

Housing and Housing Finance: The View from Australia and Beyond

Luci Ellis *

Abstract: This paper draws together themes from work at the RBA, other national central banks, the BIS and elsewhere on recent developments in housing and housing finance. The general conclusion is that financial and macroeconomic developments have increased the demand for the stock of housing. Because the stock-supply of housing is inherently sticky, this has increased its relative price. Although this is a global trend, individual country institutions have affected outcomes, sometimes in ways that are not obvious. The resulting expansion in both sides of the balance sheet is an important development for policymakers to monitor, but it is probably not of itself a cause of financial instability.

* Deputy Head, Economic Analysis Department, Reserve Bank of Australia. This paper was prepared for the Reserve Bank of New Zealand workshop 'Housing, savings, and the household balance sheet' held in Wellington on 14 November 2006. The views expressed in this paper have developed as a result of my work at the RBA and for the BIS Working Group on Housing Finance in the Global Financial Market, but they are absolutely my own and do not represent the views of either of these institutions.

I. Introduction

This paper presents a synthesis of the substantial recent work by central banks and other agencies covering developments in housing and housing finance in industrialised economies over the past decade or so. Most countries have experienced waves of financial deregulation, increased competition amongst providers of finance and greater innovation in the provision of finance to households. Together with the effect of lower inflation on nominal interest rates, these developments have increased households' demand for the stock of housing. Because the supply of housing is inherently sticky, its relative price has therefore risen in many countries. Both sides of the household balance sheet have expanded substantially as a result.

Within these global trends, national differences can affect outcomes in a variety of ways. The tax system can clearly have an effect, as can the structure and regulation of the financial system. National housing policy and regulation of the landlord–tenant relationship can affect incentives to hold housing as an investment. These institutional factors can vary substantially in different countries, but they can also be changed. Less changeable are geographic characteristics, which could also be important influences on the outcomes in particular markets. If they are, it means that countries with similar institutions could still have quite different experiences.

Increases in housing prices and household indebtedness naturally raise concerns for policymakers. They need to assess if either the household or financial sectors are taking on too much risk, and what the macroeconomic results of these developments might be. It is therefore important to ensure that the best available data are used to analyse these issues, particularly as other observers will try to push their preferred agendas and solutions. Overall, it seems unlikely that the household sector would spontaneously begin to repair their balance sheets and bring about a slowing in growth. But if a macroeconomic downturn occurs at a vulnerable moment, households' responses could exacerbate it.

The structure of this paper follows the above discussion. The next section describes the common factors and global trends affecting housing and housing finance, drawing heavily from BIS (2006). Section III then outlines some of the national and institutional details that can affect outcomes in particular countries. The policy questions and conclusions are discussed in Section IV.

II. Global Trends

II.A. Disinflation, deregulation and financial innovation

The most important common factor driving housing developments internationally has been the wave of deregulation and product innovation taking place in financial sectors in most countries. This has reduced interest margins on housing loans, lowering real interest rates paid by mortgage borrowers. Greater competition and product innovation has also encouraged lenders to make finance available to a wider range of potential borrowers than before. At the same time, declines in inflation in a number of countries over the past decade and a half have lowered nominal interest rates.

A BIS working group on housing finance recently drew some of this evidence together (BIS 2006).¹ The main theme of the findings of that group was that globalisation of financial markets, and particularly innovations in funding and risk management, had resulted in a substantial expansion in the supply of mortgage loans. Table 1 summarises some of the major developments across countries.

Table 1: Recent Developments in Housing Finance

Country	Change	Result
Australia	Flexible mortgages with variable repayments; home equity lines of credit; redraw and offset accounts	Flexibility of payments; increased capacity to pay and provides tax-effective precautionary saving
	Split-purpose loans	Tax advantages for owners of investment property
	Low-documentation loans	Finance accessible to self-employed and others unable to document their income
New Zealand	Increased competition; expansion in fixed-rate loans	Reduction in interest margins; increased capacity to pay
France	Variable payment mortgages	Flexibility of payments
Germany	Consolidation of mortgage bond legislation	Possible expansion in funding for borrowers with enough equity
Netherlands	Savings/equity loans (endowment mortgages)	Accumulation of assets with potentially higher post-tax return than (deductible) mortgage interest rate; conveys tax advantages.
Sweden	Limited; ECB policy rate tracker	Little change; some loans less linked to domestic monetary policy
Switzerland	Little change in already diverse range of products	
UK	Flexible mortgages; offset accounts	Flexibility of payments; increased capacity to pay
US	Interest-only loans; option adjustable-rate loans; negative amortization loans	Reduces initial repayment burden of larger mortgages (but risk of sudden increases); increases capacity to pay

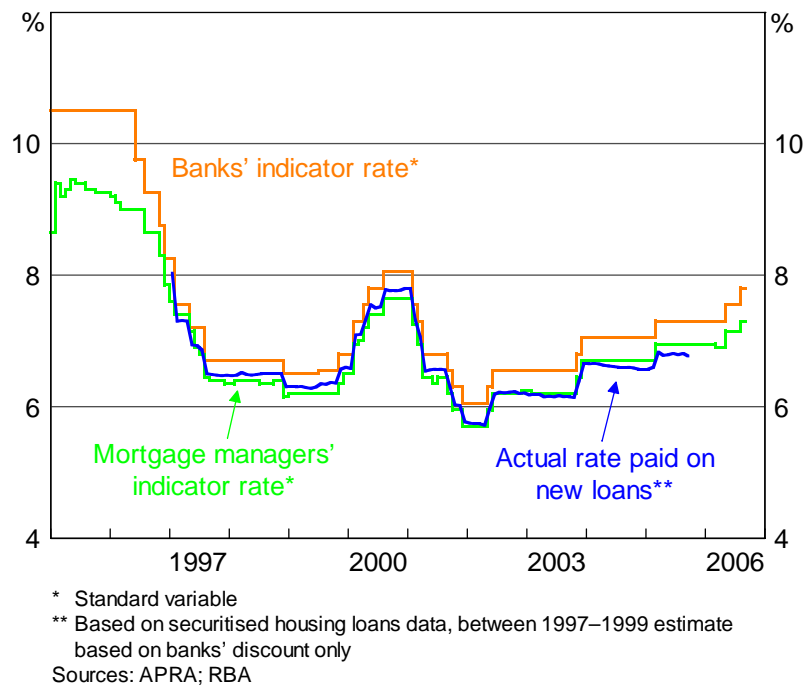
Source: adapted from BIS (2006) and national sources.

As an illustration of the role of increased competition in lowering mortgage interest rates, Figure 1 shows the evolving difference between rates advertised by Australian lenders, and the rates that borrowers actually pay. So-called mortgage managers entered the market in the mid 1990s, funded via wholesale markets and securitisation. As shown in the chart, they were initially offering rates that were well below the standard variable interest rate advertised by the major Australian banks. The banks were forced to respond to this competition, and margins on mortgage rates relative to the cash rate narrowed considerably over this period. Since then the advertised rates

¹ For more details on the housing finance systems of the individual countries represented on the working group, see the supplementary material posted with BIS (2006), at <http://www.bis.org/publ/cgfs26cbpapers.htm>.

of the two classes of lender have shown a reasonably stable spread, but the prevalence of discounting from these rates seems to have increased. Data on the average rate new borrowers actually pay are only available with a lag, but suggest that this rate is now below the average advertised rates of all major lenders. Lower mortgage interest margins increase borrowers' capacity to pay at any given level of the policy interest rate, and at the same time make mortgage borrowing accessible to a wider range of households, holding housing prices constant.

Figure 1: Housing Interest Rates in Australia



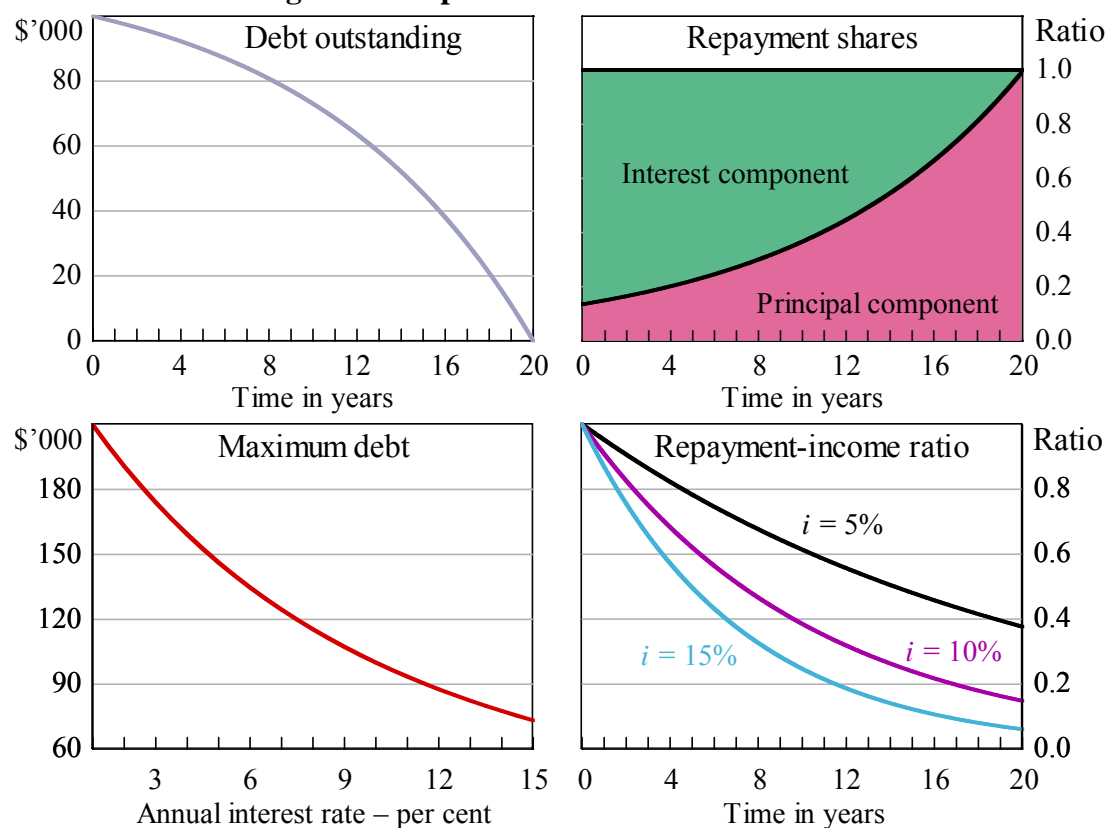
II.B. Mortgage tilt and disinflation

An important part of this increased capacity to pay reflects nominal developments, not just real ones such as the squeezing of interest margins on mortgage loans. It is well known that lending markets involve information asymmetries, so lenders don't know exactly who the good credit risks are. One way lenders traditionally dealt with this is that they imposed lending limits based on repayment ratios. That is, they determined how much they would lend to a particular borrower by working out the ratio of the initial required repayment to the borrower's income. The ratio was chosen to ensure the repayment was a manageable obligation for a well-intentioned borrower. The nominal interest rate is the important determinant of the size of the repayment, not the real interest rate.

One consequence of this practice is that a substantial disinflation increases borrowers' capacity to pay by reducing nominal rates even when real rates remain constant. This seems to have been an important driver of the increased average sizes of new mortgages and higher housing prices in a number of countries. Australia and New Zealand were particularly affected by this process given the extent of the reduction in inflation that occurred in these two countries in the 1980s and 1990s.

Figure 2 shows the effect of this on the maximum loan size available to a potential borrower. The top two panels present the standard characteristics of a fixed-term amortising (credit-foncier) loan: the amount outstanding declines at an increasing rate, as the interest component of the constant total repayment falls and the share that goes to pay off the principal can therefore rise.

Figure 2: Properties of Credit-foncier Loans



Source: RBA

Reproduced from Ellis (2006).

The bottom two panels of Figure 2 show the consequences of mortgage tilt. The line in the left-hand panel traces out the loan sizes that generate the same repayment as for a loan of \$100 000 at 10 per cent interest per annum, paid monthly over 20 years. In other words, if the borrower could afford a loan of \$100 000 when the interest rate was 10 per cent, she could afford to service a loan of nearly \$160 000 if rates were to fall to 4 per cent. This relationship is slightly non-linear but less than proportionate to the change in the interest rate. In other words, a fall in rates from 6 per cent to 5 per cent makes more difference than one from 10 per cent to 9 per cent, but halving the interest rate less than doubles the maximum loan size.

This effect also means that the higher are nominal interest rates, the more front-loaded is the repayment burden. This is shown in the lower right-hand panel of Figure 2: if nominal income growth is lower, the repayment-income ratio diminishes more gradually. It is not clear if households fully adjust their decisions to this fact after a disinflation. It may take time for them to recognise that the burden of a given repayment stays high for longer when inflation and thus nominal income growth is low (see Stevens 1997 for more discussion of this point).

The net result of this property of amortising loans is that as inflation falls, aggregate debt-income ratios rise. This occurs partly because capacity to pay has surged, and partly because the ratio of remaining debt to income falls more slowly over the life of each individual loan. Earlier Bank work (RBA 2003a) showed the effect of changes in nominal rates and income growth on the equilibrium aggregate debt-income ratio for the whole household sector, given various assumptions; Ellis (2005, 2006) presented an analytical expression for the same ratio.

II.C. Supply of housing is inherently sticky

The combination of disinflation, deregulation and financial innovation can generate a substantial boost to housing demand. For example the data presented in Figure 2 showed that a fall in inflation and interest margins similar to that experienced in Australia over the 1990s could increase individual homebuyers' capacity to pay by as much as 60 per cent. While not everyone will increase their borrowings immediately, both first-home buyers and existing owners will avail themselves of their greater borrowing capacity over time.² Thus demand for housing in dollar terms could increase by this order of magnitude within a few years.

It seems reasonable at this point to ask why households would not instead only increase their mortgage by a fraction of the expansion in their capacity to pay, and use the cost savings from their lower mortgage repayment to purchase other goods and services. One reason might be that households have preferences that are approximately homothetic, meaning that they maintain their expenditure shares constant as relative prices shift. In the context of housing, they would optimally maintain their mortgage repayments (flow of expenditure) constant as a fraction of income when interest rates changed, and expand their borrowings accordingly. Another reason is that dwellings are highly heterogeneous and they are sold sequentially rather than all trading simultaneously. As such, the market has characteristics of an auction for differentiated goods, even where properties are actually sold by private treaty. Households will therefore have an incentive to bid up to their true valuation. The borrowing limit is a form of credit constraint, so households will still bid up to the maximum they are allowed to borrow if the constraint is still binding and their true valuation exceeds this amount.

Supply of housing is inherently sticky in the face of a surge in demand of this size. The increase in demand is for the whole housing stock, because it affects (almost) the whole household sector. The available supply of housing is the existing stock, which is fixed, plus whatever building and renovating work is done over a given period. So the only increment to the supply is the flow of new dwellings and renovations of existing dwellings, which represents just a few percentage points of the size of the stock (Table 2).³ Even the most flexible and least regulated construction sector would struggle to lift its output from something equal to a few percentage points of the dwelling stock to accommodate a surge in demand of 50 per cent or more.

² Some older households that own their homes outright are probably less affected by this change in incentives, but most existing owners have the option to refinance or renovate even if they do not move.

³ These figures exclude depreciation and demolitions, so the net new supply of housing services is even smaller relative to the stock than is shown in Table 2.

It is therefore inevitable that housing prices would rise in the face of such a surge in demand. Part of this would take the form of higher building costs as renovation work increases, and part would reflect a higher average quality of dwelling as the stock gets renovated. But much of it would feed through to the price of existing, unrenovated dwellings, and implicitly the price of land. Transactions in the market should be expected to rise, as households try to express their increased demand for housing services by moving to a more desirable location.

Table 2: Stock and Flow Supply of Housing
Per cent to nominal GDP

Country	Value of Dwelling Stock		Dwelling Investment	
	1990	2005	1990	2005
Australia	190	301	5.1	6.6
New Zealand	172	328	4.8	6.7
United States	113	156	3.9	6.2

Sources: ABS, BEA, Federal Reserve, RBA, RBNZ, Statistics New Zealand, author's calculations

Comparatively little of the increased supply would take the form of additional new dwellings. Household formation rates may well increase in the face of an increase in the capacity to pay, but this would be a small effect compared with a change in the demand for housing services by existing households.⁴ This demonstrates the importance of distinguishing between the number of dwellings and the average quality of those dwellings, when trying to disentangle supply of and demand for housing. Adding a large number of extra houses of a given quality does little to meet the demand of existing households for a higher-quality home than they already have.

II.D. Result: higher housing prices in equilibrium

The increase in the relative price of housing that occurs as a result of such an increase in demand is in large part an equilibrium phenomenon. The average quality of housing will rise over time and absorb some of the increase in demand, but this should be expected to take a very long time. Even once this process has worked through, median and average house prices will be higher because average quality has risen.⁵

Both sides of the household balance sheet will expand relative to income as a result of this transition. Assuming households own most of the dwelling stock, either as owner-occupiers or landlords, their holdings of housing assets will increase as prices rise. The amount of debt funding should also be expected to increase relative to income in order to fund this more expensive housing, even if the gearing of these housing assets does not rise much. This certainly seems to have been the experience in Australia, as

⁴ Increased household formation from an existing population may actually reduce average demand for housing services a little, since it would reduce the average number of persons per household.

⁵ The desire for higher housing services and resulting higher average quality of dwellings will also be picked up by most repeat-sales indices as higher prices, because renovation effects cannot be fully adjusted for. Available data can adjust for major renovations such as the addition of rooms to a dwelling, but it is much harder to capture the addition to housing services from the installation of higher-quality fittings, additional floor space within a room, better heating and cooling equipment and so on.

well as in a number of other countries. Housing prices have risen much faster than consumer prices in many countries over the past decade (Figure 3), and ratios of debt to income have also increased (Figure 4; see also DeBelle 2004).

Figure 3: Real Housing Prices

Index, 1990=100

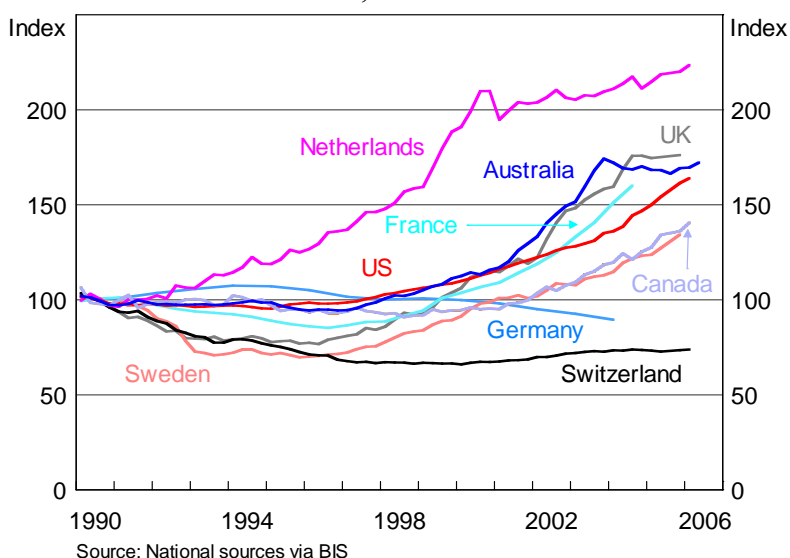
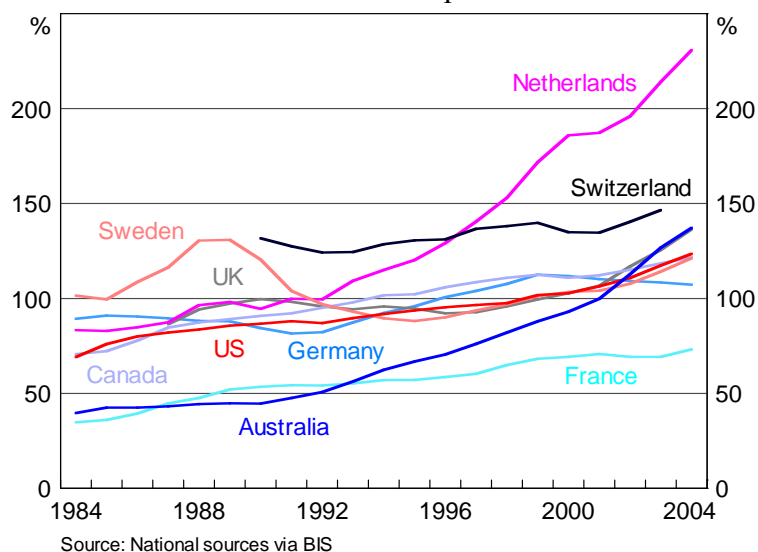


Figure 4: Household Debt

Per cent to household disposable income



However, the details of the transition can vary a lot between countries. The speed and duration of booms can differ, as can the aftermath – that is, whether the boom fizzles or busts. Some of these booms (UK in the late 1980s, Netherlands in the late 1990s, US and arguably Spain in the early 2000s) have been associated with significant increases in the owner-occupation rate. Other booms have tended to squeeze out first-home buyers instead and even reduced ownership rates a little; the recent booms in Australia and the UK seem to be examples of this. Some booms seem to have involved little speculative frenzy, while others showed signs of being at least partly

driven by investors' expectations of future capital gains. These differences probably reflect the myriad of national differences that affect housing markets. The next section discusses these differences in detail, along with their probable effects on the expansion in housing demand seen across many countries over the past decade or so.

III. National Specifics

III.A. Tax system

Housing is both an asset and a source of housing services (imputed income), and it can be owned either by the occupier or a landlord. Therefore the tax system can affect behaviour in the housing market in multiple ways and at multiple points in the life-cycle of ownership. Some relevant features are summarised in Table 3.

One set of taxes can affect a household's decision of whether and when to transact in the housing market; that is, how often they buy or sell property. For example, a transaction tax (also known as stamp duty) affects turnover directly by fixing a wedge between prices paid by buyers and returns received by sellers. This limits buyers' capacity to pay, by increasing the 'deposit gap' between feasible borrowings and the total cost of the dwelling (RBA 2003*b*). It also limits the incentive to turn properties over frequently, reducing the extent to which an upswing in housing prices can attract speculative demand aimed at short-term capital gains.⁶

Capital gains taxes (CGT) with exemptions or concessions for assets held for longer holding periods may also reduce speculative demand. For example, the half-marginal rate paid on capital gains in Australia refers to assets held for at least a year; assets held for less than this period attract CGT at the full marginal rate. In France and Germany the required holding periods to obtain concessional taxation of capital gains are considerably longer, having been extended from two years to ten years in Germany in 1998 (Scanlon and Whitehead 2004).

More generally, capital gains taxes influence the incentive to invest in residential property and other gains-producing assets such as equities, relative to assets that provide an income flow alone. This is particularly pertinent given that purchase of real estate is often highly geared, as in most jurisdictions interest payments for mortgages on rental properties can be written off as an expense against tax. The tax regime in Australia is usually considered to be among the most generous towards individual landlords, offering concessional taxation of capital gains relative to income flows, and the ability to negatively gear expenses against other income, including non-cash depreciation expenses. This has been previously identified as a factor encouraging small-investor participation in the housing market in Australia, particularly in an environment of rising prices (RBA 2003*b*; BIS 2006). On the other hand, some studies have argued that certain segments of Australian landlords – mainly those renting to low-income households – face higher effective tax rates than

⁶ Transaction taxes or stamp duties apply to property sales in most of the countries listed in Table 3, but the rates usually do not have simple relationships to sale price. Real estate agents' fees and other administrative costs can reinforce the effects of transaction taxes, together adding as much as 10–15 per cent to the purchase price in some European jurisdictions (BIS 2006).

landlords in the UK, even though the UK tax system does not permit negative gearing (Wood and Kemp 2003).

Table 3: Features of Taxation Systems Relevant to Housing Markets

Country	Mortgage deductibility		Capital gains tax		Land/property tax		Negative gearing	Depreciation
	Owner	Investor	Owner	Investor	Owner	Investor	Investor	Investor
Australia	No	Yes	No	½ rate ^(b)	Limited	Yes	Yes	Yes ^(a)
NZ	No	Yes	No	No	Limited	Limited	Yes	Yes
Canada	No	Yes	No	½ rate ^(b)	Yes	Yes	Yes ^(c)	Yes
France	No	Yes	No	No ^(d)	Limited	Limited	Limited ^(e)	Yes
Germany	No	No	No ^(d)	No ^(d)	Limited	Limited	Yes	Yes
Netherlands ^(f)	Yes	n.a.	n.a.	n.a.	Yes	Yes	n.a.	No
Sweden	Yes	Yes	Limited	Limited	Yes	Yes	Yes	No
Switzerland ^(g)	Yes	Yes	Yes	Yes	Yes	Yes	No	Outlays
US	Yes	Yes	Limited	Yes	Yes	Yes	Limited ^(h)	Yes
UK	No	Yes	No	Yes	Limited	Yes	No	No

Notes: Under Capital gains tax, “Limited” means homeowners may defer payment provided the proceeds of sale are reinvested in housing. Under Land/property tax, “Limited” refers to property owner charges along the lines of council rates, which are hypothecated to local services and need not move proportionately with property values. (a) For buildings constructed after 1985. (b) Capital gains tax is levied in Australia and Canada at half the taxpayer’s marginal rate, but in Canada gains resulting from changes in the cost base due to depreciation are levied at the full rate. (c) Only cash expenses, not depreciation, can be negatively geared in Canada. (d) Provided property owned for at least fifteen years (France) or ten years (Germany). (e) Negative gearing allowed up to a set limit and interest costs may not exceed gross rent. (f) The Netherlands levies a tax on net wealth using an assumed rate of return, so negative gearing is not possible. (g) Swiss homeowners pay tax on imputed rental income, net of interest and renovation costs. (h) Rental property expenses cannot be deducted against unrelated labour income in the US, which effectively limits negative gearing to professional property investors and developers.

Sources: adapted from Ellis and Andrews (2001), BIS (2006), RBA (2003b) and Scanlon and Whitehead (2004) with some updating from national sources.

A second set of taxation arrangements can influence the incentives around the funding of home purchases. Mortgage interest deductibility affects capacity to pay and incentives to pay debt down. This in turn affects incentives to take mortgages with fixed versus variable interest rates. When interest payments are not deductible, mortgage borrowers are effectively paying their mortgage out of post-tax income. This implies that the post-tax return to paying down the mortgage will generally greatly exceed the post-tax return on investing in financial assets instead. Borrowers will therefore have a powerful incentive to pay down the mortgage early if possible. Such an incentive encourages the use of variable-rate mortgages, which are less likely to involve prepayment penalties.

Specific tax concessions can influence the structure of ownership of the dwelling stock. For example, real estate investment trusts (REITs) in the US qualify for tax-free status provided they distribute most of their earnings to shareholders and fulfil certain other conditions. This increases the incentive for at least some of the private rental stock to be owned and managed by institutions rather than individual landlords. In countries such as France and Germany, there are concessions designed to encourage

the construction of rental housing, particularly in the market segment serving low-income households (see Scanlon and Whitehead 2004 for more details).

Despite the clear incentives for certain patterns of funding and financing embedded in tax systems, it is difficult to show a simple mapping between features of taxation systems and macro outcomes such as debt-income and housing price-income ratios. This is because the tax regime interacts with other aspects of the housing–finance system in sometimes complex ways. Some of these other features are discussed in the following subsections.

III.B. Structure of the financial system

Households in different countries access mortgage finance at widely varying terms. As summarised in Table 4, loan terms can vary from 15 to 45 years. The maximum allowable loan-to-valuation (LTV) ratio also differs substantially, as does the typical LTV actually borrowed.⁷ Variable-rate loans predominate in some jurisdictions, while in others fixed-rate loans are more important. The term of the fixed rate can differ both from the term over which the mortgage loan is amortised and from the practice in other countries.

Within this dispersion in practices, a few common trends emerge. Countries where mortgage interest payments are not tax-deductible for owner-occupiers tend to have systems where the predominant mortgage type is either a variable-rate loan or loans with interest rates that are fixed for a relatively short period compared with the contract term. This is partly an endogenous response to the tax incentive described above, which creates an option value on the ability to make prepayments if possible.⁸ There is also some tendency for LTVs to be lower in these countries than in those where deductibility is possible, as can be seen from a comparison of Australia and the UK with the Netherlands and the US. This also seems to be the conclusion drawn from the experience of the UK, where owner-occupied mortgage interest used to be deductible, but this concession was gradually removed over the 1990s (Hendershott, Pryce and White 2002).

Mortgage deductibility is also implicated in the tendency of borrowers in some countries to adopt products like endowment mortgages; these are an interest-only mortgage attached to an account that works like a managed fund. The idea is that the returns on the accumulated assets are more than sufficient to repay the loan principal at the end of the loan term. This can only work if the post-tax return exceeds the interest rate paid on the mortgage debt that would otherwise have been paid down, which is only likely if mortgage interest is deductible. It is therefore no surprise that this type of instrument has lost popularity in the UK, become more prevalent in the Netherlands, and has essentially never been adopted in Australia.

⁷ The typical characteristics of loans offered in other markets vary even more widely than for the peer group shown here. Loan terms are generally shorter in emerging markets (e.g. 10–15 years in Mexico and three years in Korea) and have more stringent down payment requirements, but these features are generally converging towards those seen in the major economies. A similar pattern of historical development was evident in mortgage markets in industrialised countries (Green and Wachter 2005).

⁸ This is not a universal trend, however; in some countries not shown in the table, such as Spain, prepayment penalties also apply to variable-rate loans (BIS 2006).

Table 4: Contract and funding features in selected mortgage systems

Country	Typical loan term	Estimated average LTV	Variable-rate loans	Prepayment penalties	Securitisation
	Years	New loans (per cent)	Per cent of total		
Australia	25	60–70	~90	For fixed-rate	Extensive
NZ	25–30	80–85	16	For fixed-rate	Very limited
Canada	25	75–95	29		Extensive
France	15–20	78	20	Limited by statute	Limited
Germany	20–30	80–100	30	Only fixed-rate (by law)	Some
Netherlands	30	87 (max 125)	26		Extensive
Sweden	30–45	80–95	98	For fixed-rate	Limited
Switzerland	15–20	80	33		Limited
UK	25	70	95	For fixed-rate	Some
US	30	~85	25	None	Extensive

Note: Variable-rate includes loans fixed for up to two years for most countries shown except New Zealand, for which only fully floating-rate mortgages are included.

Source: New Zealand – RBNZ estimates; other countries – BIS (2006), Green and Wachter (2005) with some updating from national sources; see notes to Table 3 in BIS (2006) for more detail.

In addition to tax systems, differences in other government regulations and interventions have influenced mortgage markets, particularly the development of funding markets. For example, in many jurisdictions, legislative and regulatory support was needed before securitisation of mortgage loans could occur. In some countries, such as the UK and some in continental Europe, mortgage-backed securities (MBS) or mortgage bonds (which have similar properties to MBS) have required enabling legislation setting out the rights and responsibilities of issuers and bondholders. In others, such as Canada and the US, government support for securitisation markets has been crucial to their development. The Canadian Mortgage and Housing Corporation is a government-owned agency responsible for insuring mortgages. In the US, the so-called government-sponsored enterprises (GSEs) Fannie Mae and Freddie Mac were founded to support mortgage markets and the expansion of homeownership. In both countries, these publicly supported agencies have been instrumental in supporting the MBS market by setting standards for underwriting and, in the case of the US GSEs, holding significant MBS on their balance sheets.⁹

Many other national differences in outcomes have simply reflected the endogenous developments of products and conventions in the light of historical practice and competition between lenders. The past decade or so has seen substantial innovation in the range of mortgage products available, and in the ways these products are funded,

⁹ Green and Wachter (2005) provides a comprehensive overview of the historical development of the US mortgage market and its peculiar features; see Courchane and Giles (2002) for a comparison of the historical development of the US and Canadian mortgage markets and associated government interventions.

as was already described in Section II.A above. These changes have tended to result in more households having access to more finance than had been the case previously.

In particular, there has been a tendency towards allowing higher loan to valuation ratios, so that households do not need to make as large a down payment as in the past. This has been an important development, since as disinflation and deregulation allowed households to service larger debts, the down payment required to do so would also have increased substantially relative to income. If this down payment constraint had not eased at the same time as the repayment constraint eased, the effect on housing prices and household sector indebtedness would have been reduced substantially (Ellis 2005, 2006).

The institutional framework in the financial sector has influenced the extent of mortgage product innovation in individual countries. For example, the role of technological innovation in driving product innovation has been most apparent in the United States, where the dominant presence of the GSEs and the widespread practice of mortgage originators securitising their loan books have encouraged development of data-driven credit scoring and automated underwriting practices (BIS 2006). These innovations have occurred to a much lesser extent in countries where lenders tend to keep loans on their own balance sheets and therefore face weaker incentives to package loans into standardised types with consistent degrees of credit risk.

Changes in the structure of the financial system have been important drivers of the evolution of the mortgage markets of particular countries. For example, as mentioned in Section II, the entry of a new class of lender in Australia in the 1990s resulted in lower interest rate margins, new products such as low-documentation loans, and innovations in funding such as the wider use of MBS. Similarly, the entry of banks into the UK mortgage market in the 1980s and 1990s increased competition in a market that had previously been dominated by building societies. The demutualisation of several major building societies may also have contributed to this increased degree of competition. By contrast, one reason why there has been less product innovation in some of the major European mortgage markets could be that there has as yet been little cross-border competition or examples of lenders breaking into new markets in neighbouring countries (BIS 2006).

III.C. Legal system and housing policy

Government policy affects housing markets beyond the measures specifically relating to the financial system. Government interventions especially influence the structure of ownership of the housing stock – not only the owner-occupation rate, but who owns the rental properties and the types of housing they own. This can affect housing prices and household balance sheets if different types of owners have different motivations and borrowing capacity. Table 5 summarises some of the relevant features for a selection of countries.

One of the most important differences across countries is the importance of the social housing sector, including public housing owned directly by government and more broadly defined social housing owned and managed by non-profit organisations, charities and enterprises associated with municipalities. Social housing removes an entire segment of the dwelling stock from ownership by the household sector, with

obvious implications for the size and composition of balance sheets and the sector's sensitivity to changes in housing prices. In countries with large social housing sectors such as Sweden and the Netherlands, many of its tenants include middle-income households that might have been owner-occupiers in other jurisdictions. By contrast, in countries with low shares of social housing such as Australia and the US, this housing type tends to be highly targeted to low-income and disadvantaged households, who have lower propensities to own their own homes.

Table 5: Legal and Institutional Features of Housing–Finance Systems

Country	Owner-occupation rate (per cent)		Social housing (per cent)	Rent control	Institutional landlords (private or social)
	1980	2002–2004	Latest		
Australia	71	72	5	No	Almost absent
NZ	73	68	6	No	Almost absent
Canada	62	66	6	Some provinces	Some REITs
France	47	55	19	Cost-based	1.2% non-social
Germany	41	42	6	Continuing tenants	~15% total stock
Netherlands	42	54	35	Yes	Social housing
Sweden	58	61	21	Yes	Mainly municipal
Switzerland	33	35	2	Cost-based	~1/3 rental stock
US	58	69	3	Some	REITs
UK	65	68	20	Social only	Social housing

Sources: Adapted from BIS (2006), Scanlon and Whitehead (2004) and national sources. Social housing shares are for 1997 (Sweden; municipal housing), 1998 (Netherlands), 1999 (Australia), 2000 (Switzerland), 2001 (Canada, Germany), 2002 (France, UK, US), 2004 (New Zealand). See also European Parliament (1996).

Government regulation of the landlord–tenant relationship, including imposition of rent controls and regulating the terms under which tenants may be evicted, clearly influences the supply of private-sector rented housing. Rent controls reduce their responsiveness to current market conditions and generally reduce rental returns. For example, deregulation of rents in the UK and introduction of Assured Shorthold tenancy encouraged the expansion of the rental market in that country. Figures from 1998 showed that net rental returns on properties that were still covered by the old arrangements were less than two-thirds of the returns available on properties under Assured Shorthold tenancies (Crook and Kemp 2002). Similarly, restrictions on landlords' ability to evict bad tenants or sell the property when they want will increase the riskiness of investing in rental property. This raises required returns and generally constrains the supply of rental properties.

Housing policy can also affect incentives for different parts of the private sector to own the rental properties, and the type of housing that they own. Specific incentives or requirements to invest in rental housing for low-income households have been important throughout Europe and North America (Scanlon and Whitehead 2004); supply of low-cost housing is sometimes a condition of planning permission for residential developments. On the other side of the market, encouragement of home ownership has been an explicit policy of successive US governments for many

decades. This was the motivation for the creation of the GSEs, as well as for many smaller-scale projects such as subsidisation of construction of properties for the owner-occupied market; there is evidence that the latter have boosted both ownership rates and housing values in neighbouring areas (Ellen *et al* 2001).

Another feature of the legal system that can influence the pattern of housing ownership is the way title to property is allocated and divided. In particular, small-scale ownership of rental property by individual landlords is more likely where individual apartments in a block can have different owners; this is known as condominium structure in most jurisdictions, or strata title in Australia.¹⁰ Even where ownership of condominiums is possible, other aspects of housing policy and the legal system can discourage small-scale landlords. In Canada, the authorities' housing policies are directed towards ensuring sufficient supply of so-called 'conforming' rental stock – that is, dedicated blocks of apartments that are all rented out. Other types of rental stock such as individual condominiums and detached houses are termed 'non-conforming' and are discouraged, partly because of concerns that these dwelling might be withdrawn from the rental stock at a later date (Clayton Research 1998; Crook 1998).

These policies can have unintended consequences, both in the housing market directly and in terms of macroeconomic outcomes. Rent controls and other measures designed to support tenants can sometimes work to their disadvantage, as they raise required rental returns to investors and restrict supply. For example, the focus on 'conforming' rental property in Canada seems to have resulted in relatively high costs of renting compared with owning and very low rental vacancy rates (Traclet 2005), but very little new supply of apartments (Crook 1998).

III.D. Geographical features

The physical characteristics of a country can affect the outcome of an increase in housing demand brought about by greater availability of finance. Because most people in industrialised countries live in urban areas, housing outcomes can be affected by the characteristics of the cities themselves, including their physical size and density, and perhaps also by the structure of the relationships between cities.

Traditional urban economics has antecedents in the von Thünen model of rural land rent and crop distribution. This literature assumes cities have a single employment centre, to which residents commute each day from their homes further out (Mills 1967; Muth 1969). In this model, living at the fringe of the city is generally less desirable than in the centre because commuting times are greater, so housing prices are lower there. This pattern is observable in the data for most countries;¹¹ Table 6

¹⁰ Even if some sort of condominium structure does not exist, as was the case the UK until 2004, it can still be possible to have separate ownership of apartments, but there must a residual owner of all the land under the apartment block.

¹¹ But not all countries: in the US, for example, suburban locations have often been preferred because they allowed higher-income households to avoid city taxes and inner-city schools. When US cities have reverted to the more usual situation of inner-city properties being more expensive, it has sometimes been cause for comment (McMillan 2002). There are also some non-US cases of inversion of the land-price gradient, that is, where outer areas are more expensive than inner areas, such as Haifa in Israel (Plaut and Plaut 2003). Some recent research has focused on the development of town centres at the fringe of existing cities (e.g. Garreau 1992; Glaeser and Kahn 2001; Lucas and Rossi-Hansberg 2002).

shows the ratio of inner-ring to outer-ring prices for the major cities in Australia. Although there was some tendency for inner-suburban property to become relatively more expensive during the turn-of-the-century price upswing, overall these ratios seem fairly stable within cities. There is a slight tendency for the difference to be greater in the larger cities, although Melbourne's price differential would seem out of line with that relationship.¹²

Table 6: Australian Metropolitan Median House Prices

Ratio of inner-suburban to outer-suburban median prices; December quarter data

City	1998	2002	2005
Sydney	2.19	2.16	2.01
Melbourne	1.72	1.82	1.79
Brisbane	1.65	1.68	1.89
Adelaide	1.52	1.99	1.85
Perth	1.70	1.97	1.95

Source: Real Estate Institute of Australia, author's calculations

When cities are more sprawled, it is harder to provide efficient transportation over the whole city, so the costs of traffic congestion become relatively greater at the fringe than if the city had been more compact. This would suggest that the price gradient from inner areas to outer areas should be steeper for more sprawled cities with poor transport options.¹³ The effect of this on average city-wide prices is ambiguous: the steeper gradient could imply either cheaper housing at the fringe relative to the fringes of other cities, or more expensive inner-city housing. Most evidence from the US suggests that average housing prices are lower in more sprawled cities; Figure 5 shows this for the canonical urban sprawl of Atlanta. However, sprawled cities generally differ from denser cities in other ways as well. The denser cities are usually older, larger and more likely to be constrained from expansion by coasts and other natural barriers (Fulton *et al* 2001). As such, at least some of the higher density is probably an endogenous response to the costs of commuting and congestion in large cities, while some of it can be accounted for by exogenous geographic factors.

On the other hand, sprawl usually occurs when land availability is greater, so plot and dwelling sizes can be larger at the fringe than would be possible in more compact cities. Realised prices of outer-suburban housing might therefore be quite high in sprawled cities, but a regression controlling for housing quality would still identify a steep price gradient. Table 7 shows that countries where overall population densities are lower and cities are more sprawled, such as Australia and the US, generally have larger dwellings with more floor space than countries with higher population densities and more compact cities.

¹² This might be an artefact of the REIA's definitions of inner and outer suburbs.

¹³ Consistent with this, improved transport to the outlying areas was one of the suggested causes of the land-price gradient inversion in Haifa cited by Plaut and Plaut (2003).

Figure 5: US House Prices by City

Level (\$US'000), 2003 versus growth since 2003 (Per cent)

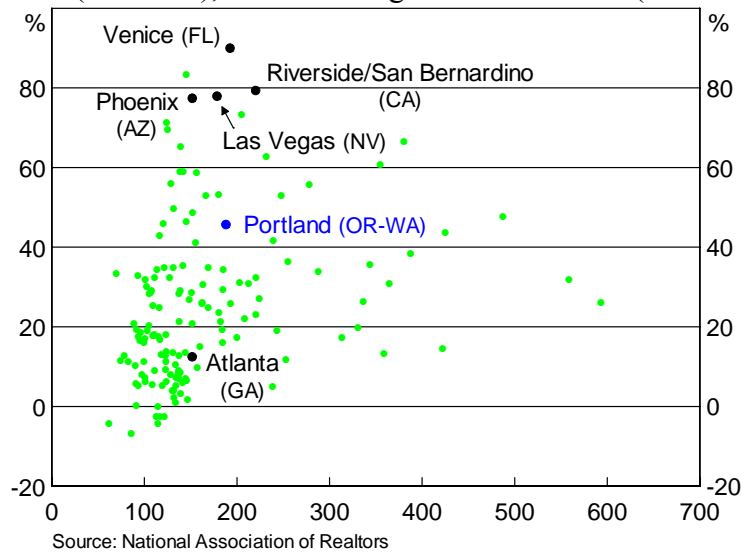


Table 7: Selected Demographic and Urban Housing Stock Characteristics

	Total population density (2001)	Average size of existing dwellings	Houses	Detached houses
	Persons/km ²	m ²	Per cent of housing stock	
Australia	2.5	131.8 ^(a)	85.6	76.5
New Zealand	14.3	132.0 ^(b)	83.0	73.0 ^(b)
Canada	3.3	114.0	66.4	55.9
France	107.1	88.0	56.2	n.a.
Germany ^(c)	230.5	86.7	45.6	31.0
UK	243.8	84.0	80.7 ^(d)	25.6
US	30.8	156.5	66.7	60.6

Sources: Reproduced from Ellis and Andrews (2001), Berger-Thomson and Ellis (2004) and RBA (2003b)

Notes: (a) Excludes public housing; (b) Detached house and floor space data refer to Auckland only; (c) German housing stock data refer to West Germany only; (d) House data refer to England only.

Another aspect of the role of urban density and the type of dwellings in the housing stock for national outcomes is that certain dwelling types are more conducive to institutional versus individual ownership of the private rental stock. Institutions are more likely to seek to reap the economies of scale in property management by owning whole apartment blocks or housing estates. In countries such as Australia and New Zealand where the dwelling stock is disproportionately comprised of detached houses, these scale economies are not available, and individual households are more likely to be landlords than is the case in some other countries.

Whatever the effect of city density on housing prices in the long run, more sprawled cities probably show less tendency towards short-run price surges in response to increased demand for dwelling *numbers*, for example when population growth

increases. This is because the more sprawled a city is, the greater is the proportion of detached single-family homes in the housing stock, as opposed to apartments. The logistics of detached-house construction are much simpler than for a multi-storey apartment block, which requires deeper foundations, lifts and other more complex engineering elements. So although detached houses consume more land than the same number of dwellings in the form of apartments, they can usually be built more quickly. Supply will therefore be more responsive to demand for extra dwellings. This may explain why Berger-Thomson and Ellis (2004) found that the estimated supply curve for the number of dwellings in the UK is steeper than in Australia, the US or Canada, where population density is lower and detached housing is a larger share of the housing stock.

This greater responsiveness to an increase in demand for extra dwellings will make little difference in the face of a surge in demand for the entire stock of housing as described in Section II. The construction of additional properties at the fringe of a city does not do much to supply an increase in demand for average housing services per property. To the extent that the newly built properties are of the currently desired quality but existing properties are not, some households might be induced to sell their existing home and move to a newly built one. Vacancy rates in the established areas would rise as a result, with the older, lower-quality homes either renovated or demolished and replaced over time. It seems that this would result in a slower process of adjustment than simply renovating the existing dwelling stock. On the other hand, it is quicker to demolish and replace detached houses than whole apartment blocks, so the renovation process might also be quicker in more sprawled cities.

The implications for prices of a demand surge might be different if the country has one big city rather than a network of smaller cities. In general, the larger is a city's population, the more expensive is its housing. This is a well-known result from urban economics (Gabaix 1999). Large cities offer advantages in terms of the range of jobs and products available because the size of the market is larger (Fujita, Krugman and Venables 2001; Fujita and Thisse 2002). There may also be productivity spillovers from living in large or dense population centres where there are more people and firms to learn from – so-called Jacobian externalities (Jacobs 1970); Kohler and Smith (2005) present evidence that wages and housing wealth are both higher in more densely populated areas.¹⁴ In equilibrium, these advantages must be balanced by the disadvantages of living in a big city. Otherwise, the population of one city would all move to one that is more attractive in net terms. Congestion costs such as traffic jams and crime are one type of disadvantage that supports the equilibrium population distribution, but housing costs are a particularly powerful disincentive against cities becoming too large.

This implies that the distribution of population between cities has a composition effect on aggregate household balance sheets at the very least (Ellis and Andrews 2001). Moreover, if there is only one large city, the positive externalities of urban living are then less likely to be provided by alternative locations. An upswing in demand for housing in that city cannot therefore easily be siphoned off by households choosing to move to other cities where housing is cheaper.

¹⁴ See also Ciccone and Hall (1996) and Glaeser and Maré (2001).

IV. Policy Issues

Housing prices have risen substantially in many countries over the past fifteen years, both in the English-speaking world and in a number of countries in continental Europe. Related to this development, households' indebtedness (debt-income ratios) has increased substantially in most major economies. This expansion in household balance sheets has raised some concern for policymakers. Lower inflation, reduced financial regulation and ongoing competition and innovation have allowed higher debt burdens. To the extent this is an equilibrium phenomenon, it should be able to be managed safely. But even if most or all of the expansion so far has been a rational response to a new equilibrium, there is a risk that households or lenders may succumb to over-exuberance and a tendency to extrapolate past price gains into the future. On the lending side, there is evidence that financial institutions in some countries have eased lending standards at the same time as households have been able to borrow more. It is therefore important to disentangle how much of the increase in household indebtedness and gearing against housing represents a normal reaction to the easing of constraints and regulation, and how much implies an increase in lenders' risk profiles.

Even if systemic risks to the financial system have not increased, these developments have implications for policymakers' understanding of macroeconomic behaviour. There is a growing body of literature suggesting that the easing of financial constraints makes household spending more sensitive to income shocks, not less (Almeida 2000; Aoki, Proudman and Vlieghe 2002; Debelle 2004, for example). Similarly, city-level evidence from the US suggests that households respond more to income shocks when the average LTV ratio is high (Lamont and Stein 1999). It is therefore important for policymakers to have good information on how the transmission of shocks and in particular the transmission mechanism for policy might be changing.

IV.A. Need for more and different data

To assess the implications of these developments in household balance sheets for macroeconomic and financial stability, policymakers are finding that they need to expand the types of data they analyse (BIS 2006). In particular, disaggregated information about household financial position and stresses is likely to become increasingly important. This is because it is not the average household position that will experience distress in the event of a shock, but rather those households at the tails of the distribution. At this stage, the conclusions drawn from analysis of disaggregated data are fairly benign. For example, stress tests using Swedish data (BIS 2006) and analyses of disaggregated data on balance sheets of Australian households (e.g. RBA 2003*a*; Ellis, Lawson and Roberts-Thomson 2003; Kohler and Rossiter 2005) suggest that the holders of housing debt in Australia and elsewhere are those most able to afford it.

In addition, if balance sheet developments have a stronger influence on household spending than in the past, identifying turning points in housing prices will be a greater concern for macroeconomic analysis than previously. This means that the quality of housing price indicators will become increasingly important. In Australia, the RBA has put considerable resources not only into analysing the indicators that already existed, but also into encouraging data providers to improve the range and quality of

their data. Some of the outcomes of these efforts included the introduction of a new set of mix-adjusted house price indices (Prasad and Richards 2006) and a deeper understanding of repeat-sales and hedonic price indices (Hansen 2006). Also largely in response to the RBA's advocacy, many data providers shifted to reporting house prices using the date of sale as the reference period, rather than the date the transaction was reported to land titles agencies, as before. This improves the usefulness of the data because it relates the price to the point in time that the economic decision was made.

Improvement of data quality not only helps policymakers, but might also assist private decision-making as well. The increased use of data-driven risk assessments through credit scoring implies that data quality has become increasingly important for lending and underwriting decisions. For this reason, there may be positive externalities to efforts by policymakers to improve the available data.

IV.B. Old rules of thumb for balance sheets might be misleading

As has been discussed earlier in this paper, much of the expansion in borrowing has been a response to reductions in inflation, financial market deregulation and product market developments that have all allowed borrowers to manage larger debts. These are permanent changes. Ratios of balance sheet variables, such as debt and house prices, to income should therefore not be expected to revert to past historical averages, and it would be a mistake to enact policies designed to bring this about.

It would also be misleading to assume that past historical relationships within the household balance sheet ought to reassert themselves. Ratios of household debt to assets, or interest payments to income, have been much more stable over recent years than the debt-income and housing price ratios shown in Figure 3 and Figure 4 above. This is because they are not affected by the mortgage tilt effects of disinflation. But they have nonetheless increased, as households have responded to the removal of financial constraints that resulted from deregulation and increased competition.

Old rules of thumb about individual mortgages have likewise been rendered obsolete. As lenders have used technology to become more precise in ascertaining different borrowers' credit risk, the amounts they are willing to lend are no longer linked to repayment-income ratios or loan-to-valuation ratios in a simple way. Particularly in the North American markets, simple ratios have given way to credit scoring and risk-based pricing, so that loan sizes and pricing are more closely tailored to individual borrowers' circumstances. To the extent that this reduces the margin of safety for some borrowers who are now able to borrow more than the older practices would have implied, this might mean that more households are facing greater financial risks than previously. But overall, this easing of financial constraints is a reflection of their ability to repay and withstand those risks. It should therefore not be assumed that a shift away from the earlier lending practices based on rigid ratios implies that financial vulnerability has increased in any significant way.

IV.C. Extra supply at the margin would not have prevented recent price upswings

In some countries, particularly Australia and the UK, the upswing in housing prices has made it difficult for young households to achieve home ownership. At times, this has become a political issue, with various interested parties arguing that government policy has brought about an affordability crisis by preventing an expansion of supply at the fringes of cities.¹⁵ But as was argued earlier in this paper, this confounds increases in the number of dwellings demanded, and average quality of those dwellings. Extra dwellings may well be being demanded if income growth, demographic change or immigration is boosting the number of households. However, this is not the main cause of the expansion in housing demand and mortgage borrowing seen in recent years. As shown in Table 2 above, it is simply physically infeasible for new supply to expand enough to have accommodated the expansion in households' capacity to pay, without large increases in the cost of housing and land.

This is not to say that government regulation has not had a role in determining the level of house prices. As mentioned in the previous section, sprawled cities do seem to have lower house prices. However, they are not immune from price cycles (Chinloy 1996), or from the level shift in equilibrium housing prices that occurs when inflation falls and financial sectors deregulate. It seems indisputable that government regulation can increase housing prices (Glaeser and Gyourko 2002, 2003), but regulation designed to prevent sprawl is not the only kind that does so. Regulations setting high minimum standards for housing quality or block size, or preventing medium-density and apartment development – which effectively enforce sprawl – also raise prices (Schill 2002). As an illustration of this, Figure 5 above shows that Portland, Oregon, which is widely cited as a case where planning policy has been inspired by anti-sprawl 'Smart Growth' ideas, does not appear to have particularly high housing prices compared to other cities of comparable size. In addition, the cumulative price growth in the recent upswing has been much less there than for some fast-growing cities where sprawl has occurred, such as Las Vegas and Phoenix.

The debate about the role of housing supply highlights the fact that the expansion in housing prices and borrowing has meant that issues previously considered to be specific to housing policy now have implications for macroeconomic policy. Policymakers may need to become more expert in topics they previously considered outside of their portfolio, in order to evaluate claims and debates that have begun to affect their assessments of macroeconomic and financial developments.

IV.D. Rising indebtedness need not be dangerous

The most important lesson to draw from recent international experience is that a run-up in housing prices and debt need not be dangerous for the macroeconomy, and may even be desirable. As emphasised by the BIS CGFS Working Group report, the expansion in household borrowing has in many cases reflected better risk-pricing and credit scoring, implying that credit should be being allocated more efficiently than in the past. This should improve the economy's risk-bearing capacity. In addition, the product innovation summarised in Table 1 implies that households now have greater

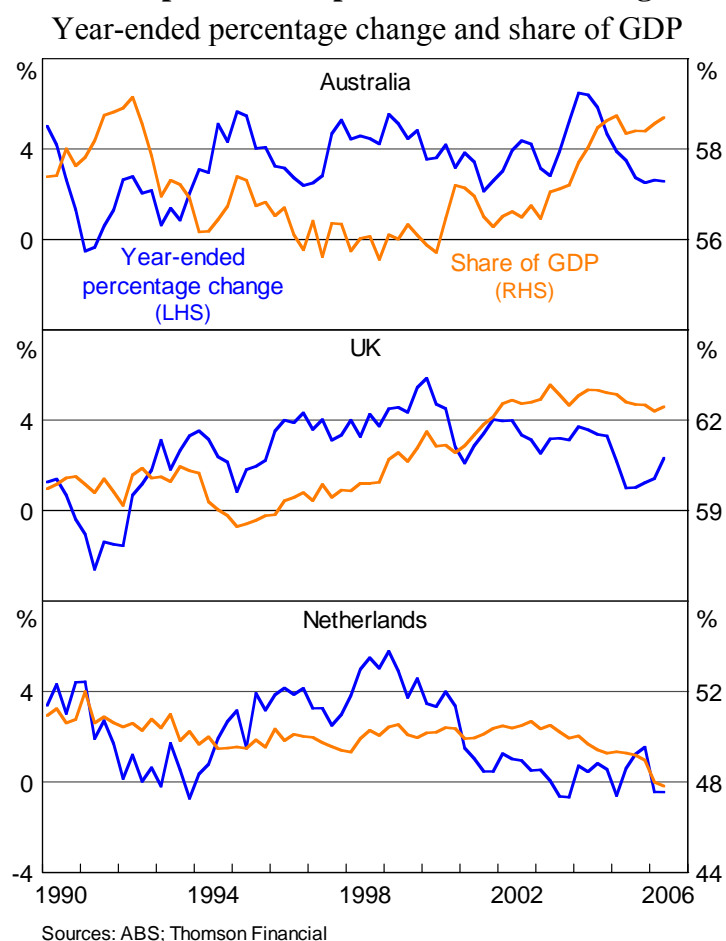
¹⁵ See, for example, some of the submissions made to the 2003 Productivity Commission Inquiry into First Home Ownership in Australia, at <<http://www.pc.gov.au/inquiry/housing/subs/sublist.html>>.

choice about the kind of mortgage they take out, which has to be welfare-improving (BIS 2006).

Housing booms do have the potential to worsen a macroeconomic slowdown when they bust. However, the experience of Australia and UK seems to suggest that, absent a simultaneous macroeconomic downturn, booms in housing price growth can subside without crashing. In Australia, nominal housing prices fell at a national level for around two years from about the end of 2003, and have increased only slowly in recent quarters. Household consumption did slow during this period, but from rates that were unsustainably strong (Figure 6). A similar picture can be seen for the UK, even though it did not benefit from the cushioning effect on incomes from a sharply rising terms of trade, as Australia has experienced.

These relatively benign outcomes point to the underlying robustness of the financial systems in most industrialised economies. Even where there was evidence of speculative demand (or panic buying), and an apparent belief in some quarters that housing prices never fall, households adapted to the turn in the market reasonably well. Although there have been a number of anecdotal reports of home buyers experiencing negative equity and large realised capital losses, it seems that most of these can be attributed to the normal idiosyncratic risk inherent in a heterogeneous product like residential housing.

Figure 6: Consumption Developments after a Housing Price Boom



In contrast, consumption slowed more sharply in the Netherlands when housing prices slowed there. However, in this case the slowdown in consumption was not caused directly by households reacting to housing prices; rather, both developments were driven by a more general macroeconomic slowdown brought about by other causes, namely the slowing in Germany and other trading partners. There seems to be little evidence that households that have rapidly expanded both sides of their balance sheet will autonomously decide to shrink it again, thereby generating a slowdown. Rather, it seems households only re-evaluate their balance sheets when they are forced to by a slowdown. While this may not be a desirable pattern of behaviour in cases where household balance sheets are in genuine need of repair, it might provide some comfort that a crash is not the inevitable outcome of a boom.

V. References

- Almeida H (2000)**, 'Financial Constraints and House Prices – An International Perspective', Leonard N Stern School of Business, New York University Finance Working Paper No FIN-00-017.
- Aoki K, J Proudman and G Vlieghe (2002)**, 'Houses as Collateral: Has the Link between House Prices and Consumption in the U.K. Changed?', Federal Reserve Bank of New York *Economic Policy Review*, 8(1), pp 163–177.
- Bank for International Settlements (2006)**, 'Housing Finance in the Global Financial Market', CGFS Paper No 26, January 2006.
- Berger-Thomson L and L Ellis (2004)**, 'Housing Construction Cycles and Interest Rates', Reserve Bank of Australia Research Discussion Paper No 2004-08.
- Chinloy P (1996)**, 'Real Estate Cycles: Theory and Empirical Evidence', *Journal of Housing Research*, 7(2), pp 173–190.
- Ciccone A and RE Hall (1996)**, 'Productivity and the Density of Economic Activity', *American Economic Review*, 86(1), pp 54–70.
- Clayton Research (1998)**, 'Economic Impact of Federal Tax Legislation on the Rental Housing Market in Canada', Report prepared for the Canadian Federation of Apartment Associations, November 1998.
- Courchane MJ and JA Giles (2002)**, 'A Comparison of US and Canadian Residential Mortgage Markets', *Property Management*, 20(5), pp 326–368.
- Crook, ADH and PA Kemp (2002)**, 'Investment Returns in the Private Rented Housing Sector', Research Report prepared for the British Property Federation, February 2002.
- Crook, ADH (1998)**, 'The Supply of Private Rented Housing in Canada', *Netherlands Journal of Housing and the Built Environment*, 13(3), pp 327–352.
- Debelle, G (2004)**, 'Macroeconomic Implications of Rising Household Debt', BIS Working Paper No 153.

- Ellen IG, MH Schill, S Susin and AE Schwartz (2001)**, ‘Building Homes, Reviving Neighborhoods: Spillovers from Subsidized Construction of Owner-Occupied Housing in New York City’, *Journal of Housing Research* 12(2), pp 185–216.
- Ellis L (2005)**, ‘Disinflation and the Dynamics of Mortgage Debt’, in *Investigating the relationship between the financial and real economy*, BIS Papers No 22, April.
- Ellis L (2006)**, ‘Disinflation and the Dynamics of Mortgage Debt’, paper presented at a seminar at the Reserve Bank of New Zealand, November 2006.
- Ellis L and D Andrews (2001)**, ‘City Sizes, Housing Costs and Wealth’, Reserve Bank of Australia Research Discussion Paper No 2001-08.
- Ellis L, J Lawson and L Roberts-Thomson (2003)**, ‘Housing Leverage in Australia’, Reserve Bank of Australia Research Discussion Paper No 2003-09.
- European Parliament (1996)**, ‘Housing Policy in the EU Member States’, European Parliament, Directorate General for Research Social Affairs Series No W14.
- Fujita M, P Krugman and A Venables (2001)**, *The Spatial Economy: Cities, Regions, and International Trade*, MIT Press, Cambridge MA.
- Fujita M and JF Thisse (2002)**, *Economics of Agglomeration: Cities, Industrial Location and Regional Growth*, Cambridge University Press, Cambridge.
- Fulton W, R Pendall, M Nguyen, and A Harrison (2001)**, ‘Who Sprawls Most? How Growth Patterns Differ Across the U.S.’ Brookings Institution Center on Urban & Metropolitan Policy Survey Series, July.
- Gabaix X (1999)**, ‘Zipf’s Law for Cities: An Explanation’, *Quarterly Journal of Economics*, 114(3), pp 739–767.
- Garreau J (1992)**, *Edge City: Life on the New Frontier*, Doubleday.
- Glaeser EL and J Gyourko (2002)**, ‘The Impact of Zoning on Housing Affordability’, Harvard Institute of Economic Research Discussion Paper No 1948.
- Glaeser EL and J Gyourko (2003)**, ‘The Impact of Building Restrictions on Housing Affordability’, Federal Reserve Bank of New York *Economic Policy Review*, 9(2), pp 21–43.
- Glaeser EL and ME Kahn (2001)**, ‘Decentralized Employment and the Transformation of the American City’, NBER Working Paper No 8117.
- Glaeser EL and DC Maré (2001)**, ‘Cities and Skills’, *Journal of Labor Economics*, 19(2), pp 316–342.
- Green RK and SM Wachter (2005)**, ‘The American Mortgage in Historical and International Context’, *Journal of Economic Perspectives*, 19(4), pp 93–114.
- Hansen J (2006)**, ‘Australian House Prices: A Comparison of Hedonic and Repeat-sales Measures’ Reserve Bank of Australia Research Discussion Paper No 2006-03.
- Hendershott PH, G Pryce and M White (2002)**, ‘Household Leverage and the Deductibility of Home Mortgage Interest: Evidence from UK House Purchasers’, NBER Working Paper No 9207.
- Jacobs, J (1970)**, *The Economy of Cities*, Vintage Press, New York.

- Kohler M and A Rossiter (2005)**, ‘Property Owners in Australia: A Snapshot’, Reserve Bank of Australia Discussion Paper 2005-03.
- Kohler M and K Smith (2005)**, ‘Housing and the Household Wealth Portfolio: The Role of Location’, Reserve Bank of Australia Discussion Paper 2005-10.
- Lamont O and JC Stein (1999)**, ‘Leverage and House-Price Dynamics in U.S. Cities’, *RAND Journal of Economics*, 30(3), pp 498–514.
- Lucas RE and E Rossi-Hansberg (2002)**, ‘On the Internal Structure of Cities’, *Econometrica*, 70(4), pp 1445–1476.
- McMillen DP (2002)**, ‘The Center Restored: Chicago’s Residential Price Gradient Reemerges’, Federal Reserve Bank of Chicago *Economic Perspectives*, 26(2), pp 2–11.
- Mills ES (1967)**, ‘An Aggregative Model of Resource Allocation in a Metropolitan Area’, *American Economic Review*, 57(2), pp 197–210.
- Muth RF (1969)**, *Cities and Housing: The Spatial Pattern of Urban Residential Land Use*, University of Chicago Press, Chicago.
- Plaut PO and SE Plaut (2003)**, ‘The Inversion of the Land Gradient in the Inner City of Haifa, Israel’, *Journal of Real Estate Research*, 25(4), pp 557–576.
- Prasad N and A Richards (2006)**, ‘Measuring Housing Price Growth – Using Stratification to Improve Median-based Measures’, Reserve Bank of Australia Research Discussion Paper No 2006-04.
- Reserve Bank of Australia (2003a)**, ‘Household Debt: What the Data Show’, Reserve Bank of Australia *Bulletin*, March, pp 1–11.
- Reserve Bank of Australia (2003b)**, Submission to the Productivity Commission Inquiry on First Home Ownership, Occasional Paper No 16, November 2003.
- Rosenthal SS and WC Strange (2005)**, ‘The Geography of Entrepreneurship in the New York Metropolitan Area’, Federal Reserve Bank of New York *Economic Policy Review*, 11(2), pp 29–54.
- Scanlon K and C Whitehead (2004)**, ‘International Trends in Housing Tenure and Mortgage Finance’, UK Council of Mortgage Lenders report, November 2004.
- Stevens GR (1997)**, ‘Some Observations on Low Inflation and Household Finances’, Reserve Bank of Australia *Bulletin*, October, pp 38–47.
- Tralet V (2005)**, ‘Structure of the Canadian Housing Markets and Finance System’, Bank of Canada country note for BIS CGFS Working Group on Housing Finance in the Global Financial System, available at <<http://www.bis.org/publ/cgfs26cbpapers.htm>>
- Wood GA and PA Kemp (2003)**, ‘The Taxation of Australian Landlords: Would the British Tax Treatment of Rental Investments Increase Tax Burdens if Introduced in Australia?’, *Urban Studies*, 40(4), pp 747–765.