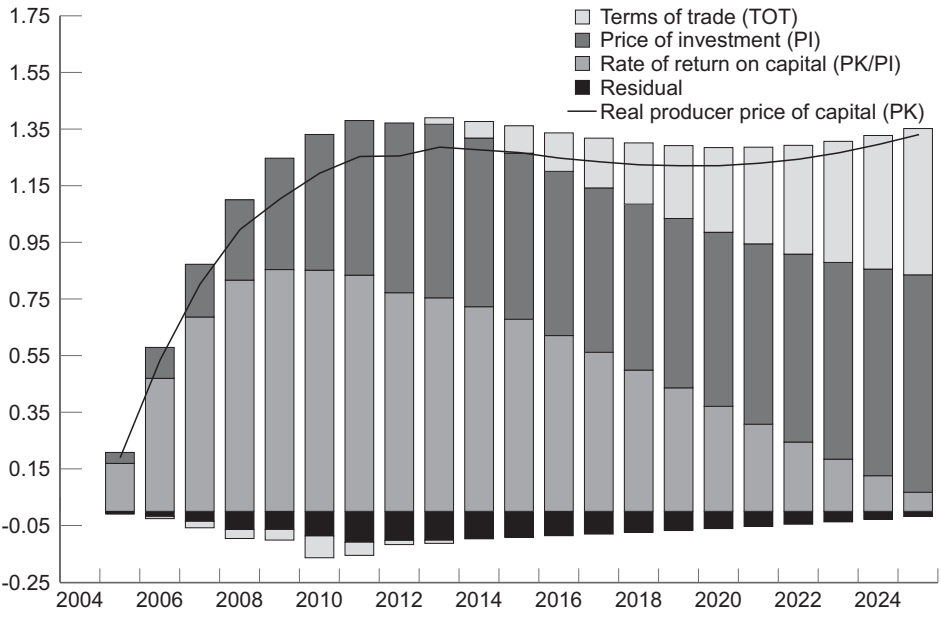
As discussed above the real producer price of capital (P_K) is determined by movements in the rate of return (P_K/P_I), the price of investment (P_I) and the terms of trade (TOT). Figure 7 plots the MONASH result for P_K[12] and decomposes its movements into the individual contributions of four factors: the terms of trade, the price of investment, the rate of return, and a residual.[13] It is clear from Figure 7 that much of the initial rise in P_K is due to the rise in the rate of return (P_K/P_I). However over time, capital accumulation drives the rate of return back towards its basecase level (hence its exogenous status in Figure 2). Nevertheless, the increase in P_K remains at approximately its 2013 level. This is due to a rise in the cost of constructing capital (P_I) and a fall in the terms of trade (TOT) (see sub-section on the balance of trade below).

As we have seen, labour is modelled as heterogeneous. It is distinguished by skill types that each face a constrained ability to transfer the application of their skills across different occupations. At the same time, firms face limited substitution possibilities between labour of differing occupational types. The strong increase in investment demand (see sub-section above) increases demand for occupations used intensively in investment (see sub-section on wages of skilled labour below). This causes wages of construction-related occupations to rise. This accounts for much of the increase in P_I.

Real GDP rises, but not by as much as real GNE

With employment of labour and capital rising through time, so too must output of goods and services. That is, real GDP rises (connection (w) in Figures 1 and 2). This

Figure 7: Contributions to the change in the real producer price of capital



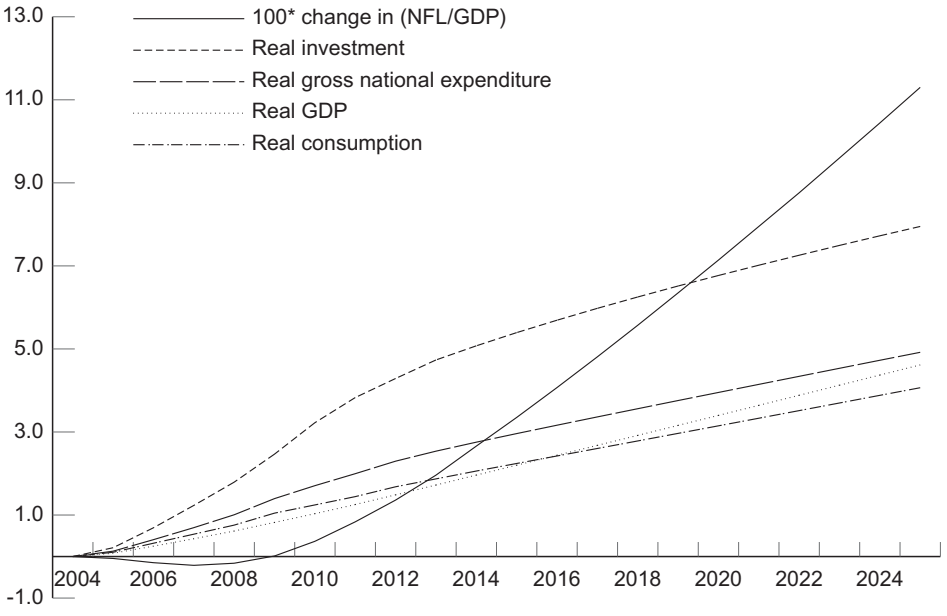
accounts for the strong correlation between growth in real GDP and growth in labour and capital inputs in Figure 3. The value of final goods and services produced in the economy (GDP) largely determines national income (GNP). This is described by connection (v) in Figures (1) and (2). Leaving aside for the moment the effects of changes in terms of trade and foreign liabilities (connections (t) and (u) in Figure 2) the rise in GDP causes GNP to rise.

The model assumes a fixed ratio of consumption (both private and public) to GNP (connection (s) in Figures 1 and 2). Hence, with real GNP higher, so too is real consumption. Since connection (v) in Figures 1 and 2 largely determines GNP, the increase in real consumption tracks closely the increase in real GDP (Figure 8). However the terms of trade also affect aggregate real income. For example, an improvement in the terms of trade lifts real income (GNP) because more imports are possible for any given level of exports. The link between the terms of trade (TOT) and real GNP is expressed by connections (t) in Figures 1 and 2 respectively.

In Figure 8 the increase in real consumption is initially marginally above the increase in real GDP. This is due to the initial increase in the terms of trade (see sub-section below). However two factors eventually cause the increase in consumption to be slightly less than the increase in GDP. First, the terms of trade outcome is negative from 2011. Second, the strong increase in investment—and attendant rise in the balance of trade deficit (see sub-section below)—causes net foreign liabilities (NFL) to rise (Figure 9). Via connections (t) and (u) in Figure 2, declining terms of trade and rising net foreign liabilities reduce the extent of the real GNP increase (and hence, via connection (s), the real consumption increase) relative to the increase in real GDP.

Despite the damping effect on real consumption (C+G) of declining terms of

Figure 8: GDP, consumption, investment and foreign liabilities (per cent deviation from basecase)



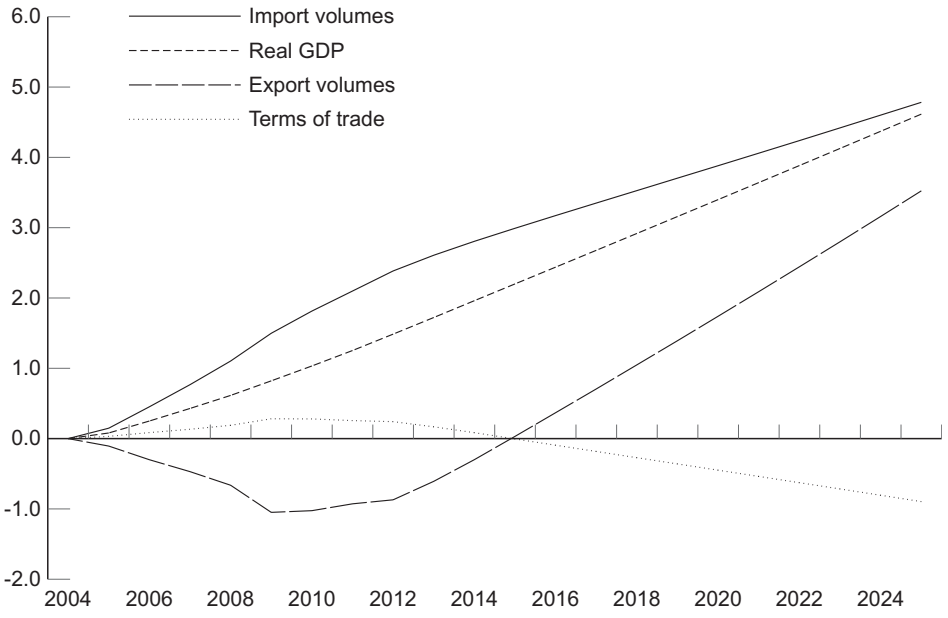
trade and rising net foreign liabilities, the increase in real GNE (C+I+G) is greater than the increase in real GDP throughout the simulation (Figure 8). This is due to the strong growth in real investment (see subsection on employment, investment and capital above). The growth in investment is strongest in the first decade. Accordingly, the gap between real GNE and real GDP is widest in this period (Figure 8).

The balance of trade moves towards deficit, the long-run terms of trade decline

Since the growth in real GNE exceeds the growth in real GDP, the GDP identity (GDP=GNE+X–M) requires that net exports (X–M) decline. Initially, this is achieved through both an increase in import volumes and a decline in export volumes (Figure 9). The terms of trade are directly related to export volumes. The terms of trade is defined as the ratio of export prices to import prices. Foreign currency import prices are assumed to be unaffected by the policy. However Australia's export volumes do affect foreign currency export prices. It is assumed in MONASH that Australia faces downward-sloping demand curves for its exports. Hence, an expansion in Australia's exports requires that Australia accept a lower price for its exports, in order to induce foreigners to purchase those exports. The converse is also true: a contraction in Australian export volumes allows a somewhat higher price to be charged for the smaller quantity of exports.

The initial reduction in export volumes accounts for the initial rise in the terms of trade (Figure 9). Through time, the growth in import volumes tends to track the growth in real GDP (Figure 9)[14] because higher economic activity (higher GDP) draws in more imports for input to production, consumption, and capital formation (connection r). Hence, with real GDP growing steadily throughout the simulation

Figure 9: Real GDP, import volumes, export volumes and terms of trade (per cent deviation from basecase)



(Figure 3) so too must import volumes (Figure 9). This requires that export volumes also eventually rise above basecase levels (Figure 9). This accounts for the decline in the terms of trade from 2015 onwards (Figure 9).

The real consumer wage falls relative to basecase

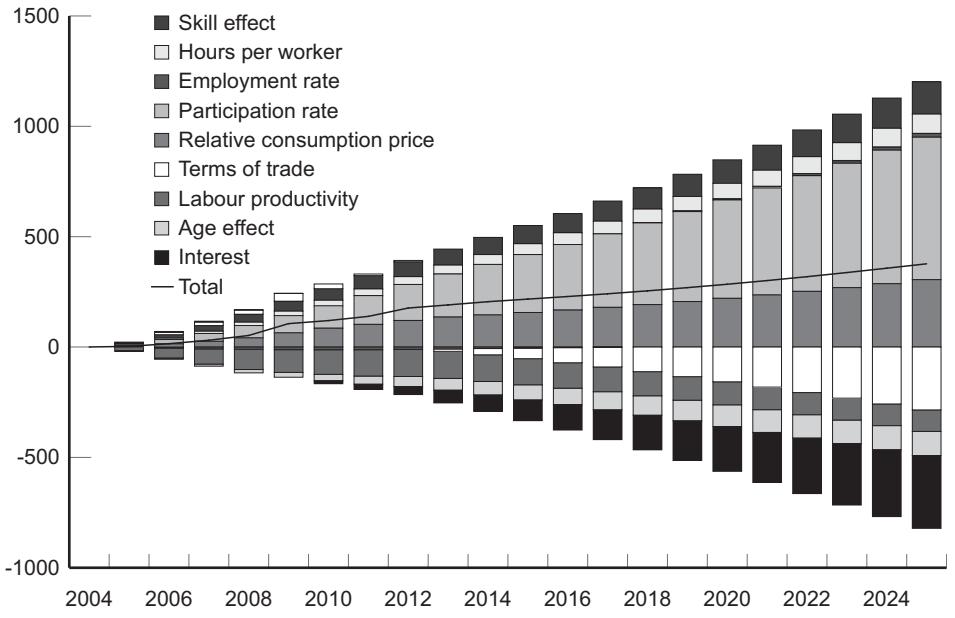
Figure 2 describes the real consumer wage (W) as determined by the labour/capital ratio (connection p) and the terms of trade (connection q). The labour/capital ratio is above basecase throughout the simulation period (see sub-section on the labour/capital ratio above). All other things being equal, a rise in the labour/capital ratio causes the real wage to fall because, by contributing to congestion of the capital stock, labour productivity falls. This contributes to the fall in the real wage in Figure 5. However, from 2015 onwards, the terms of trade also fall (see sub-section above). Declining terms of trade also contribute to the decline in the real (consumption price deflated) wage (connection q in Figure 2).

A decline in the terms of trade causes the price of output in general to fall by more than the price of consumption goods. This accounts for the terms of trade's negative effect on the real wage: for any given level of employment and the capital stock, the fact that a fall in the terms of trade reduces the price of output (which firms receive) by more than the price of consumption (which workers pay) means that firms' willingness to pay for an hour's labour (that is, the nominal wage) is reduced by more than the cost of the things that consumers purchase with an hour's worth of labour.

Per capita GNP rises, reflecting the characteristics of the skilled immigrants

Figure 10 plots the contributions to the change in real GNP per capita made by nine factors. For at least two decades, prospective positive deviations in real GNP and GDP per capita have been put forward in Australia as an argument in support of im-

Figure 10: Contributions to change in real GNP per capita ($2005)



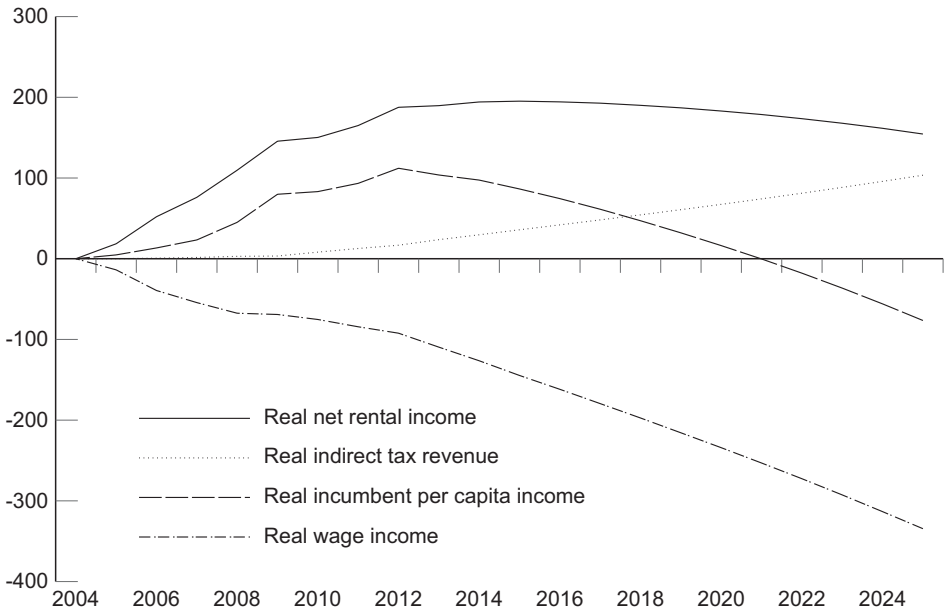
migration. This continues to occur, notwithstanding cautions against the use of this measure by authors such as Parmenter[15] and Peter and Verikios.[16] Figure 10 is presented here, not because the change in real GNP per capita is a useful welfare indicator (which in this case, it is not[17]) but because the individual determinants of the change in GNP per capita affect the incomes of incumbents and new arrivals differently. Hence Figure 10 provides insights into the likely effect of the policy on incumbent welfare. (The following sub-section considers incumbent real income more directly.)

Figure 10 decomposes the change in real per capita GNP according to the equation below, where GNP is real (consumption price deflated) GNP, POP is the population, PI is the investment deflator, PC is the consumption deflator, PX is the export deflator, PM is the import deflator, GDP is real GDP, EH is employment measured in efficiency units, H is employment measured in hours, L is employment measured in persons, LS is labour supply in persons, PWA is the working age population, NFL is real (consumption price deflated) net foreign liabilities, R is the interest rate on net foreign liabilities, and *f* and *g* are positive functions of the relative price of investment and the terms of trade respectively.

Figure 10 plots the dollar contributions to the change in real GNP per capita of each right-hand-side term of the equation, distinguishing the impact of movements in: the relative consumption price term, f(PI/PC), the terms of trade term, f(PX/PM), labour productivity (GDP/EH), the skill effect (EH/H), hours worked per worker (H/L), the employment rate (L/LS), the participation rate (LS/PWA) and the working age effect (PWA/POP).

$$\frac{GNP}{POP} = f\left(\frac{PI}{PC}\right) g\left(\frac{PX}{PM}\right)\left(\frac{GDP}{EH}\right)\left(\frac{EH}{H}\right)\left(\frac{H}{L}\right)\left(\frac{L}{LS}\right)\left(\frac{LS}{PWA}\right)\left(\frac{PWA}{POP}\right) - \left(\frac{NFL \times R}{POP}\right)$$

Figure 11: Change in real per capita incumbent income and its components (deviation $2005 from basecase)



The changes in these determinants of real GNP per capita provide pointers to the likely impact of the policy change on incumbents. New arrivals can be expected to capture most of the gains from the rise in the skill effect, hours worked per worker, the employment rate, the participation rate, and the working age effect, since these labour market characteristics of the new arrivals will be reflected in the wages that they earn. Movements in the terms of trade and labour productivity will affect the incomes of both incumbents and new arrivals.

In the first four years of the projection period there is a small increase (averaging $25 per annum) in per-capita real GNP. Over this period, factors acting to reduce per capita GNP relative to the basecase (declining labour productivity, a rise in the unemployment rate, and a fall in the working age share) are slightly more than offset by factors acting to increase per capita GNP (rises in the terms of trade, the relative price of investment, the skill effect, the hours worked per worker, and the participation rate).

After 2008 the increase in real GNP per capita rises steadily. This is the net result of a number of countervailing effects. Compared to incumbents, the skilled immigrants have high participation rates, high working hours per worker, high skills, and (from 2018) low unemployment rates. These characteristics act to increase real GNP per capita. However the declining terms of trade, rise in the labour/capital ratio, and rising foreign interest payments damp the increase in real GNP per capita. It is clear from Figure 10 that much of the increase in per capita GNP is driven by the rise in the participation rate.[18]

Incumbents' income rise in the medium -run, and decline in the long-run

Figure 11 plots real per capita income for incumbents. It also plots the movements in the components of per capita incumbent income: wages, net capital rentals (comprising capital and land rentals less net foreign interest payments), and incumbents' share of real indirect tax revenues. The real wage declines throughout the simulation period (see sub-section on real consumer wages above). This accounts for the fall in wage income (Figure 11). The movement in the rate of return on capital is positive and, for the first five years of the simulation, growing (see sub-section on employment, investment and capital above). This accounts for the rise in rental income[19] (Figure 11). The policy stimulates imports relative to real GDP (see sub-section on the balance of trade above and endnote 13). This stimulates indirect tax revenue (Figure 11).

For the first sixteen years of the policy (2005–2020) the gain in incumbent capital and indirect tax income exceeds the loss of wage income by an average of $61 per annum (Figure 11). However the decline in real wages grows throughout the simulation, while ongoing growth in capital supply damps the positive movement in capital rentals. From 2021 the loss in wage income dominates the net income calculation, leading to a growing decline in incumbent income relative to the basecase. By the year 2025 the decline in incumbent real income reaches minus $77 per capita.

Underlying these movements in average income are likely to be large distributional effects. Broadly, incumbent workers lose from the policy while incumbent capital owners gain. At a five per cent discount rate, the present value of incumbent real wage losses over 2005–25 is minus $1,775 per capita. The present value of the capital income gains is $1,953 per capita. In addition, there are likely to be large within-group variations in income.

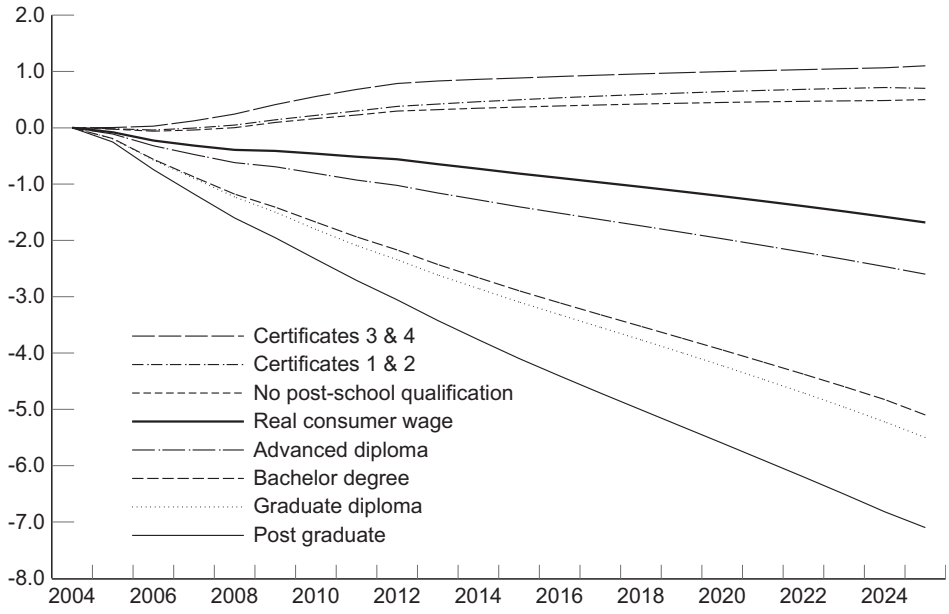
The declines in real wages are greatest for workers with post graduate, graduate diploma, bachelor and advanced diploma qualifications. Incumbent workers with

trade certificates 1 and 2, trade certificates 3 and 4, or no post-school qualifications experience small rises in real wages relative to basecase (see 3.8 below). Owners of capital in the sectors experiencing the largest output gains will, in general, experience the largest gains in capital income. The gains in capital income will be permanent for the owners of assets in fixed long-run supply, such as agricultural land, property possessing high amenity and location value, and government licences.

Furthermore, the distribution of capital income in Australia is quite concentrated. The capital owned by the wealthiest 10 per cent of the Australian population represents approximately 45 per cent of all household net wealth.[20] While income distribution is not explicitly modelled in the version of MONASH used in this paper, it is reasonable to conjecture that a likely distribution of the gain in (pre-tax) aggregate incumbent capital income would follow the pattern described by Heady, Marks and Wooden.[21]

The distribution of net gains and losses from the policy are also likely to be quite unevenly distributed across the population ranked in terms of age. Heady et al. note that household net wealth, associated as it is with past savings behaviour, peaks in the pre-retirement years of 55 to 64 and declines thereafter. Hence it is possible that incumbents of pre-retirement age stand to gain the most from the policy. With few years left in the labour force, the net present value of their wage losses is likely to be relatively low. At the same time, with high capital ownership, they stand to gain from rises in capital rents. The reverse is the case for young incumbents: they begin with modest stakes in the domestic capital stock (thus receiving relatively little direct benefit from the rise in rental rates) while facing many years of participation in the workforce (thus experiencing a comparatively larger decline in the present value of wage income).

Figure 12: Real wage outcomes by qualification (per cent deviation from basecase)



The wages of skilled labour declines relative to basecase

The version of MONASH used in this paper produces wage rates for 64 skill types, 81 occupations and 106 industries. Here we focus on wage outcomes for labour distinguished by skill, aggregating across qualification fields to produce changes away from basecase in wage rates for seven broad skill categories distinguished by qualification level (Figure 12). It is useful to compare Figure 12 with Figure 4. Figure 4 shows that the immigration program produces a relative increase in the supply of persons with post graduate, bachelor and advanced diploma qualifications. Figure 12 shows that the wage paths for these qualifications lie below the economy-wide average: other things being equal, the model requires negative wage deviations for the occupations in which these qualifications are predominantly employed, in order to ensure full employment.

However this wage-adjustment mechanism only considers the model's supply side. For example, the policy also promotes the relative supply of labour with trade certificate 1 and 2 qualifications (Figure 4), yet the average wage received by people with these qualifications rises relative to basecase (Figure 12). This is because workers with certificate 1 and 2 qualifications (along with those with certificate 3 and 4 qualifications and those with no post-school qualifications) supply relatively heavily to occupations used intensively in investment activities. The strong increase in investment (see subsection on employment, investment and capital above) causes demands for these qualifications to rise, generating positive deviations in their wage rates.

CONCLUSIONS

This paper has investigated the economic effects of a general expansion in skilled immigration. This expansion has some impacts on the composition of aggregate economic activity, but such a policy is largely about the scale of the economy: broadly, the economy simply expands in proportion with the skilled immigration intake. As such, a general expansion in skilled immigration would not appear to be an appropriate policy response to popular perceptions of a current 'skills shortage', particularly when the articulation of such shortages is typically in terms of quite narrowly defined skills.

Indeed, the importance of ensuring that any policy reaction to such concerns is accurately targeted is highlighted by the policy's effect on the construction sector. This is a sector that is presently said to face severe skills shortages. However the effect of a general expansion in skilled immigration is to exacerbate 'skill shortages' (measured by wage rises) in this sector, by adding to demand for construction services.

Another motivation for encouraging skilled immigration, relative to simply promoting immigration in general, is that skilled migrants are more productive. For the policy investigated in this paper, this 'skill effect' proves to be relatively small, lifting wage-weighted employment by about eight per cent above employment in hours (Figure 3).[22] The contribution of this skill effect to the change in real GNP per capita averages $79 per annum over the simulation period (Figure 10). Most of this accrues to the new arrivals via their hourly wage.

The impact of the policy on average incumbent income is small, averaging an annual $37 ($2005) per capita over the study period. However this average obscures distributional effects that are likely to be quite large, and hence worthy of further research. Distributional effects have had a central place in recent policy debates on the GST and income tax cuts. They should also feature prominently in debates about skilled immigration.

Naturally, the modelling reported in this paper has a number of limitations, and the results should be interpreted cautiously with those limitations in mind. Constant returns to scale have been assumed throughout the economy. Technical efficiency (productivity) and foreign willingness to pay for Australian exports are held unchanged at their basecase levels. It is possible that, on a per-capita basis, skilled immigrants and their descendants, because of their qualifications and natural ability, might contribute more to innovation than the basecase population. This would mitigate the real wage reductions.

Another avenue for growth in technical efficiency is capital accumulation: the new capital installed in response to population growth may embody technologies more advanced than those embodied in the older basecase capital stock. It is also possible that skilled immigrants may identify new foreign markets for Australian goods. This would mitigate the terms of trade losses.

The measure of incumbent real income reported does not take account of net fiscal transfers between incumbents and new arrivals. The paper models a general expansion in skilled immigration: even with the high level of skill/occupational disaggregation in the present version of MONASH, the modelling cannot capture the benefits of a selective immigration policy that targets very specific skills deemed critical to the timely exploitation of particular investment or market opportunities. This could be an important source of benefit from skilled immigration, but one that can only be evaluated on a case-by-case basis. More generally, the modelling has assumed that the workers arriving under the expanded program are perfectly substitutable with workers holding the same skills as the basecase population. This rules out any downward shift in the skill level at which new arrivals of a given skill find employment. It also rules out gains from immigrants holding skills that are complementary to those held by basecase workers.

Notwithstanding these limitations, the results provide some grounds for caution against uncritical advocacy of a general program of expanded skilled immigration simply as a response to present claims that Australia faces a 'skills shortage'.

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References

[1] The paper is based on a report commissioned by the Productivity Commission for input to their recent commissioned study *Economic Impacts of Migration and Population Growth*, 2006. The views expressed in this paper are mine, and do not necessarily reflect those of the Commission. The original report is available on the Productivity Commission's website at <www.pc.gov.au/study/migrationandpopulation/consultancy/monashmodel/index.html>. Graham Cuxson (Productivity Commission) and Tony Meagher (Centre of Policy Studies) calculated the impacts of this policy on labour-force participation rates, hours worked per worker, the share of the population of working age, and labour supply by skill type in the base and policy cases. This paper discusses the results of inputting the results of Cuxson and Meagher's calculations into MONASH. For details on Cuxson's calculations, see appendix F of Productivity Commission, *Economic Impacts of Migration and Population Growth*, Commonwealth of Australia, 2006. For details on Meagher's calculations, see section A of J. Giesecke and T. Meagher, 'Modelling the economic impacts of migration and population growth', General Working Paper No. G-157, Centre of Policy Studies, Monash University, June 2006

[2] The basecase includes a business-as-usual level of immigration. Hence the term 'incumbents' refers to the population present in 2005 and their descendents plus basecase 2005–2025 immigrants and their descendents.

[3] Full details of MONASH's theoretical structure are described in P.B. Dixon and M.T. Rimmer, *Dynamic general equilibrium modelling for forecasting and policy analysis, a practical guide and documentation of*

MONASH, Contributions to Economic Analysis 256, North-Holland Amsterdam, 2002. The model is solved with the GEMPACK economic modelling software: see W.J. Harrison and K.R. Pearson 'Computing solutions for large general equilibrium models using GEMPACK', *Computational Economics*, vol. 9, 1996, pp. 83–127

[4] The short-run relates to the first one to three years of the policy. The long-run effects of the policy begin to become apparent after around seven years.

[5] In the basecase, the intake under the skilled immigration program is held at its 2004–05 level (78,000 persons per annum).

[6] The employment rate (one minus the unemployment rate) is determined exogenously to reflect the acclimatisation path of the new arrivals. Broadly, skilled immigrants begin with employment rates slightly to below average, but over time, their employment rate rises slightly above average. See Productivity Commission, 2006, op. cit., p. 290

[7] The 81 occupations are the Australian Bureau of Statistics' Australian Standard Classification of Occupations minor groups. Examples of these are occupations such as building and engineering professionals, medical practitioners, school teachers, printing tradespersons, plumbers, and structural construction tradespersons.

[8] This is implemented via skill-specific CET (constant elasticity of transformation) functions.

[9] Via industry-specific CES (constant elasticity of substitution) functions.

[10] The qualification levels in Figure 4 correspond to the broad groups in Australian Bureau of Statistics, Australian Standard Classification of Education (ASCED), Commonwealth of Australia 2001

[11] Defined as the ratio of the average capital rental rate to the investment price deflator.

[12] Defined in Figure 7 as the ratio of the average rental price of capital to the gross domestic product (factor cost) deflator.

[13] The residual term is the product of two ratios: the ratio of the gross national expenditure (GNE) deflator to an index of the GNE deflator calculated using gross domestic product (GDP) weights; and, the ratio of the GDP at market prices deflator to the GDP at factor cost deflator. See Giesecke and Meagher, 2006, op. cit., pp. 58–59

[14] The deviation path for imports lies above the real GDP deviation throughout the simulation period because investment (the deviation in which is greater than the deviation in real GDP) is relatively import-intensive.

[15] See B. Parmenter, 'The economics of immigration', *Economic Papers*, vol. 9, no. 2, 1990, pp. 39–50.

[16] See M. Peter and G. Verikios, 'The effect of immigration on residents' incomes in Australia: some issues reconsidered', *Australian Economic Review*, vol. 2, 1996, pp. 171–188.

[17] The measure subtracts from the policy scenario value of average per capita GNP (an average of the incomes of both the basecase population and the new arrivals) the basecase scenario value of average per capita GNP (the income of the basecase population only). Hence it compares the average incomes of two different populations, when, from a policy perspective, only the incomes of the basecase (incumbent) population matter.

[18] Of the total value of the contributions to real GNP made by factors acting only to increase real GNP per capita, the participation rate accounts for 24 per cent of the total in 2005 and 54 per cent of the total in 2025.

[19] The deviation in per capita rental income begins to peak slightly later than the peak in the rate of return deviation, for two reasons. First, the deviation in land rents grows throughout the simulation. Second, the deviation in net incumbent income is positive for the first sixteen years of the simulation. This allows an initial positive deviation in net incumbent savings which, in turn, adds to incumbent capital ownership in the policy case relative to the basecase.

[20] B.G. Heady, G. Marks and M. Wooden, 'The structure and distribution of household wealth in Australia', Melbourne Institute Working Paper No. 12/04, Melbourne Institute of Applied Economic and Social Research, The University of Melbourne, July 2004

[21] ibid.

[22] In Figure 3 the deviation in employment (wage-weighted) is approximately eight per cent higher than the deviation in employment (hours).