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Reserve Bank

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Mail Room Supervisor
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Bulletin Enquiries

Information Department
Tel: (612) 9551 9830
Facsimile: (612) 9551 8033
Email: rbainfo@rba.gov.au

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The Next Generation Banknote Project

Edward Kim and Terence Turton*

A core function of the Reserve Bank is to maintain public confidence in the nation's banknotes so that they remain an effective means of payment and a secure store of wealth. This article discusses the Bank's counterfeit deterrence strategy and the central role that the Next Generation Banknote (NGB) project will play in this strategy by enhancing the security of Australia's banknotes.

Introduction

The Reserve Bank dedicates substantial resources to counterfeit deterrence consistent with its responsibility under the *Reserve Bank Act 1959* to preserve confidence in Australia's banknotes. The Bank approaches its responsibilities in this regard in two ways. First, the Bank monitors counterfeiting activities and develops improved security measures to counter potential counterfeiting threats. Second, the Bank engages with the community on counterfeit detection techniques.

Efforts by the Reserve Bank have ensured that Australia has experienced low levels of counterfeiting for many years. However, the growing availability of more advanced technologies that allow reproduction of images to be made more easily and more cheaply means that, in the future, the security features on Australia's current banknotes may no longer adequately guard against counterfeiting. Reflecting this, the Bank announced in 2012 that it had initiated the NGB project to upgrade the security of the current series of banknotes.

Another concern for the Bank relates to an inaccurate perception within the community that a counterfeiting problem exists, despite the low levels of counterfeiting actually being experienced. The Bank is addressing this through increased engagement with a variety of groups to improve community understanding about the security embodied in Australia's current series of banknotes and is developing communication channels in preparation for the launch of the new banknotes.

This article discusses the important role that the Bank's counterfeit deterrence strategies play in maintaining confidence in Australia's banknotes. It then discusses some of the key elements of the NGB project.

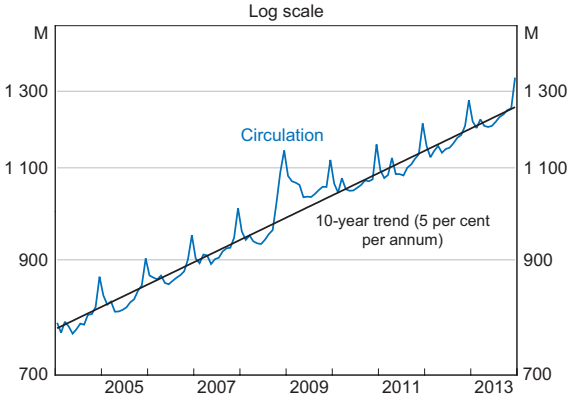
Banknote Use and Confidence

Despite strong growth in the use of electronic payment methods in Australia, demand for cash continues to grow, totalling around 1.3 billion banknotes in circulation as at the beginning of 2014. The number of banknotes on issue has grown at a rate of around 5 per cent per annum over the past decade, peaking seasonally during the high-volume demand periods around Christmas and Easter (Graph 1). Furthermore, towards the end of 2008 the number of banknotes on issue increased rapidly for a time, reflecting a temporary increase in demand for cash during the global financial crisis (Cusbert and Rohling 2013).

The Bank's Consumer Payments Use Study conducted in 2010 indicates that cash still accounts for the greatest share of the number of consumer payments (Bagnall and Flood 2011, p 58). The study showed that cash was used for 62 per cent of all transactions and around 80 per cent of transactions under $25. The study also showed that cash was the dominant means of payment for take-away stores, hotels, bars and small food stores where transactions

* The authors are from Note Issue Department.

Graph 1
Banknotes in Circulation
Log scale



Source: RBA

are typically of low value and are made in person, where quick turnaround times are preferred and where accepting alternative methods of payment may be less efficient.

Given the continued importance of banknotes as a payment mechanism, a loss of confidence in Australia's banknotes could have a substantial impact on the community (Cowling 2011, pp 65–66). For instance, transaction costs may increase as businesses spend additional resources on counterfeit detection, or consumers may switch from cash to alternative, more costly means of payment.

In view of these potential costs, it is important that the Bank continues to allocate resources to ensure ongoing public confidence in Australia's banknotes. The Bank works to preserve confidence in Australia's banknotes by:

- having banknotes with robust and effective security features; and
- ensuring that the community is well informed about Australia's banknotes.

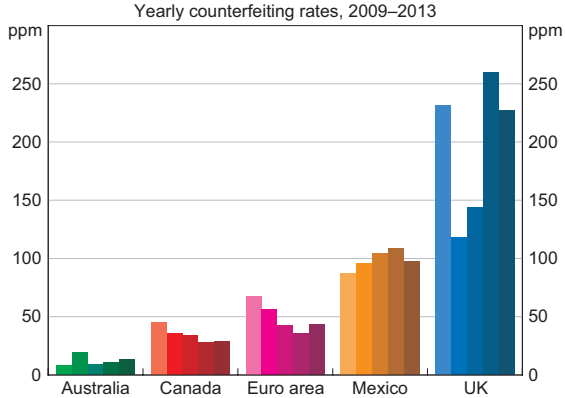
Efforts in these two key areas help to deter potential counterfeiters by making counterfeiting difficult, time-consuming and costly, and by making it more difficult to pass counterfeits undetected. To the extent that these initiatives are effective, less reliance is needed on policing and judicial activities, thereby enabling law-enforcement agencies to focus on other priorities.

Banknote Security

In the 1980s, a process was developed that allowed intricate layers of print to be applied to polymer (or 'plastic'). In addition to enabling a durable banknote to be printed, it meant banknotes could incorporate a clear window on which an embossed feature could be impressed. When polymer banknotes were first introduced in Australia in 1992, these features were difficult for counterfeiters to replicate and it placed Australia's banknotes at the global forefront of banknote security (see 'Box A: Australian Banknote Security Features' for more information on the security features on Australia's current banknotes).

Since its introduction, the current series of banknotes has experienced low rates of counterfeiting. On average, in the past five years, only around 12 counterfeits have been detected for every million genuine banknotes in circulation (i.e. around 12 parts per million).[1] This is low when compared with the experience of a number of other countries (Graph 2).

Graph 2
Counterfeits Detected
Yearly counterfeiting rates, 2009–2013



Source: central banks

1 The yearly parts per million (ppm) rate is calculated as the number of counterfeits detected in a year divided by the average of genuine banknotes in circulation for that year, scaled by a million. The five-year average was calculated on the rates for 2009 to 2013.

The impact of counterfeiting, however, acquires greater relevance when it is expressed in value terms. In Australia, direct losses from counterfeiting in 2013 amounted to around $900 000.[2] While this is relatively low, the financial impact on the consumer as a result of a counterfeiting incident is significant because the recipient of a counterfeit directly and immediately bears the loss. Further, the victims of counterfeiting in Australia are frequently small retailers and members of the public who can less easily afford to bear either the direct cost relating to the face value of the counterfeit passed, or the more expensive indirect cost associated with installing and using banknote authentication equipment. Even low levels of counterfeiting activity can lead to diminished confidence in the counterfeited denomination, resulting in consumers rejecting cash payments altogether. A more likely scenario though is that consumers resort to less convenient denominations. This was the case in 2002, where in some regions of Canada around one-tenth of retailers refused to accept C$100 banknotes, forcing the Bank of Canada to make a concerted effort to upgrade the security of its banknotes (Spencer 2011, p 2).

Community Liaison

In addition to ensuring that banknotes are as difficult as possible to counterfeit, it is important that the public is well informed about the security features on Australia's banknotes and how they function. For example, it is useful for the public to know that there is a pattern in the clear window of a genuine banknote, but it is much better still for them to know what that unique pattern is in each denomination.[3]

In 2010 and 2012, the Bank conducted online surveys to gauge the public's perception and knowledge of the current banknote series, and to assess public confidence in Australia's banknotes. Despite the low levels of counterfeiting in Australia, 12 per cent of participants in 2010 and 19 per cent of participants in 2012 believed that it was more likely than not that they would receive a counterfeit in the next year. Moreover, additional questions in the 2012 survey indicated that 6 per cent of participants did not feel that Australia's banknotes were secure against counterfeiting, while 7 per cent of participants believed that there was a significant counterfeiting problem in Australia.

These perceptions of counterfeiting risk were higher than expected given Australia's actual counterfeiting experience. While the surveys did not examine why participants may have lacked full confidence in Australia's banknotes, it may in part reflect a low level of public awareness of how to check properly for the authenticity of banknotes. Misinformation can exacerbate this problem. For example, the Bank observed heightened concern about counterfeiting in late 2010 when misinformation was circulated stating that a counterfeit could be recognised by the absence of portrait names on a banknote.[4]

In light of the impact that misinformation or insufficient information can have on how the public perceives banknotes, the Bank identified that further work was needed to engage with stakeholders and that additional resources needed to be allocated to banknote education. As part of this effort, in August 2012 the Bank launched its dedicated banknotes website (banknotes.rba.gov.au) as a comprehensive resource designed to provide the public with information on Australia's banknotes and how to authenticate them. More recently, with assistance from the NSW Department of Education and Communities, a banknote education resource for early primary school children is in the final stages of development. This resource will help teachers integrate banknote-related material into their mathematics and history curriculums.

The Bank has also increased its engagement with retailers, financial institutions, law enforcement agencies and armoured car companies, all of whom

2 The majority of Australian counterfeits belong to the $50 denomination because of its higher value and widespread use (Cowling 2011, p 65).

3 A gumnut in the $5, a windmill in the $10, a compass in the $20, the Southern Cross in the $50 and a lyrebird in the $100.

4 See Cowling (2011, p 67) for details.

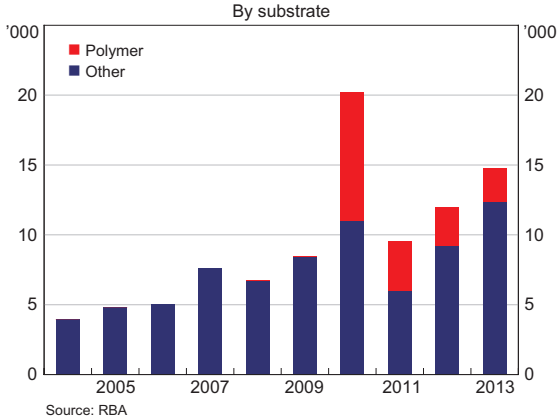
perform a vital role in the counterfeit detection, prevention and management process. One initiative in this respect is a series of Counterfeit Deterrence Workshops run by the Bank in partnership with the Australian Federal Police. These workshops provide an opportunity for key stakeholders in the banknote community to acquire in-depth knowledge about Australia's banknotes and discuss collaborative counterfeit prevention strategies. Two workshops have been held to date, with a third planned for March 2014.

In addition, the Bank distributes educational material to various organisations and regularly gives presentations to audiences including school groups, the vision-impaired community, police, banknote equipment manufacturers, retailers, financial institutions and other central banks.

Emerging Threats

The vast majority of counterfeits detected in circulation have, to date, been poor-quality reproductions on paper, made using standard commercial copying devices. In fact, prior to 2010, counterfeits on polymer were virtually non-existent. More recently, however, counterfeiters have not only been increasingly attempting to reproduce many of the security features used on our banknotes, but using polymer as well (Graph 3).

Graph 3
Counterfeits Detected
By substrate



Source: RBA

A counterfeiting incident in 2010, where increased volumes of high-quality polymer $50 counterfeits entered into circulation over a short period, illustrates the emerging threat to the current banknote series and how quickly a concerted attack can develop. Of particular concern was the fact that the counterfeits contained high-quality and consistent replications of the clear window, embossing and the white Southern Cross pattern within the clear window, and were therefore more difficult for the public to detect than most other counterfeits.[5] Notwithstanding the fact that the cost of manufacturing the counterfeits was significant, this incident highlighted the challenges posed by technological innovation and the access that smaller counterfeiting operations increasingly have to more sophisticated printing and scanning equipment.

While counterfeiting of banknotes from the current series has arisen mostly through domestic channels, threats to the security of Australian banknotes can also be observed through two significant international incidents. The first was in 2006 and related to a criminal network in Colombia attempting to counterfeit Australian $100 banknotes (RBA 2006). The partially completed counterfeits had a face value in excess of $5 million, were printed on plastic film, and contained high-quality reproductions of the design, clear window, white pattern within the clear window and shadow image.

The second incident occurred more recently in Mexico, where the 50 peso banknote, which is produced on the same polymer substrate as Australian banknotes, was counterfeited in large numbers until the Mexican federal police made arrests in November 2012 (Bank of Mexico 2013). By the time the Bank of Mexico had upgraded the 50 peso polymer banknote with improved security and released the banknote into circulation in May 2013, 220 000 counterfeits of the original polymer 50 peso banknote had been seized. In addition to the direct costs that were incurred by victims, this

5 This counterfeiting operation was shut down in late 2010 following the arrests of members of the manufacturing and distribution ring and the seizure of three large commercial printing machines (AFP 2010).

incident highlighted the substantial indirect cost to the taxpayer resulting from the need by the Bank of Mexico to design, produce and issue an upgraded 50 peso banknote in a short space of time.

These examples of large-scale, high-quality counterfeiting incidents are a cause for concern for the Bank. They show that sole reliance on the polymer substrate and the security features presently in use is no longer enough to ensure long-term confidence in Australia's banknotes. It is a testament, however, to the success of the original series of polymer banknotes that the Bank has been able to delay introducing a new banknote series for over 20 years. This is in comparison with other countries that, on average, have to replace their series every 7 to 10 years.

The Next Generation Banknote (NGB) Project

Mindful of the increasing threat posed by counterfeiters – particularly to banknotes printed on polymer – the Bank has for a number of years been undertaking research into new anti-counterfeiting technologies. This work was formalised in the NGB project that was established in 2007, publicly announced in 2012 and will culminate in a new, more secure banknote series being introduced in coming years.

There are many aspects to the NGB project that make it an undertaking of considerable complexity. In addition to production and design, a number of key stakeholders have had to be engaged and there are significant logistical issues that need to be addressed.

Banknote production and design

The production of the current banknotes involves many complex processes and the application of multiple layers of inks and security features (see 'Box B: The Banknote Production Process'). The NGB project brings further complexity to the production cycle with the addition of new security features and changes in design.

To determine which security features would be appropriate for the next generation of Australian banknotes, over 200 features were assessed based on the criteria of resilience to counterfeiting, functionality, durability, production-readiness and cost of production. Further, to take full advantage of the opportunities that polymer substrate offers, the new banknotes will incorporate state-of-the-art security printing technologies as well as multiple windows with designs that are significantly more complex than those on the current series. The new banknotes will also feature up-to-date intaglio and offset printing techniques, which will achieve greater fidelity in the print quality.

As part of the design process, the Bank is consulting with designers, artists and historians to ensure that the new banknotes reflect Australia's cultural identity while remaining functional and recognisable. Accordingly, a decision was made to retain many of the salient characteristics of the current series including the people portrayed on the banknotes, size, general colour palette and denominational structure. An important driver in this decision was the Bank's continued commitment to assist the vision-impaired community, who rely on the size differentials, the distinct colours of our banknotes and the bold numerals to distinguish between different denominations. The Bank was also conscious of the multitude of machines that accept banknotes and the benefits to manufacturers and users of these machines of retaining the size and denominational structure.

In the process of finalising the design, the Bank is conducting rigorous production trials with its banknote printer, Note Printing Australia. The purpose of these trials is to identify and resolve any production complications and ensure that the new banknotes are ready for full-scale manufacture. The banknotes produced in these trials will provide the Bank with material to assess the aesthetics, machine readability and the durability of the banknotes and will allow the Bank to engage in a very tangible way with the public and banknote equipment manufacturers.

Stakeholder engagement

The issuance of the new banknote series will affect both the general public and a broad range of groups.

To ensure public recognition and acceptance of the new banknotes, the Bank will invest in national public awareness and education campaigns, and is working with experts in the areas of media and public relations to ensure that all target audiences are reached in the appropriate manner.

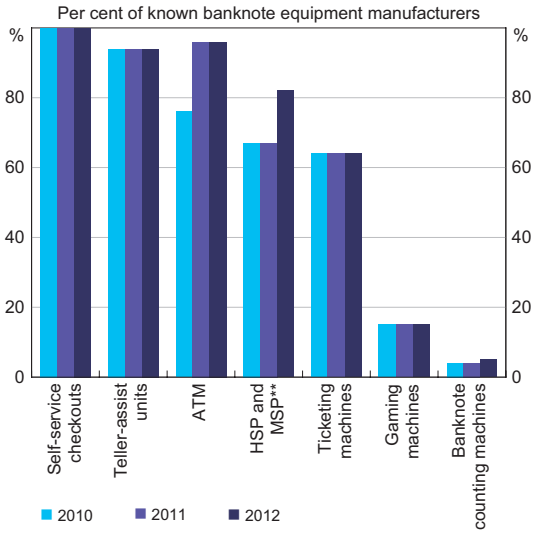
The Bank has also consulted extensively with a number of key users of banknotes including banknote equipment manufacturers, retail organisations, financial institutions and the vision-impaired community. These ongoing consultations provide an opportunity to ensure that the new banknotes meet the various needs of the whole community.

For example, it is estimated that there are more than 35 000 automatic teller machines (ATMs), 8 000 self-service checkouts, 200 000 gaming machines and over 250 000 vending machines in Australia that will need to be upgraded and reconfigured to ensure that they can accept and dispense the new banknotes. In recognition of this, the Bank began engaging with the banknote equipment manufacturers in 2009, providing test notes with similar security features and designs to those intended for the new banknotes. Technical feedback was sought from the equipment manufacturers on the capabilities of their machines to process the banknotes. This engagement was expanded in 2010 and again in 2011.

To date, more than 90 per cent of manufacturers of self-service checkouts, teller-assist units and ATMs that are known to the Bank have been involved with NGB testing. In addition, key suppliers of banknote processing machines and a provider of validators to the ticketing and gaming industries have also been consulted (Graph 4).

The Bank has presented to over 130 organisations in the past year, and will continue to present NGB project information in person to equipment manufacturers, banknote equipment users and industry representative associations. In addition to providing background information to the Bank's program, the Bank is encouraging machine users and machine suppliers to engage with each other to develop strategies to ensure their readiness for the new banknote series.

Graph 4
Industry Engagement*



* There was no engagement conducted in 2013
** 'High-speed processing' and 'medium-speed processing' manufacturers
Source: RBA

Logistical preparations

When the Bank last introduced a new banknote series in 1992, it had secure storage and processing facilities in every capital city in Australia and the number of banknotes in circulation was less than half what it is currently. Since then, rationalisation of the Bank's operations and improvements in banknote distribution arrangements have reduced the Bank's secure banknote storage facilities in Australia to three, with just one banknote processing site.

The introduction of the new series of banknotes will, however, require significantly more storage and processing capacity, and the Bank is therefore planning to upgrade its processing and storage facilities over the next few years (Campbell 2014).

There are two parts to this project. First, the Bank is embarking on a program to upgrade the logistics infrastructure at its existing sites. This will result in a substantial improvement in material handling capabilities and a reduction in manual handling. It will also deliver improvements in security and work health and safety. Second, it is proposed that a new purpose-built automated banknote storage and processing facility will be built in Victoria. The National Banknote Site will provide additional storage and processing capacity, and will ensure that the Bank's holdings of banknotes are appropriately and securely stored and managed for many years into the future. Construction of the new site remains subject to Parliamentary approval.

Conclusion

Although counterfeit rates in Australia continue to be very low, a banknote series with ageing security features, combined with the threats faced from improvements in technology and materials, underline the importance of the NGB project as a means to ensure that confidence in Australia's banknotes is preserved.

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Box A

Australian Banknote Security Features

1. Plastic Banknote

Australian banknotes are printed on polymer (plastic), which means they have a distinct feel and it is difficult to start a tear along the edge. A plastic banknote 'scrunched' in the hand should return to its original form.

2. The Clear Window

The clear window should be part of the banknote and the white image printed on the window should not be easily rubbed off. The window should also contain a clear embossed image – a wave pattern on $10 banknotes, and the value of the banknote on $20, $50 and $100 banknotes.

3. The Coat of Arms

When the banknote is held up to the light, the Australian Coat of Arms should be visible.

4. The Federation Star

Diamond-shaped patterns are printed inside a circle on both sides of the banknote. When the banknote is held up to the light, the patterns should line up perfectly to form the seven-pointed Federation star.

5. The Distinct Feel of the Printing

A special raised ink gives the banknote a distinctive feel.

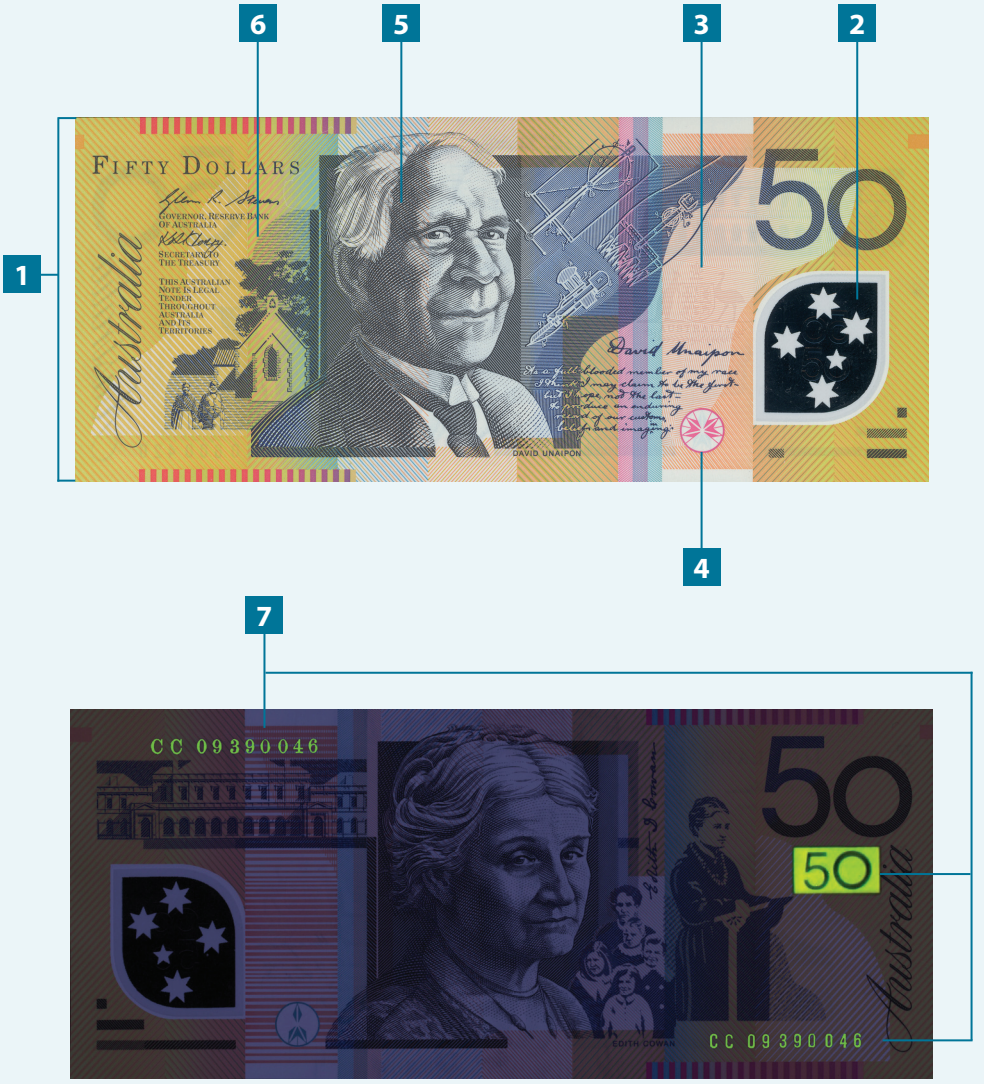
6. Print Quality/Microprinting

The background printing should be sharp. In particular, microprinted text should be clearly visible under a magnifying glass.

7. Fluorescent Properties

With the exception of the serial numbers and designated UV patches, the banknote should not fluoresce under a UV light.

Additional information about the security features on Australian banknotes can be found at banknotes.rba.gov.au/securityfeatures.html.

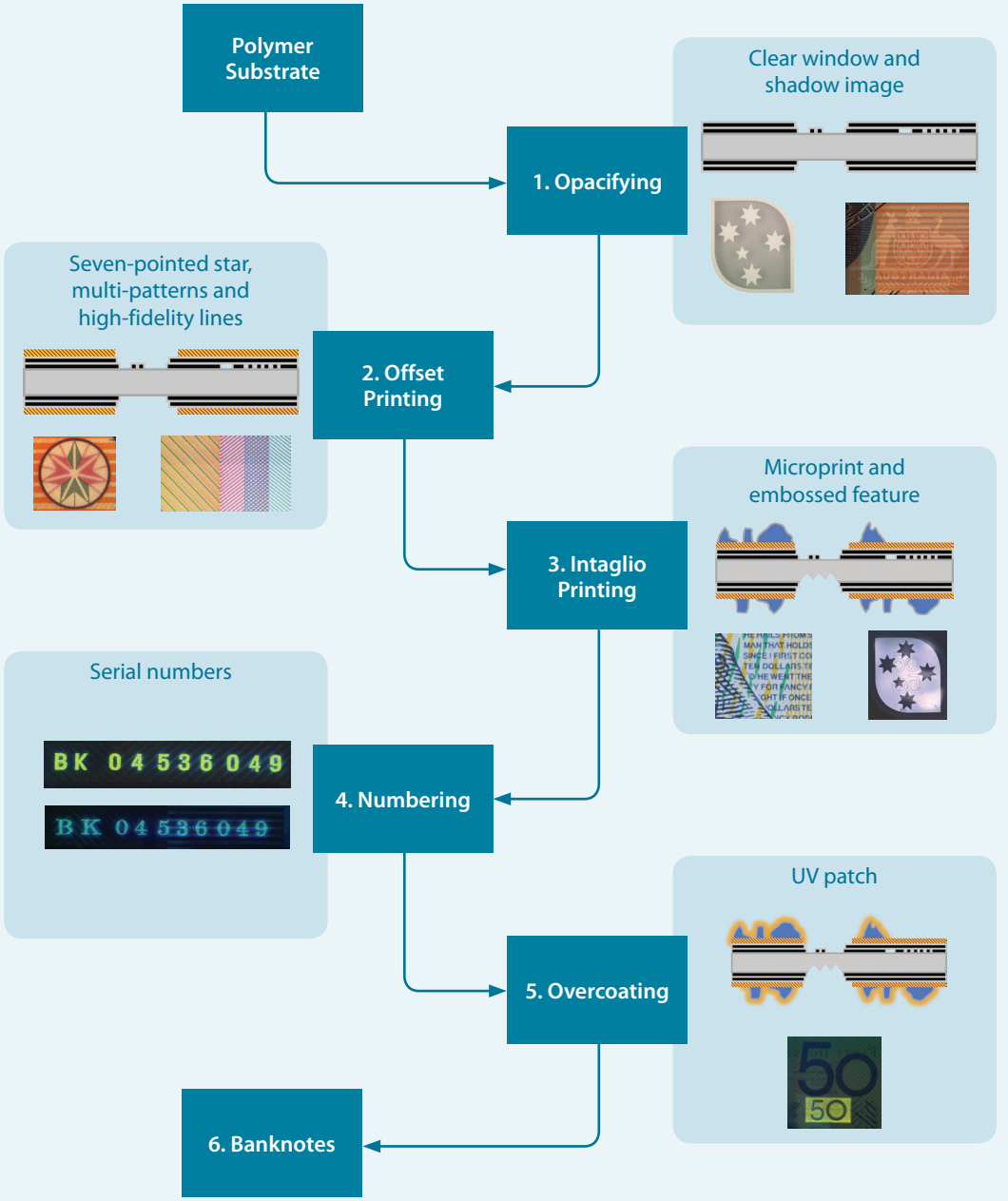


Source: Reproduced from Cowling (2011, pp 68–69)

Box B
The Banknote Production Process

There are many stages to the production of a banknote.

1. *Opacifying*. Starting with sheets of a specially manufactured clear polymer (plastic) film, a layer of ink called gravure is applied. This helps other inks adhere to the polymer. At this stage, the clear window, vignette (white pattern within the clear window) and shadow image of the Australian coat of arms are also formed.
2. *Offset printing*. Sheets are then processed through an offset printing press that applies coloured inks to both sides of the sheets simultaneously. This way, the images on both sides of the banknote are aligned. This process allows the production of one of the key security features on Australia's banknotes – the see-through registration device. When the banknote is held up to the light, diamond-shaped patterns printed on each side of the banknote combine to form an image of the seven-pointed Federation star inside a circle.
3. *Intaglio printing*. Raised printing called intaglio is then applied. The portraits, the numerals and some key images on the banknotes are printed using this process. Intaglio gives the banknotes their distinctive feel. Two important security features are also applied at this stage. One is the microprint, which is very small text that appears in various places on different banknotes and cannot be read by most people without the aid of a magnifying glass. The other is the embossed feature that is applied to the clear window of all banknotes except the $5 denomination.
4. *Numbering*. Unique serial numbers are then printed onto the banknotes using ink that fluoresces under UV light.
5. *Overcoating*. Before banknote sheets are cut into separate banknotes, a protective coating is applied for durability and to help the banknotes remain clean. A fluorescent patch is also incorporated at this stage.
6. *Final banknotes*. Individual banknotes are checked to make sure they were printed without error. The banknotes are then wrapped and packed ready for issue into circulation. ✠


Polymer Substrate
1. Opacifying
Clear window and shadow image
Seven-pointed star, multi-patterns and high-fidelity lines
2. Offset Printing
3. Intaglio Printing
Microprint and embossed feature
Serial numbers
BK 04536049
BK 04536049
4. Numbering
5. Overcoating
UV patch
6. Banknotes

The Distribution of Household Spending in Australia

Amy Beech, Rosetta Dollman, Richard Finlay and Gianni La Cava*

This article uses household-level data to examine the distribution of spending and saving in Australia and how that has changed over time. The distribution of spending and saving is important as, among other things, it can affect the way that the household sector responds to economic shocks. The data indicate that households headed by older people have increased their share of total spending over the past two decades, reflecting both an ageing population and an increase in the average spending of older households compared with other households. The household survey data also indicate that spending is more equally distributed than income across households due to their ability to borrow and save. Moreover, consumption inequality has been little changed, despite an increase in income inequality over recent decades.

Introduction

Real per capita consumption and disposable income in Australia have both risen by an average of close to 2 per cent annually since the early 1980s. However, aggregate trends can mask important changes in the distribution of income and spending across households over time. Further, an examination of how spending and saving are distributed can be important to understanding the overall state of the economy. The sensitivity (or resilience) of the household sector to shocks can be affected by which households are saving and which are borrowing at a given time. For example, an unexpected increase in income will cause a relatively large increase in aggregate spending if the shock is concentrated among a segment of households whose spending is particularly sensitive to changes in income.

The ABS recently released new distributional data on household income and consumption for 2009/10.[1] For the first time, these data integrate household-level information – from the Household Expenditure Survey (HES) and the Survey of Income and Housing (SIH) – with aggregate data from the national accounts. This has produced data on the distribution of household income and consumption that are consistent with national accounts concepts and aggregates. This article uses the new survey data to document some facts about the distribution of household spending and income in Australia; earlier versions of the HES are also used to examine how the distribution has changed over time.[2]

The Distribution of Spending and Saving

The distributional results from the new data are consistent with several well-established stylised facts about consumption (see Deaton (1992)). For instance, the data clearly show that (on average) income, consumption and saving each follow a hump-shaped pattern over the life cycle. All three

* The authors are from Economic Group; they would like to thank Emily Gitelman for help with some of the analysis contained in this article.

1 See ABS (2013) for details.

2 In line with this, in the next section 'spending' and 'consumption' are defined as in the national accounts and include a number of items provided to households that are government funded, such as public education and health care; the subsequent two sections for the most part exclude such items (but include imputed rent). Imputed rent captures the implicit benefit an owner-occupier receives from owning his or her own home. Throughout this article, imputed rent is determined using the methodology outlined in ABS (2008) for each household survey.

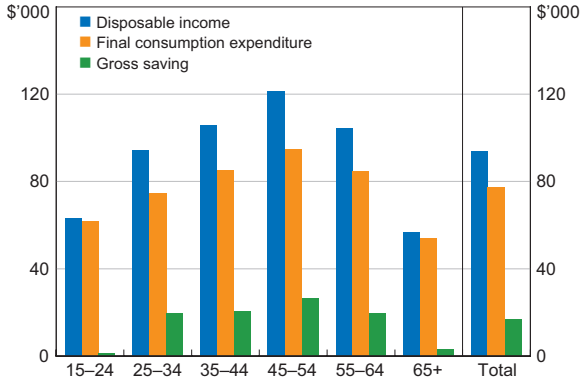
peak for households with the reference person aged between 45 and 54 years – that is, in the prime of their working life (Graph 1).[3] Consumption, however, is more evenly distributed across age groups than income, reflecting the ability of households to smooth consumption over their lifetimes by borrowing and saving. This is broadly consistent with the life-cycle hypothesis of consumption, which states that young households tend to increase their consumption by borrowing against their future income, middle-aged households tend to save during their peak earning years and older households tend to run down savings they may have accumulated. The smoothness of consumption relative to income can also be explained in terms of the permanent income hypothesis, which postulates that consumers spend in line with their permanent level of income and borrow or save to offset temporary fluctuations to income, so that consumption varies by less than income.

Looking at household consumption and saving across income groups, it is clear that both rise with income (Graph 2).[4] More notably, consumption rises by less than income, which implies that saving increases with income: in 2009/10, the highest income quintile accounted for 80 per cent of total saving, while the lowest income quintile were dis-savers – that is, they spent more than they earned, on average. Again, this suggests that these households are able to offset temporary shocks to their income by borrowing and saving, at least partially.

Total consumption expenditure of households can also be disaggregated into different categories of goods and services. It is then possible to examine how these components of spending vary with household characteristics, such as age and income.

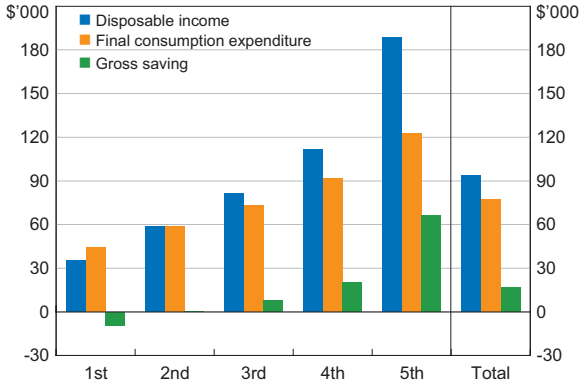
Older households tend to allocate a smaller proportion of their spending to durable goods than do younger households, perhaps because they have already accumulated such goods over their lifetime.[5] On the other hand, older households tend to spend proportionately more on essential services, such as health care, than younger households. In contrast,

Graph 1
Household Income, Consumption and Saving*
By age of household reference person, 2009/10



* Household average
Source: ABS

Graph 2
Household Income, Consumption and Saving*
By equivalised household income quintile, 2009/10



* Household average
Source: ABS

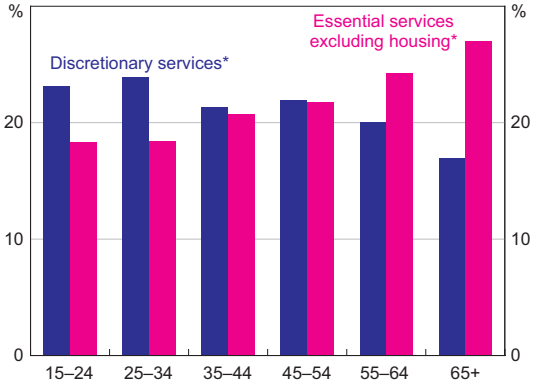
3 The household reference person (or household head) is the member of the household most likely to make economic decisions. Income is gross disposable income and includes earned income such as wages, salaries and the profits of small businesses, rental income (actual and imputed), and transfers such as social assistance benefits; it deducts taxes, interest payments and net non-life insurance premiums.

4 Households are grouped by equivalised household disposable income, which is household disposable income adjusted for household size and composition. The aim of this adjustment is to produce an income estimate that more accurately reflects household wellbeing. For example, a given amount of household income shared among two people will enable a higher standard of living than the same income shared among four people.

5 Durable goods include clothing and footwear, furnishings and household equipment, motor vehicles, computers and audio visual equipment, other durable recreational items and equipment (such as sports and camping equipment), and books.

younger households spend proportionately more on discretionary services such as travel, hotels and restaurants, and recreational services (Graph 3).[6]

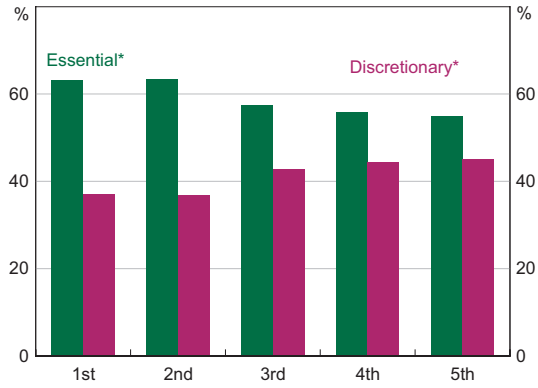
Graph 3
Consumption of Services
By age of household reference person, 2009/10



* Per cent of total consumption
Sources: ABS; RBA

Looking at the breakdown of spending across income quintiles, the share of consumption allocated to necessities tends to decrease with income, while the share spent on discretionary items tends to increase with income, as would be expected (Graph 4).[7] In particular, compared with low-income households, high-income households tend to allocate a larger share of their spending to discretionary services such as travel and recreation, as well as durable goods. In contrast, low-income households tend to allocate a larger share of spending to non-durable goods and rent.[8]

Graph 4
Consumption
By equivalised household income quintile, 2009/10



* Per cent of total consumption
Sources: ABS; RBA

Long-term Trends in the Distribution of Household Spending

Concentrating first on the distribution of spending across different categories of goods and services, the most prominent trend over recent decades has been the reallocation of nominal spending away from goods (mostly durable) and towards services (mostly dwelling and other essential services, such as education). Between 1986 and 2013, household spending on goods decreased from around half to one-third of total spending, while the share spent on services increased from around half to two-thirds (Graph 5).

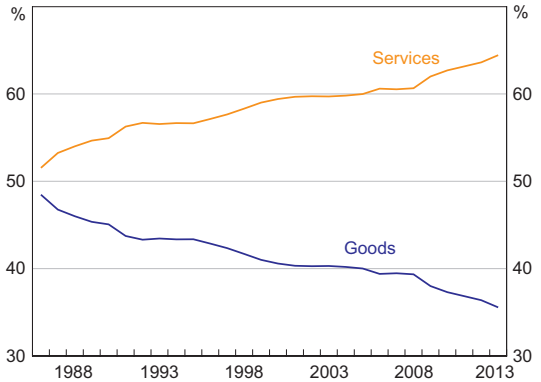
At the aggregate level, the rising share of nominal expenditure on services reflects a small rise in the volume of services consumed as a share of total consumption, and a larger rise in the relative price

6 Essential services include the following spending categories from ABS (2013): healthcare services; water and sewerage services; electricity, gas and other fuel; communication services; education; insurance and other financial services. Discretionary services include recreational and cultural services; spending at hotels, cafes and restaurants; transport services; and other goods and services. Due to data limitations, for some categories it is not possible to entirely separate spending on goods and services or essential and discretionary spending. In these cases, the spending category is classified as either essential or discretionary depending on which type of spending makes up the largest share of that category (e.g. for transport services, the majority of spending is on air travel, which is classed as discretionary).

7 Essential consumption consists of spending on essential services plus spending on food, motor vehicle fuel, and actual and imputed rent. Discretionary consumption includes spending on discretionary services, cigarettes and tobacco, alcoholic beverages and durable goods.

8 For example, there is a noticeable difference between essential spending on food and discretionary spending at hotels, cafes and restaurants for high- and low-income households. As a share of total expenditure, households in the lowest income quintile typically spend three times as much on food as on hotels, cafes and restaurants, while households in the highest income quintile spend similar amounts on both.

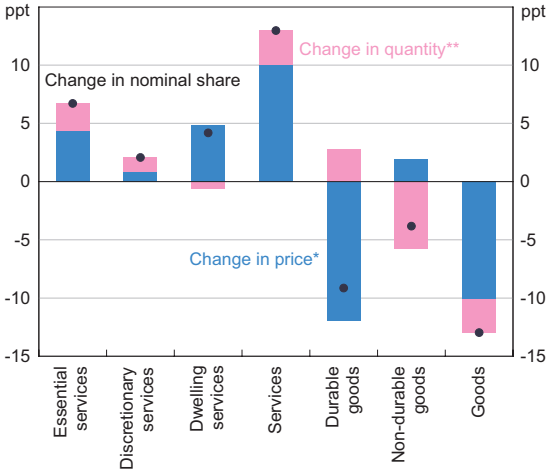
Graph 5
Goods and Services Consumption
Per cent of total consumption



Sources: ABS; RBA

of services compared with that of goods (Graph 6).[9] The increase in the volume of services consumed has occurred despite an increase in relative price, suggesting that services are a 'superior good': as incomes rise, consumers spend a greater share of income on them (Jääskelä and Windsor 2011). Conversely, the relative price of goods has fallen substantially over the past few decades, driven by a sharp decline in the relative price of durable goods. Consistent with this, as a share of total consumption, the volume of durable goods consumed has increased, while that of non-durable goods has fallen substantially. The household-level data indicate that these aggregate trends have been broad based across household types, although there is some evidence that the largest reallocation of spending away from goods and towards services has occurred for households in the top income quintile. These trends are common to many advanced economies: as households grow richer they tend to spend proportionately less on items such as food (a non-durable good) and proportionately more on services.

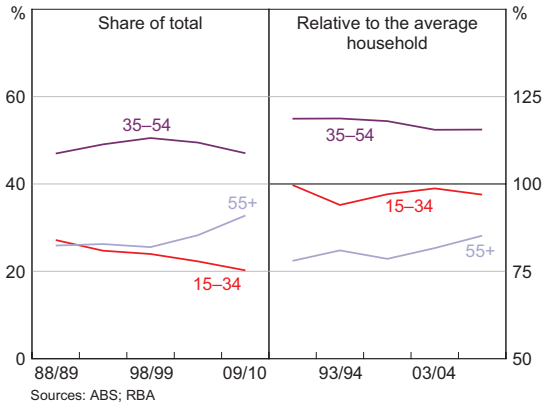
Graph 6
Change in Consumption Shares
1985/86 to 2012/13



* Change implied by nominal consumption moving in line with relative prices
** Calculated as the residual from the change in nominal share and the change in price
Sources: ABS; RBA

Turning to the distribution of spending across different household types, the data suggest that, on average, older households spend less than other households. For example, in 2009/10 households headed by a person aged 55 years and above consumed goods and services to the value of $57 000 on average, compared with $67 000 for all households, a ratio of around 85 per cent. But, over the past two decades, households headed by persons aged 55 years and above have comprised an increasing share of aggregate consumption, while younger and middle-aged households' share of total consumption has declined (Graph 7, left-hand panel).

Graph 7
Household Consumption
By age of household reference person



Sources: ABS; RBA

9 The rise in the relative price of services mainly reflects an increase in the relative price of dwellings and other essential services such as education.

These trends have reflected two key developments. First, the share of older households (those aged 55 years and above) in the overall population has risen while the share of younger households (those aged 34 and below) has fallen. Second, older households now spend more, compared with the average household, than older households did two decades ago (Graph 7, right-hand panel). Conversely, both younger and middle-aged households now spend slightly less, compared with the average household, than was the case 20 years ago.

The increase in the importance of older households – who tend to spend less on goods and more on services than other households – has contributed to the aggregate shift in consumption away from goods and towards services, although the size of this effect has been small.

Increasing expenditure by older households has been facilitated by more recent cohorts of older households having higher disposable income and wealth compared with earlier cohorts. Indeed, the disposable income of older households has risen over the past two decades compared with that of the average household, while the disposable income of the youngest households (those headed by persons aged 15 to 24 years) has fallen compared with the average household; among other things, these trends reflect increases in the real value of the aged pension and the growing importance of superannuation and later retirement for older households (Grenville, Pobke and Rogers 2013).[10]

In contrast, the distribution of consumption across income groups has remained fairly stable. This suggests that consumption inequality has also been quite stable over recent decades, a phenomenon which is discussed in more detail in the next section.

Consumption and Income Inequality

The HES data can also be used to measure economic inequality across households. Recent studies on inequality in Australia have largely focused on income inequality (see, for example, Leigh (2013), Fletcher and Guttmann (2013) and Grenville *et al* (2013)).[11] There are several reasons why it is useful to examine consumption inequality. First, some economists consider consumption to be a more appropriate measure of household wellbeing than income (see, for example, Slesnick (1998)). If some households smooth temporary fluctuations in income by borrowing and saving, then income will be more variable than expenditure at a point in time and hence income will overstate the level of inequality in household welfare. Second, estimates of inequality based on consumption can be a useful cross-check if income estimates are relatively more affected by measurement error.[12] Third, examining changes in the distribution of consumption relative to income can shed light on household saving and borrowing patterns.

While consumption is typically considered to be a better guide to living standards than current income, it is still not a complete measure of household wellbeing. For example, the consumption estimates based on the HES data do not include measures of consumption of public goods (e.g. recreational facilities), social transfers in kind (e.g. government-funded goods and services such as public health care and education) or goods produced within the home. Past studies have typically found that including these factors lowers estimates of economic inequality, on average (Barrett *et al* 1999a).

10 *A priori*, compulsory superannuation need not lead to higher wealth and consumption in retirement if households offset their compulsory saving via superannuation with reduced saving elsewhere. However, households do not appear to have acted in this way, with compulsory superannuation indeed leading to increased household wealth (Connolly and Kohler 2004; Connolly 2007).

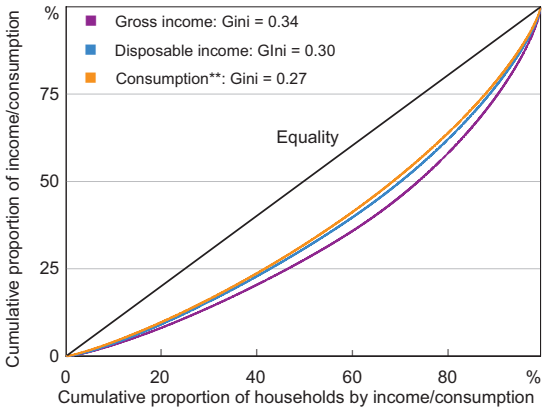
11 Earlier Australian studies examined trends in expenditure inequality (Harding and Greenwell 2002) and non-durable consumption inequality (Barrett, Crossley and Worswick 1999a) in Australia through the 1980s and 1990s. Barrett, Donald and Bhattacharya (2014) provide some more recent estimates of non-durable consumption inequality. Overall though, Australian research in this area is limited relative to other developed countries.

12 Wilkins (2013) discusses some of the issues in measuring income inequality in Australia.

The most common measure of inequality is the Gini coefficient, which is derived from the Lorenz curve. The Lorenz curve shows the share of spending (or income) by households ranked by spending (or income); the further the curve is below the 45 degree line, the less equal the distribution. Correspondingly, the Gini coefficient is calculated as the area between the Lorenz curve and the 45 degree line divided by the total area under the 45 degree line. The Gini coefficient ranges from zero to one, where zero represents perfect equality and one represents complete inequality.

Based on the 2009/10 HES, the Lorenz curve for gross income indicates that the top 20 per cent of households earned approximately 43 per cent of total household income (Graph 8). In contrast, the bottom 20 per cent of households earned about 8 per cent of total income. However, the Australian tax system reduces income inequality to some extent by redistributing income from rich households to poor households through government taxes and transfers. As a result, in 2009/10 the Gini coefficient for disposable income (0.30) was lower than that of gross income (0.34).[13]

Graph 8
Lorenz Curves*
2009/10



* Population weighted; equivalised; all measures include gross imputed rent less housing costs
** Also excludes other interest payments
Sources: ABS; RBA

13 Disposable income refers to gross income after deducting personal income tax and the Medicare levy.

In addition, the Gini coefficient for consumption (0.27) was lower than that of disposable income (0.30), suggesting that economic inequality is further reduced by the ability of households to borrow and save to offset temporary changes in income. The Lorenz curve for consumption indicates that the highest-spending households (in the top 20 per cent) accounted for approximately 37 per cent of total spending in the economy. In contrast, the lowest-spending households (in the bottom 20 per cent) accounted for about 10 per cent of total spending.

Using this framework, and the various household expenditure surveys that are available, it is possible to examine how inequality in both spending and income has evolved over recent decades. Based on the Gini coefficient, gross income inequality has risen over the past quarter of a century (Graph 9).[14] The rise in income inequality has largely reflected an increase in non-wage income inequality and, in particular, capital income; wage income inequality has been little changed over recent decades.[15]

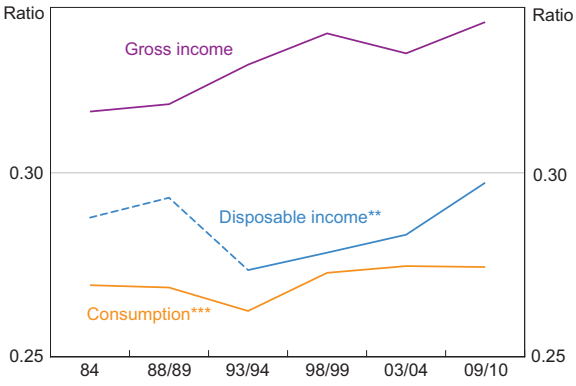
Disposable income inequality, based on the HES estimates, fell from the 1980s to the early 1990s and has been gradually rising since then. However, the disposable income inequality estimates for the 1980s should be treated with caution. The tax data for the 1984 and 1988/89 surveys are calculated based on a combination of actual reported taxes and imputations, but the tax data for the later surveys are entirely imputed. This complicates comparisons of inequality in disposable income before and after the early 1990s (Barrett, Crossley and Worswick 1999b).

Regardless, the HES estimates indicate that consumption inequality has been consistently lower than both gross and disposable income

14 Measures of income inequality based on income tax data also indicate that there has been a rise in inequality over recent decades (see, for example, Leigh (2013)).

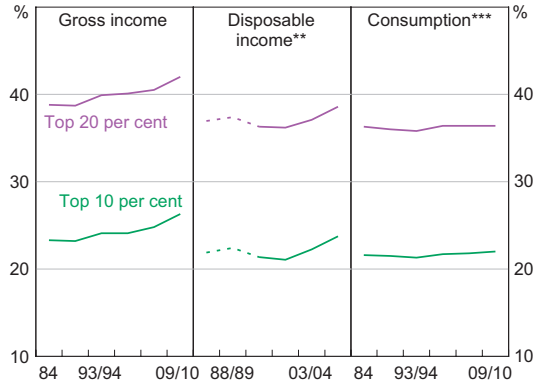
15 The fact that wage income inequality has been broadly unchanged over the past two decades reflects two offsetting effects (Grenville *et al* 2013). On the one hand, high-income households have benefited relatively more from rising hourly wages for full-time employees and an increase in the share of part-time employment (which have tended to increase inequality). On the other hand, low-income households have benefited relatively more from the reduction in the share of jobless households (which has tended to reduce inequality).

Graph 9
Gini Coefficients*



* Population-weighted; equivalised; all years relate to financial years, except for 1984, which relates to the calendar year; includes gross imputed rent for owner-occupied dwellings and subsidised rentals; excludes housing costs
** Dashed line indicates estimates based on a combination of reported and imputed taxes
*** Also excludes other interest payments
Sources: ABS; RBA

Graph 10
Top Income Earners/Consumers*
Share of total household income/consumption



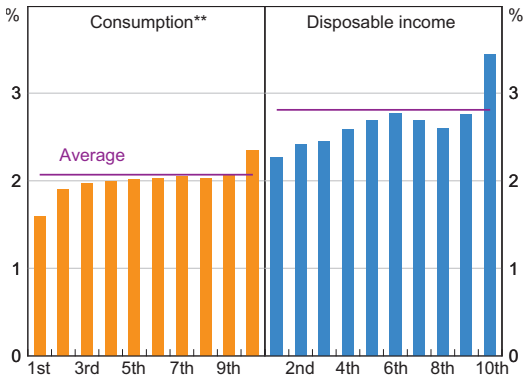
* Population-weighted; equivalised; all years relate to financial years, except for 1984, which relates to the calendar year, includes gross imputed rent for owner-occupied dwellings and subsidised rentals; excludes housing costs
** Dashed line indicates estimates based on a combination of reported and imputed taxes
*** Also excludes other interest payments
Sources: ABS; RBA

inequality. The increase in consumption inequality has also been less pronounced than the increase in income inequality over the past few decades. One interpretation for the differing trends is that some of the increase in income inequality has been due to an increase in transitory income shocks, which households have been able to smooth through borrowing and saving (Barrett *et al* 1999a).

The Gini coefficient is a useful indicator for summarising distributions. However, it does not identify which parts of the distribution are responsible for any changes over time. An alternative approach to examining the distributions of consumption and income is to look at how much of aggregate household income is earned by the high-income households and, similarly, how much of aggregate household consumption is accounted for by the high-spending households. For instance, based on the gross income estimates, the top 20 per cent of income earners accounted for about 39 per cent of aggregate household income in 1984 and about 43 per cent in 2009/10 (Graph 10). The share of aggregate household disposable income earned by the top income earners also increased between 1984 and 2009/10 but to a lesser extent. This is consistent with the rise in income inequality based on the Gini coefficient. In contrast, the top 20 per cent of spenders accounted for about 37 per cent of aggregate consumption in both 1984 and 2009/10. This is again consistent with consumption inequality being little changed over the past few decades.

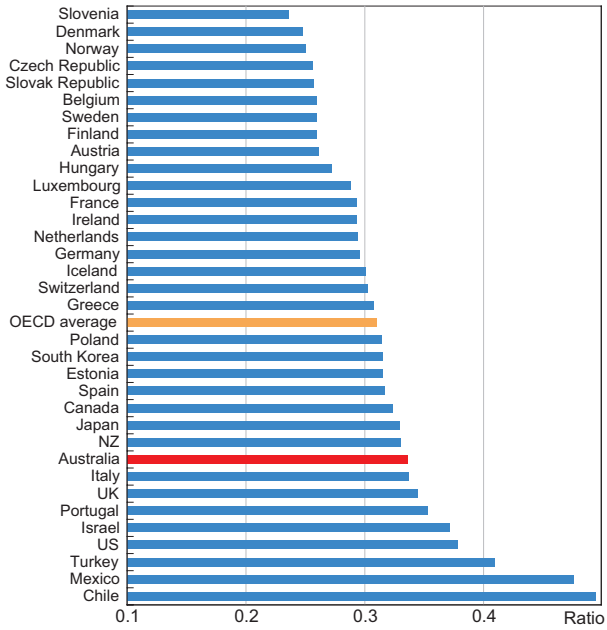
Another approach is to break down the distributions of consumption and income into separate deciles, and then examine the relative growth in consumption and income across each decile. Based on this, the top 10 per cent of earners have experienced a relatively large increase in real disposable income over recent decades (Graph 11, right-hand panel). This is consistent with the increase in income inequality based on the Gini coefficient. The top 10 per cent of spenders have experienced slightly faster growth in real consumption than other households over recent decades, though the difference in growth is less pronounced than in the case of income (Graph 11, left-hand panel). Taken together, the changes in both the distribution of consumption and income indicate that the highest-earning households increased their saving relative to all other households. This, in turn, is consistent with

Graph 11
Real Consumption and Income Growth*
By decile, average annualised, 1993/94–2009/10



* Includes gross imputed rent for owner-occupied dwellings and subsidised rentals; excludes housing costs; deflated by the CPI
** Also excludes other interest payments
Sources: ABS; RBA

Graph 12
Gini Coefficients
Disposable income, late 2000s



Source: OECD

income inequality rising by more than consumption inequality over the past quarter of a century.[16]

To put these results in context, it is useful to compare the estimates of inequality in Australia with corresponding estimates for other countries. The Organisation for Economic Co-operation and Development (OECD) has recently produced estimates of income inequality that allow for comparisons across countries. According to the estimates in OECD (2013), inequality in Australia is relatively high by international standards, and on a par with New Zealand and the United Kingdom, but lower than in the United States (Graph 12). Moreover, compared with the OECD average, Australia appears to have experienced an increase in income inequality over recent decades.

However, it is more difficult to find comparable estimates of consumption inequality for other developed economies. The academic literature suggests that, as in the case of Australia, consumption inequality is typically lower and more stable over time than income inequality.[17] However, most of these studies exclude durable goods from the consumption estimates, which typically results in a more equal distribution and may also affect the measured trends in consumption inequality.[18]

Conclusion

Household-level survey data indicate that older households have increased their share of total spending, due to both an ageing population and an

16 As the time-series estimates of inequality are based on repeated cross-sections of the HES data, it is not possible to track specific households over time. As a result, the characteristics of the highest-income households in the early 1990s could be quite different to the characteristics of the highest-income households in the late 2000s, which complicates an analysis of the determinants of changes in inequality over time. See Dollman and La Cava (forthcoming) for more details.

17 For more details on consumption inequality in developed countries, see the *Review of Economic Dynamics* special issue on Cross Sectional Facts for Macroeconomists, which includes studies for the United States (Heathcote, Perri and Violante 2010), Canada (Brzozowski *et al* 2010), the United Kingdom (Blundell and Etheridge 2010), Germany (Fuchs-Schuendeln, Krueger and Sommer 2010), Italy (Jappelli and Pistaferri 2010), Spain (Pijoan-Mas and Sanchez-Marcos 2010) and Sweden (Domeij and Floden 2010).

18 The evidence for consumption inequality is more mixed in the United States, with some studies indicating that consumption inequality has been broadly unchanged (see, for example, Krueger and Perri (2005) and Meyer and Sullivan (2012)) while other studies suggest that it has risen in line with disposable income (see, for example, Aguiar and Bils (2011) and Attanasio, Hurst and Pistaferri (2012)).

increase in the average spending of older households compared with other households. There has also been a shift in real spending towards services and away from goods at the aggregate level, which has been accompanied by a rise in the relative price of services. The household survey data indicate that spending is more equally distributed than income, and that consumption inequality has been broadly unchanged despite an increase in income inequality over recent decades.

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Employment Outcomes of the Economically Disadvantaged

Michelle Cunningham, David Orsmond and Fiona Price*

As part of its liaison program, the Bank meets with community organisations to discuss the labour market and other opportunities and challenges faced by economically disadvantaged persons in Australia. The data available suggest that economic conditions faced by the disadvantaged generally improved over the years leading up to the global financial crisis, though they have deteriorated somewhat since then. Nonetheless, around half of those who were economically disadvantaged in 2005–06 had moved out of this category by 2011–12. Finding employment was an important pathway out of economic disadvantage, although this outcome depended in part on a person's skills and the type of job obtained. The majority of people who remained economically disadvantaged over this period were not in employment, and community organisations note that many of them face a range of structural barriers to finding employment.

Introduction

Through its liaison program, the Bank meets regularly with community organisations in order to understand in more depth the economic conditions faced by economically disadvantaged members of society. These organisations include agencies providing job assistance, disability, welfare, housing and financial counselling services. The employment opportunities and outcomes of disadvantaged groups have been a prominent theme in these discussions. This article presents the insights that the Bank has gained from this liaison, as well as information on the nature of economic disadvantage gathered from the HILDA Survey, which provides a longitudinal annual snapshot of household income, wealth, employment and other characteristics.[1]

* The authors are from the Economic Analysis Department.

1 For a longitudinal study, unit record data are gathered for the same subjects over a period of time. This article uses longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Economic and Social Research (Melbourne Institute). The findings and views in this article, however, are those of the authors and should not be attributed to either DSS or the Melbourne Institute.

Measuring Economic Disadvantage

Economic disadvantage can be defined and measured in different ways, both quantitatively and qualitatively. In discussions with the Bank, community organisations generally define a disadvantaged person *qualitatively* as someone who genuinely needs their services. Typically, they struggle to find employment, experience financial hardship and/or face significant housing instability. In this article, disadvantage is defined *quantitatively* as households in the bottom quintiles of both the income and wealth distributions in the HILDA Survey.[2] This quantitative measure enables an examination of the dynamics of disadvantage, tracking the characteristics of households that were able to move out of disadvantage over time. While disadvantage also encompasses an array of factors not related to income and wealth – such as

2 Specifically, a household is defined as economically disadvantaged if the household was in the lowest quintile of income in a given year *and* in the lowest quintile of wealth in any of the years when the wealth components were surveyed in HILDA (2002, 2006 or 2010). The sample used in this article excludes households headed by a person over 70 years of age as well as all persons over 70 years of age since they are generally retired from the workforce.

Table 1: Characteristics of Economic Disadvantage, 2011–12

	Household			Share of people		
	Share of households	Median equivalised income[a]	Median wealth[a]	Employed	Unemployed	Not in the labour force
	Per cent	$	$, 2010			
Economically disadvantaged	9	19 600	6 200	29	10	61
Asked a community group for help	3	22 900	17 000	43	12	45
HILDA – full sample	100	43 800	386 000	72	3	25

(a) Measured in 2011/12 dollars; see footnote 3 for definition of 'equivalised' income
Source: HILDA Release 12.0

education, health standards, social exclusion and the ability to access services and infrastructure – low income and wealth are common symptoms of disadvantage.

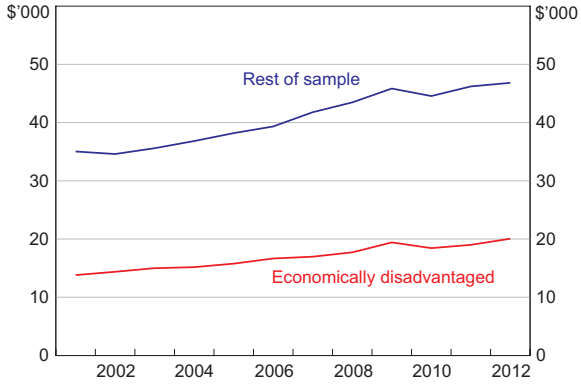
Based on this definition, the HILDA data indicate that around 9 per cent of Australian households headed by a person no older than 70 years of age were experiencing economic disadvantage in 2011–12 (Table 1). Median household income for this group was around $19 600, which was less than half the HILDA sample median of $43 800.[3] The difference in wealth was significantly larger: median wealth for disadvantaged households was $6 200, less than 2 per cent of the sample median ($386 000), primarily reflecting differences in the degree of home ownership. Persons within economically disadvantaged households also had significantly lower levels of employment than the full HILDA sample. These income, wealth and labour market characteristics were broadly similar to households that reported in the HILDA Survey that they had asked a community organisation for help, suggesting that the key messages gathered from the Bank's liaison with community organisations are likely to be representative of the economically disadvantaged group as defined in this article.

Recent Trends

The median, or typical, financial status of the economically disadvantaged group – and the gap between this group and the rest of the population – varies over time. Overall, economically disadvantaged households benefited from the relatively strong economic conditions in Australia between 2001 and 2008, with real incomes rising, on average, by 3½ per cent a year (Graph 1). In line with this improvement, the HILDA Survey shows that the share of these households reporting that they sought assistance from a community organisation declined by half over this period (to around 12 per cent) while the share reporting that they were experiencing financial difficulties fell by over one-third (to around 20 per cent; Graph 2).

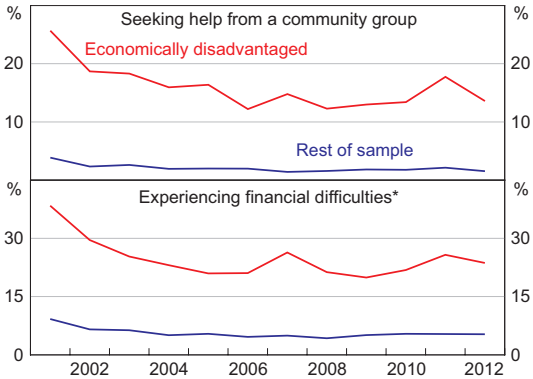
3 These data are presented in 'equivalised' form, which adjusts actual household income for its size and age composition, with the first adult receiving a weight of one, subsequent adults and children over 14 years a weight of 0.5 and children under 14 years a weight of 0.3. The lowest equivalised income quintile thresholds in 2011 and 2012 were $27 100 and $27 700, respectively; the lowest wealth quintile thresholds in 2002, 2006 and 2010 were $32 500, $43 000 and $53 200, respectively (2011/12 dollars). As a relative concept, the lowest income quintile threshold can in principle vary with the economic cycle but, in practice, there was little change in this threshold in Australia between 2009 and 2012.

Graph 1
Real Household Equivalised Income*
Median



* Measured in 2011/12 dollars
Source: HILDA Release 12.0

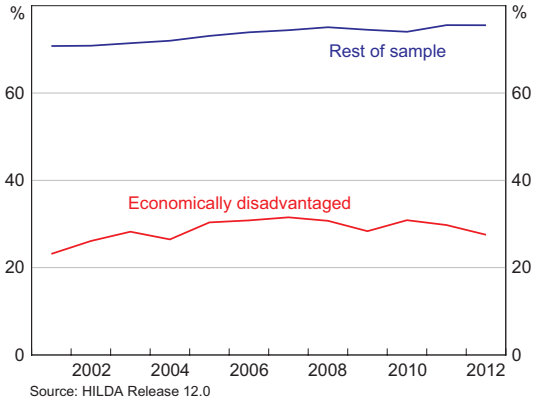
Graph 2
Disadvantage Measures
Share of households



* Share of respondents agreeing to at least three of the seven financial difficulties categories
Source: HILDA Release 12.0

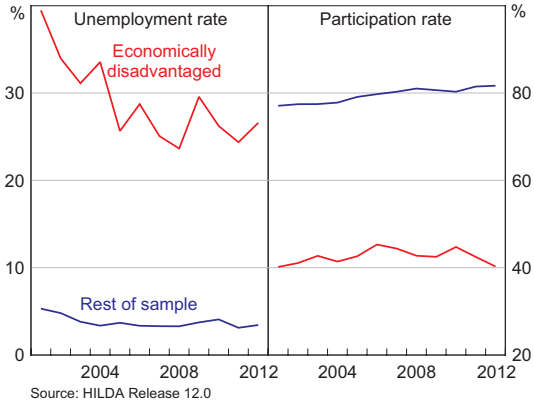
This improvement in conditions occurred alongside an improvement in labour market outcomes for the disadvantaged and the general decline in the national unemployment rate over this period, which fell from 6.8 per cent in 2001 to 4.2 per cent by 2008. The share of persons from economically disadvantaged households that were in employment increased significantly, and the large employment gap between the economically disadvantaged and the rest of the sample narrowed somewhat (Graph 3). Reflecting this, the unemployment rate for economically disadvantaged Australians fell by over one-third (to around 24 per cent) and there was a gradual rise in their participation rate (Graph 4). Since the onset of the global financial crisis, however, conditions for the economically disadvantaged have not continued to improve, and community organisations have reported an increase in the demand for their services, including for financial assistance and financial counselling.

Graph 3
Employment
Share of persons



Source: HILDA Release 12.0

Graph 4
Labour Market Outcomes



Source: HILDA Release 12.0

Dynamics within the Economically Disadvantaged Group

The HILDA data can also be used to examine the characteristics of people who tend to move out of – or remain in – economic disadvantage over time.[4] Around half (49 per cent) of those who were economically disadvantaged in 2005–06 were no longer in that category by 2011–12 as their income had increased above the lowest quintile threshold (Table 2).[5]

Community organisations report that employment status is an important, though not always sufficient, factor in determining whether a person remains economically disadvantaged over time. In line with this, the HILDA data indicate that three-quarters of those who moved out of disadvantage (35 percentage points of the overall 49 per cent) had either obtained or retained a job over this period. There is also some evidence that the longer someone has a job, the more likely he or she is to move out of economic disadvantage over time. Of those disadvantaged people who were employed in 2005–06, 80 per cent who still had a job in 2011–12 had moved out of disadvantage. The corresponding share for those who did not have a job in 2005–06 but had obtained employment by 2011–12 was smaller, at 65 per cent. Conversely, the biggest determinant of whether a person remained in economic disadvantage over the period was employment status, with 75 per cent of those not employed in either 2005–06 or 2011–12 remaining economically disadvantaged. The rest of

Table 2: Disadvantage Status in 2011–12

	Remained disadvantaged	Moved out of disadvantage
	Probability	Probability
Labour force status in 2011–12	Per cent	Per cent
For those disadvantaged in 2005 or 2006 (total sample)		
All	51	49
– Employed	12	35
– Unemployed	4	2
– Not in the labour force	35	12
For those disadvantaged and employed in 2005 or 2006 (31 per cent of total)		
All	33	67
– Employed	15	58
– Unemployed	4	1
– Not in the labour force	14	7
For those disadvantaged and not employed in 2005 or 2006 (69 per cent of total)		
All	62	38
– Employed	11	22
– Unemployed	5	2
– Not in the labour force	47	14

Source: HILDA Release 12.0; subcategories do not necessarily add to the total due to rounding

4 Persons who move into economic disadvantage are not discussed in this article.

5 Around one-quarter of the 49 per cent who moved out of economic disadvantage were students who completed their studies and moved into employment.

this section examines the typical characteristics of persons who found employment and those who did not become employed over this period.

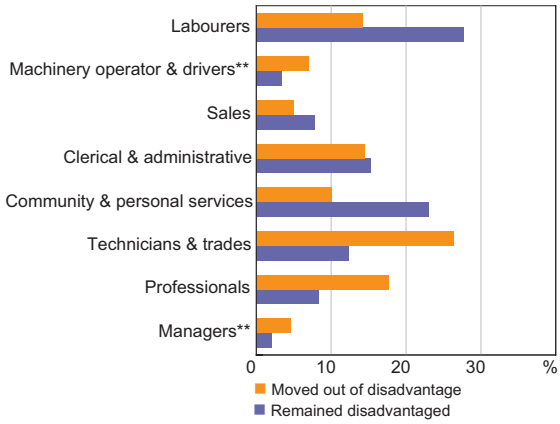
Characteristics of persons in employment

While employment is a key means of providing a path out of disadvantage, community organisations note that the type of job obtained is an important determinant of success in this regard. People who obtained a full-time job were more likely to move out of disadvantage than those who worked casual or part-time hours (Table 3).

Differences in the likelihood of moving out of disadvantage relative to remaining disadvantaged exist across industries. Those who found a job as a machinery operator, technician & tradesperson or as a professional were more likely to have moved out of disadvantage; many of them were students in 2005–06 (Graph 5). The opposite was true for those who found employment as labourers or community & personal service workers, which are industries that have a high proportion of casual and contract workers (Graph 6). The HILDA data show that around half of those who worked casual or part-time hours were available to work longer hours.

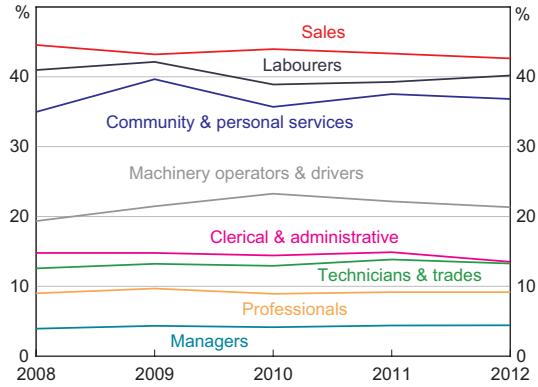
There is, however, some evidence that people who start in casual and part-time employment generally move to full-time employment and out of disadvantage over time. The HILDA data indicate that 70 per cent of those who had a casual or part-time job in 2005–06 were still employed in

Graph 5
Employment by Occupation*
Share of employment, 2011–2012



* For those disadvantaged and not employed in 2005 or 2006 and found employment in 2011–2012
** The remained disadvantaged sample has less than 10 people
Source: HILDA Release 12.0

Graph 6
Casual and Contract Workers by Occupation*
As a share of total employment by occupation



* Estimated by the number of workers without paid leave entitlements
Source: ABS

Table 3: Employment Characteristics
For those disadvantaged and not employed in 2005 or 2006

	Remained disadvantaged	Moved out of disadvantage
Employment status in 2011–12	Probability Per cent	Probability Per cent
Employed	11	22
– Full-time	2	13
– Part-time/casual	8	9
Of which: available to work more hours	4	3
Not employed	51	16

Source: HILDA Release 12.0; subcategories do not necessarily add to the total due to rounding

2011–12, and over 80 per cent that found full-time employment were no longer disadvantaged (Table 4). While 70 per cent of those who retained casual or part-time employment also moved out of disadvantage, obtaining a full-time job appears to have been more effective in this regard. Community organisations note that casual jobs tend to be concentrated in particular industries, suggesting that these employees are more likely to find non-casual employment if they change industries.

A person's job options depend in part on their skills and experience, with those having low skills and limited experience less likely to obtain higher-paying jobs that often require specialised skills and/or substantial experience. The economically disadvantaged tend to have low skills on some measures compared with the general population. In 2011–12, around 50 per cent of the economically disadvantaged did not complete high school, compared with around 25 per cent for the full HILDA sample. Furthermore, comparing the education and experience of the economically disadvantaged who found a job and those who did not highlights the importance of a person's skills. Those who had moved out of economic disadvantage by 2011–12 typically had more education and more experience, having spent a greater share of their working-age life in employment (Table 5). Community organisations note that low skills are especially problematic for older workers.

Characteristics of persons not in employment

The persistence of economic disadvantage is especially pronounced for those not in employment. Community organisations report three interrelated

Table 4: Type of Employment over Time
For those disadvantaged and employed in part-time or casual work in 2005 or 2006

	Remained disadvantaged	Moved out of disadvantage
Employment status in 2011–12	Probability Per cent	Probability Per cent
Employed	18	53
– Full-time	5	26
– Part-time/casual	12	27
Not Employed	21	9

Source: HILDA Release 12.0; subcategories do not necessarily add to the total due to rounding

Table 5: Education Level and Years of Experience[(a)]
For those disadvantaged and not employed in 2005 or 2006

	Remained disadvantaged		Moved out of disadvantage	
Labour force status in 2011–12	Education index	Experience index	Education index	Experience index
Employed	2.3	0.4	2.4	0.5
– Full-time	2.3	0.5	2.6	0.5
– Part-time/casual	2.3	0.4	2.1	0.5
Unemployed	2.0	0.3	2.3	0.4
Not in the labour force	1.8	0.3	1.8	0.4

(a) Education: 1 – did not finish year 12; 2 – finished year 12; 3 – certificate (equivalent to TAFE); 4 – bachelor or diploma; 5 – PhD or master's degree; experience: proportion of working life (15 years+) spent in paid work; data are averages
Source: HILDA Release 12.0

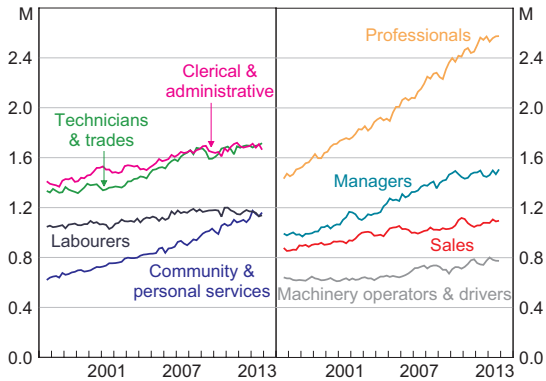
factors that can explain why people tend to remain unemployed or economically inactive over time: unavoidable job turnover, especially for those in casual employment; limited job opportunities for low-skilled workers to enter or re-enter employment; and structural barriers that reinforce the cycle of economic disadvantage.

Higher risk of unemployment and limited employment opportunities

Community organisations note that the economically disadvantaged have a higher level of job turnover than the rest of the employed population. The HILDA data show that while the probability of being retrenched or laid off for the economically disadvantaged was broadly similar to that for the rest of the sample, the disadvantaged were around five times more likely to leave a job for personal reasons such as illness or to care for someone (Table 6). In addition, nobody from an economically disadvantaged household reported in the HILDA survey that they ended their employment to obtain a better job, highlighting their concerns regarding employment prospects.

Faced with a high level of job turnover, community organisations report that the ongoing structural change within the Australian economy – combined with the recent below-trend growth of activity – has reduced the demand for relatively low-skilled jobs. Since 2008, there has been little growth in employment in occupations where economically disadvantaged persons are typically employed – such as labourers, technicians & trades workers and clerical & administrative roles – although there has been a rise in community services employment (Graph 7). Furthermore, community organisations report a decline in the number of apprenticeships and trainee programs, making it more difficult for younger disadvantaged persons to acquire skills that could improve their employment prospects.

Graph 7
Employment by Occupation
Seasonally adjusted



Sources: ABS; RBA

According to the HILDA Survey, one-third of the disadvantaged who were unemployed in 2011–12 were long-term unemployed. It is also likely that others who had been unemployed for a long time had become discouraged and were no longer actively seeking employment. Research suggests that long-term unemployment leads to a depreciation of skills (Sen 2000), reduces social networks (Horn, Scutella and Wilkins 2011), and has adverse consequences in terms of health outcomes and life satisfaction (McLachlan, Gilfillan and Gordon 2013), all of which impede the task of finding employment.

Table 6: Unemployment Characteristics
Share of unemployed sample in 2011–12, per cent

Main reason for stopping work	Economically disadvantaged	Rest of sample
Retrenched or laid off	27	31
Own illness/looking after others	19	4
Obtain a better job	0	4

Source: HILDA Release 12.0

In addition, the deterioration in labour market conditions since the global financial crisis, particularly for lower-skilled occupations, has resulted in a greater proportion of the resources available for employment services being absorbed by short-term unemployed clients, leaving fewer resources to assist those requiring more intensive services. Many community organisations provide employment programs in partnership with Job Services Australia. Within these programs, a client is categorised into one of four 'streams' based on their skill level, work experience and the level of support they require.[6] In a weaker labour market, it is relatively easier for those in the higher streams (streams one or two) to find employment compared with those in streams three or four who generally require services in addition to employment support. Community organisations note that the lower category streams (three or four) have a higher proportion of long-term unemployed, young people and Indigenous Australians.

Structural barriers to employment

In addition to fewer employment opportunities, community organisations identify a range of entrenched structural barriers to labour force participation that are prevalent among the economically disadvantaged. These include:

- *Housing instability.* In 2011–12, spending on housing and utilities accounted for close to 40 per cent of total disposable income for the economically disadvantaged, almost double the share of total disposable income spent on housing and utilities by the rest of the HILDA sample. Low levels of disposable income reduce the ability to pay housing costs and to build a financial safety net against adverse outcomes. As a consequence, those economically disadvantaged who need to find alternative housing find it more difficult to sustain employment while searching for affordable housing, especially given the limited supply of social housing.
- *Large geographical distance between affordable housing and job markets.* Many low-skilled roles (such as carer and hospitality roles) are located close to city centres, some distance from affordable housing locations. Disadvantaged people reliant on public transport are therefore often limited by the type and location of jobs available to them, especially in rural and remote communities.
- *Limited access to technology.* Limited access to technology can make it harder to search for employment. The HILDA Survey shows that this is particularly the case for the economically disadvantaged; around half of those not in the labour force did not have internet access at home.
- *Intergenerational unemployment.* According to community organisations, children who grow up in jobless households typically understand less about how to participate in the labour market and how to find and apply for jobs. The HILDA data suggest that, if a parent was unemployed for a period of six months or more when their child was growing up, the child's likelihood of being employed in adulthood is reduced (Hérault and Kalb 2009).
- *Disability.* Community organisations note that, historically, employers have been reluctant to hire workers with a disability, perceiving that they could pose a risk to other workers or that the business would incur additional costs. Even so, a growing number of employers are now including people with a disability in their recruitment and graduate programs. Another barrier arises because some people with a disability cannot afford the medical devices they require to be able to enter the workforce. This can result in a situation where they need a job to pay for the required equipment, but cannot obtain a job without it.

6 For example, someone categorised into stream one will be assisted in putting together a resume, searching for a job, assessing skills and mentoring, while someone categorised into stream four will be allocated a caseworker and receive more intensive support.

- *Health issues.* Many economically disadvantaged persons find it more difficult to participate in employment due to mental health issues and/or a range of other long-term health and personal issues. Community groups note that providing support to overcome these issues can be a costly and time-intensive process.
- *Marginal financial benefit to working.* Given the additional financial costs associated with after-school and dependent adult care if the main caregiver takes up employment, and the high marginal effective rates of taxation on labour income they face as welfare assistance tailors off, several community organisations note that the net financial gain for economically disadvantaged persons finding employment in low-income, casual jobs can be limited. Similar issues are raised in the Productivity Commission's report into disadvantaged persons (McLachlan *et al* 2013).

Conclusion

The conditions faced by Australians experiencing economic disadvantage improved in the years leading up to the global financial crisis, aided by generally strong economic conditions, though conditions have deteriorated somewhat since then. Nonetheless, taking the period as a whole, there has been an increase in full- and part-time employment for some people in this group, which community organisations and the HILDA data indicate can be an important pathway out of disadvantage. However, low initial skill levels, a lack of experience, declining low-skilled employment opportunities within the economy and a range of other structural barriers pose significant impediments to obtaining and retaining employment for many economically disadvantaged people. Addressing these challenging issues remains a central focus for many of the community organisations that the Bank is in contact with via its liaison program.

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Inflation and the Cost of Living

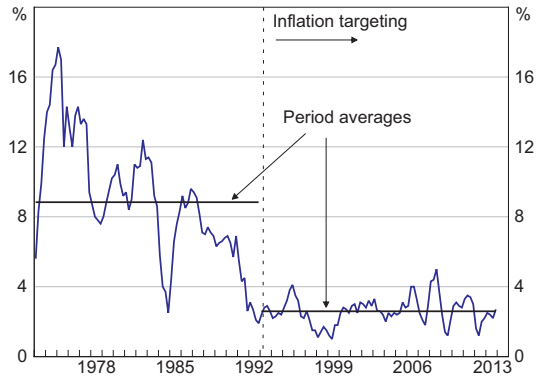
David Jacobs, Dilhan Perera and Thomas Williams*

This article looks at increases in the cost of living for Australian households over the past decade. Inflation as measured by changes in the consumer price index (CPI) overstates 'true' increases in the cost of living due to a number of inherent conceptual differences and measurement issues. Even so, other measures of the cost of living have increased by a similar amount to the CPI over the past decade. Measured inflation has been higher for some households and socio-economic groups than for others, though the differences have generally not been large and have tended to even out over time. Although cost-of-living inflation has been moderate across most households, there are a number of reasons why some households might have perceived inflation to be higher than it actually was.

Introduction

A significant concern for many households is the expense they incur to buy the goods and services that are necessary to maintain a certain standard of living – that is, their 'cost of living'. The prices of many of these items tend to rise over time, which places upward pressure on the cost of living. The CPI, which measures inflation in prices, is often used to assess changes in the cost of living. Over the past decade, the CPI has increased by around 30 per cent, averaging around 2¾ per cent per year. This pace of increase has been consistent with the Reserve Bank's target of keeping CPI inflation between 2 and 3 per cent per year, on average, over the business cycle. This rate of inflation has also been low compared with that in the two decades prior to the Reserve Bank's adoption of an inflation target (in 1993), when CPI inflation averaged nearly 10 per cent a year (Graph 1).

Graph 1
CPI Inflation*
Year-ended



* Excludes interest and the tax changes of 1999/2000
Sources: ABS; RBA

However, the CPI is not an ideal measure of changes in the cost of living. In very broad terms, cost-of-living inflation means the increase in household spending needed to maintain a constant standard of living.[1] The CPI is a measure of the price of a *fixed basket of goods and services*, with unchanged composition and quality over time. This approach is relatively practical and gives the CPI certain properties that make it attractive as a target for monetary policy.[2] However, there are several reasons why the CPI might not fully reflect household concerns about cost-of-living inflation. In particular, this article addresses three key questions about using the CPI as a measure of increases in households' cost of living:

* The authors are from Economic Analysis Department.

1 The 'standard of living' can be thought of as the utility that a household derives from consuming goods and services.

2 Because the CPI is based on a fixed basket, it provides a measure of 'pure' price changes, unaffected by compositional change, and it is a good gauge of the extent to which spending is running above or below the economy's production capacity.

- How closely does the CPI reflect cost-of-living inflation? While there is no perfect measure of cost-of-living inflation, a number of alternative measures are available.
- How different is inflation across households? The CPI, together with alternative indices, measures the average rate of inflation across households. But the rates of inflation for individual households are dispersed around the average, because consumption baskets differ and not all prices increase at the same rate.
- What factors might affect households' perceptions of inflation? While the CPI is calculated from a very large number of prices (around 100 000 each quarter), individuals have much less information with which to assess the general rate of inflation. Accordingly, measured inflation may not align with perceptions of inflation from the standpoint of households.[3]

The CPI and Cost-of-living Inflation

The CPI is designed to measure inflation in the prices of household goods and services. While the rate of inflation in prices is likely to be similar to that in the cost of living, there may also be some differences. In addition, there are some constraints to measuring CPIs in practice, both in Australia and internationally, that might affect the measured rate of inflation. Accordingly, CPI inflation may be expected to differ from cost-of-living inflation in a predictable way. These issues are relatively complex, so a full treatment is presented in Appendix A (also see ABS (2011)). However, three aspects are particularly important:

- *Substitution bias*. Consumers will try to lessen the impact of price increases on their cost of living by shifting their spending from higher inflation to lower inflation items. The CPI does not capture much of this behaviour because it is based on a fixed basket (at the 'upper level'; see Appendix A)that is updated every six years or so. This results in an upward 'substitution' bias relative to cost-of-living inflation. The Australian Bureau of Statistics (ABS) estimates that this bias has been around ¼ percentage point per year since 2000 (ABS 2011). Similarly, consumers' efforts to shop around between outlets to obtain the best price are not fully captured in the CPI. This can result in a further upward bias, which may have become larger in recent years owing to the increased prevalence of online shopping (RBA 2011).
- *Incomplete quality adjustment*. The quality of goods and services tends to improve on average over time, helping to lift living standards. If prices increase in line with quality, then the cost of living is unchanged, while if prices are unchanged but quality improves, then the cost of living has declined.[4] Therefore, recorded prices need to be adjusted downward to account for the effect of quality improvements. The ABS performs explicit quality adjustments for items such as personal computers, which tend to have large quality improvements over time and have easily measureable characteristics. However, for certain items, it is particularly difficult to measure quality and therefore to adjust for improvements. This is true of services such as health and education, where the quality changes are less tangible than for many goods. Where quality is more difficult to assess, CPI inflation can potentially reflect an element of quality improvement, which is not a genuine rise in the cost of living. In other words, in this case CPI inflation can overstate cost-of-living inflation.
- *Treatment of housing*. One of the most challenging items to measure in the CPI is the price of living in a dwelling that is owned by the occupant (as opposed to rented). The CPI takes the approach of evaluating the price of buying a newly built, free-standing house (excluding the cost of the land). Changes in the price of established housing are not taken into account, as these largely reflect changes in the value of an asset (land) and, moreover, the purchase of existing housing

3 For previous analysis of these issues, see Phillips, Li and Taylor (2012).

4 More precisely, price increases will be offset by increases in consumer utility resulting from improvements in quality (see Appendix A).

represents a transfer *within* the household sector (which means that there is zero net expenditure by the household sector in these transactions). This approach is appropriate given that the CPI is used as a target for monetary policy (see ABS (2010)). However, two alternative approaches are possible. One is to measure the cost of servicing a mortgage on the property, which might align more closely with households' perceptions of their expenses. A more difficult alternative is to recognise that, by living in dwellings, owners are effectively renting properties from themselves; in this case, an 'imputed' rent must be estimated.[5]

A large body of academic research has estimated the effect of these factors on the rate of inflation as measured by the CPI, both in Australia and internationally (Table 1; Appendix A). Some of the factors are likely to push CPI inflation higher and others lower, and their relative importance is likely to change over time. However, the overall effect is likely to be positive, meaning that CPI inflation would generally be expected to *overstate* cost-of-living inflation.

Several other measures of inflation are available that provide an alternative means of assessing increases in the average cost of living. These measures are constructed differently from the CPI, and so are affected differently by the biases discussed above. Generally speaking, they are also closer in concept to a measure of cost-of-living inflation as opposed to price inflation (see ABS (2011)). The national accounts use a measure called the *household final consumption expenditure chain price index* (HCPI). This measure should be less affected by substitution bias than the CPI (as it is reweighted each year) and it measures the price of owner-occupied housing as implied rent. The ABS also publishes *analytical living cost indices* (ALCIs); these measure the price of owner-occupied housing on the basis of mortgage interest payments. The ALCIs are only available for specific household types, and the ABS does not publish an aggregate measure. However, an aggregate measure over different household types is produced by the National Centre for Social and Economic Modelling (NATSEM).[6]

Despite their different approaches, and some temporary deviations, these measures have risen by similar amounts over the past decade or so. The three measures all indicate inflation in the range of 33–36 per cent over the period since 2003 (Graph 2). So, while the CPI is subject to certain biases when used to assess cost-of-living inflation, these have either tended to even out over a long period of time or have been present in other measures to a similar degree.

Table 1: Biases in CPI Inflation as a Proxy for Cost-of-living Inflation
Percentage points per year

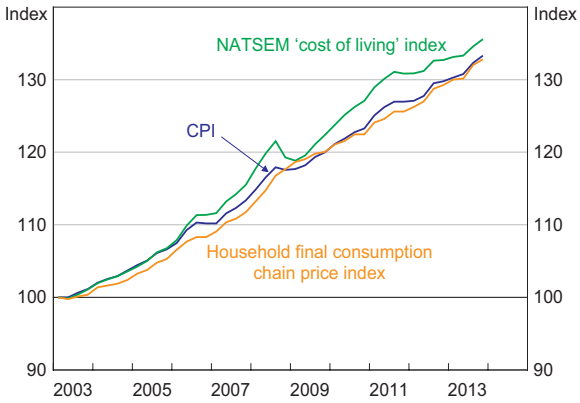
Source of bias	Estimated effect on CPI inflation relative to 'true' cost-of-living inflation[(a)]
Substitution bias	+¼ to +½
Incomplete quality adjustment	+0 to +½
Treatment of housing[(b)]	– (+) when mortgage interest rates rising (falling)

(a) Positive figure indicates that factor pushes up CPI inflation; range of estimates based on studies of both Australian and international CPI inflation
(b) 'Acquisitions approach' relative to 'outlays approach'; see Appendix A
Sources: see Appendix A

5 None of these measures perfectly captures the issue of housing affordability, which is indicative of the complexity of this issue. For example, increases in new or established dwelling prices affect housing affordability for prospective first home buyers, but have little impact on affordability for those who have a mortgage. On the other hand, changes in interest rates can influence affordability for both aspiring home buyers and those with a mortgage.

6 For details of this measure, see Phillips, Li and Taylor (2012).

Graph 2
Price Indices
March quarter 2003 = 100



Sources: ABS; NATSEM; RBA

Inflation for Different Households

Inflation rates vary across households due to different spending patterns and because not all prices increase at the same rate. As a result, the official aggregate measures will only approximate cost-of-living inflation for many households. At any given time, roughly half of households will have experienced inflation somewhat above the average for all households, because they spent proportionately more on high-inflation items, while the other half will have experienced inflation below the average, because they spent proportionately more on low-inflation items.[7] In addition, a household's consumption basket is usually influenced by certain socio-economic characteristics, such as income, housing tenure or demographics, resulting in differences in cost-of-living inflation between certain socio-economic groups.

Two main data sources are available that permit an analysis of the distribution of inflation across households:

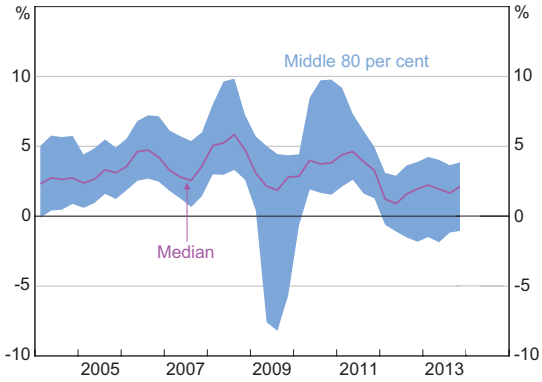
- The ALCIs published by the ABS measure cost-of-living inflation across households according to their main source of income, with inflation measured for employees, age pensioners, recipients of other government transfers and self-funded retirees. But to examine differences in inflation at the more granular level of individual households, or to look at differences on the basis of other household characteristics, a different data source is needed.
- To construct the data needed for this additional analysis, we make use of individual responses to the Household Expenditure Survey (HES). The HES collects information from a sample of around 10 000 households and is conducted every five or six years, with the results used by the ABS in calculating the ALCIs as well as the CPI. For each respondent household in the HES, we calculate an inflation rate by combining information from the HES on that household's reported consumption basket and state of residence, together with CPI inflation data disaggregated by expenditure class and capital city. In addition, we use demographic data available for each household in the HES to construct average cost-of-living inflation for different socio-economic groups. These groups are defined by several characteristics: housing tenure, level of income, family structure, age of reference person and location. For this exercise, inflation in owner-occupied housing costs is measured on the basis of mortgage interest payments (in line with the ALCIs) rather than the cost of new dwellings (as used in the CPI). For further details on the construction of these data, see Appendix B.

Short-term differences

Based on the data constructed using the HES, the distribution of inflation rates across households looks to have been fairly narrow over the past decade. In most years, less than 5 percentage points have separated the inflation rates of the middle 80 per cent of capital city households (Graph 3). At times, the distribution has widened and become 'skewed', because a group of households experienced well above-average or well below-average inflation. A major driver of these short-term differences in inflation across households has been interest rate movements, which tend to have a large influence on

7 The share of households with inflation above and below official aggregate measures will not be exactly half, because households are weighted according to spending in the construction of these measures and because the distribution of inflation among households can be skewed. Also, a household experiencing above-average inflation one period may experience below-average inflation the next.

Graph 3
Distribution of Cost-of-living Inflation*
Year-ended

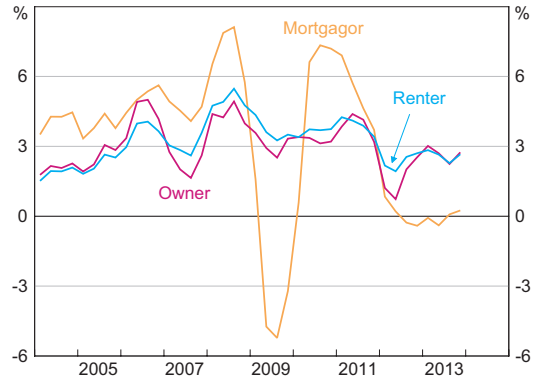


* Shaded area shows the middle 80 per cent of capital city households ranked by year-ended inflation rates in each quarter
Sources: ABS; RBA

living costs for the roughly one-third of households with a mortgage. In contrast, for households that rent or own their home outright, mortgage rates do not directly affect their cost of living. As a result, when interest rates have risen, households with mortgages have tended to face higher cost-of-living inflation than other households (Graph 4). And when interest rates have fallen, such as over the past two years, mortgagor households have experienced lower inflation than other households, with the cost of living even falling for some.

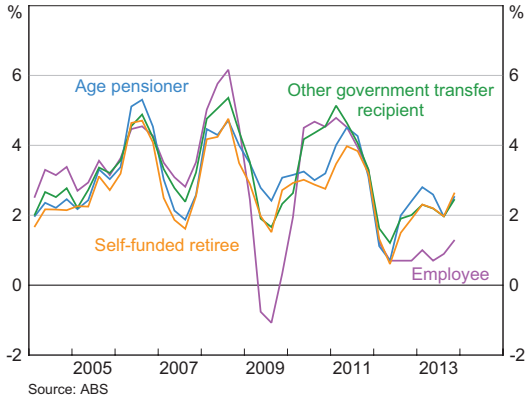
Differences in cost-of-living inflation across households that have different sources of primary income can also be largely explained by changes in mortgage rates, at least in the short-term. Households for which employment is the main source of income are more likely to have a mortgage. So, according to the ABS' ALCIs, changes in mortgage rates have had a relatively large effect on cost-of-living inflation for these employee households (Graph 5). In contrast, self-funded retirees, pensioners and other government transfer recipients are all less likely to have mortgages, so their cost of living is less affected by interest rates.

Graph 4
Cost-of-living Inflation by Housing Tenure
Year-ended



Sources: ABS; RBA

Graph 5
Cost-of-living Inflation by Source of Income
Principal source of household income, year-ended



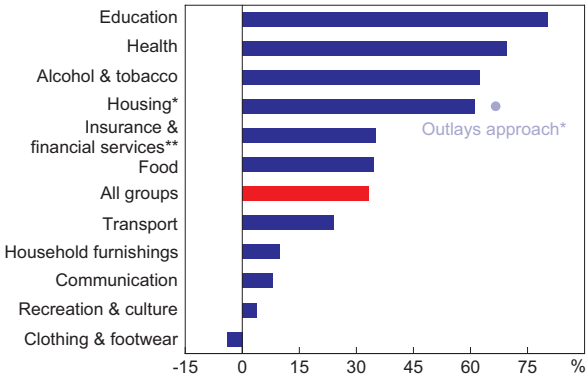
Source: ABS

While cycles in interest rates have been the main source of differences in cost-of-living inflation between households over periods of a year or so, over a longer horizon these influences have largely evened out. Accordingly, differences in cost-of-living inflation across households over a longer period of time have reflected other aspects of their spending patterns, together with longer-term differences in the rates of inflation across the basket of consumption items.

Long-term differences

Looking over a longer horizon, there have been large differences in the rate of inflation for different goods and services in the CPI. Over the past decade or so, services such as education, health care and utilities have seen prices rise by more than the overall rate of CPI inflation (Graph 6). Other items have experienced inflation below overall CPI inflation and for some

Graph 6
Relative Price Movements
By CPI expenditure group, cumulative change since 2003



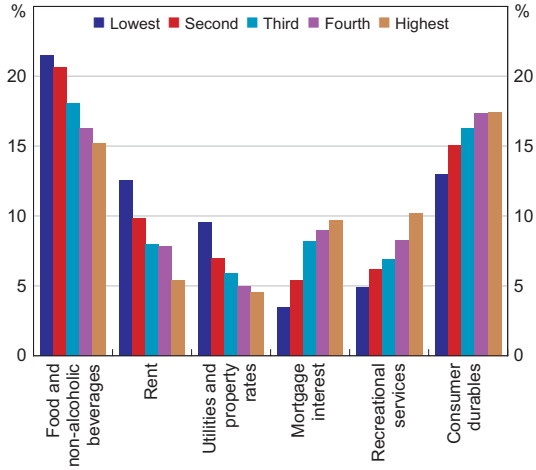
* Bar includes owner-occupied housing calculated using the acquisitions approach (i.e. the cost of new dwellings excluding land); dot includes owner-occupied housing using the outlays approach (i.e. the cost of servicing a mortgage)
** Excluding indirect deposit and loan facilities
Sources: ABS; RBA

consumer durables, including clothing, footwear, and audio, visual & computing equipment, prices have even declined. These goods are manufactured and often imported, with declines in prices having reflected significant improvements in productivity, sourcing from low-cost economies (particularly in Asia), the appreciation of the exchange rate over the past decade and intense retail competition (both domestically and, for some items, from overseas online stores).

Despite these large differences in inflation across items, differences in cost-of-living inflation among different groups in society have been fairly small over the past decade. As explained above (and in Appendix B), we use HES data to construct average inflation rates over a range of household characteristics – level of income, source of income, housing tenure, family structure, age and location. The differences in inflation for different groups, as defined by these characteristics, have cumulated to no more than around 6 percentage points over the past decade (Table 2). That is, for all groups, cost-of-living inflation has not differed much from the average pace captured by the CPI or other measures of aggregate inflation because, while inflation has varied markedly among different items, the consumption bundles of different households are fairly similar.

There have been differences in inflation for households with different levels of income. Over the past decade, low-income households have experienced slightly higher rates of inflation than high-income households. Low-income households tend to spend proportionately more on items that are relatively 'essential' in their nature, particularly housing and food, which has resulted in them being more exposed to relatively large increases in utility prices over this period (Graph 7). In addition, high-income households spend proportionately more on items that are relatively 'discretionary', such as recreation and consumer durables. They have consequently benefited more from the relatively slow pace of inflation in items such as motor vehicles, overseas travel and clothing over this period. [8]

Graph 7
Basket by Household Income Quintile*
Selected expenditure categories, share of living costs



* Equivalised disposable household income from 2009/10 Household Expenditure Survey; capital city households
Sources: ABS; RBA

Inflation reduces the amount of goods and services that can be bought with a given level of household income – that is, by itself it reduces 'real' incomes. So the slightly higher rate of inflation for low-income households over the past decade has weighed more on the growth in their real incomes than has been the case for high-income households. However, this

8 Working in the other direction, high-income households are more likely to have a mortgage, which has added to their inflation, as average interest repayments on houses have risen faster than rents, in line with rising house prices over this period.

Table 2: Inflation by Household Characteristic[a]

Per cent

	Share of households	Cumulative inflation since 2003
Disposable income		
Lowest quintile	20	39
2nd	20	36
3rd	20	35
4th	20	36
Highest quintile	20	35
Principal source of household income[b]		
Wages and salaries (employees)	65	33
Age pension[c]	10	36
Other government transfers	10	38
Property income incl superannuation (self-funded retirees)	5	32
Housing tenure		
Mortgagor	38	36
Owner	31	36
Renter	29	38
Family structure		
Family with dependent children	33	35
Family without dependent children, head aged under 45	13	34
Family without dependent children, head aged over 45	26	35
Lone person or non-family group household	28	39
Age of household reference person		
15–24	4	35
25–34	19	36
35–44	21	36
45–54	21	36
55–64	17	36
65+	19	37
Area of residence		
Adelaide	6	36
Brisbane	9	37
Hobart	1	33
Melbourne	18	37
Perth	8	37
Sydney	20	35
ACT or NT	2	37
Outside state capital cities and territories	36	36

(a) Period from December quarter 2003 to December quarter 2013; share of households calculated across capital city households in 2009/10, except where otherwise stated

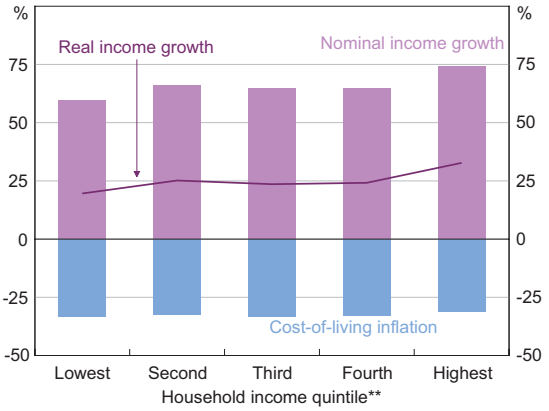
(b) As published in the ABS' ALCIs; these are calculated on a plutocratic basis (with households weighted by their expenditure) and are therefore not directly comparable to the other cost-of-living inflation rates presented here, which are calculated by the RBA on a democratic basis (with households weighted evenly); weights do not add to 100 per cent as classifications are not exhaustive

(c) Also includes veterans' affairs pension

Sources: ABS; RBA

difference has not been large, with inflation for the lowest income quintile only around 4 percentage points more than the highest income quintile over the course of a decade. Accordingly, it has still been the case that nominal income growth has outstripped increases in the cost of living; that is, real incomes have increased for all income groups (Graph 8). Moreover, differences in real income growth between groups have primarily reflected differences in nominal income growth, rather than differences in inflation.

Graph 8
Real Income Growth*
Cumulative change between 2003 and 2011

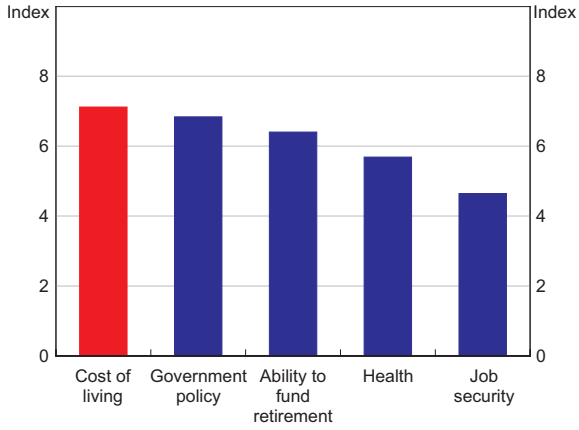


* Components may not add to total due to interaction effect
** Households sorted by nominal equivalised disposable household income
Sources: NATSEM; RBA

Perceptions of Inflation

According to a range of measures, cost-of-living inflation has been moderate and consistent with the RBA's target for CPI inflation over the past decade. In addition, differences in inflation across different household types have not been large. Nonetheless, the cost of living is a source of significant concern for households (Graph 9). This is likely to reflect concerns about both the level of prices and the rate of inflation. One factor that may contribute to these concerns is perceptions of inflation. Households may perceive inflation to be higher than measured inflation, either due to biases in their perceptions or because they interpret the cost of living differently from the standard statistical measures.

Graph 9
NAB Consumer Anxiety Index*
2013 average



* 0 = not at all concerned, 10 = extremely concerned
Source: NAB

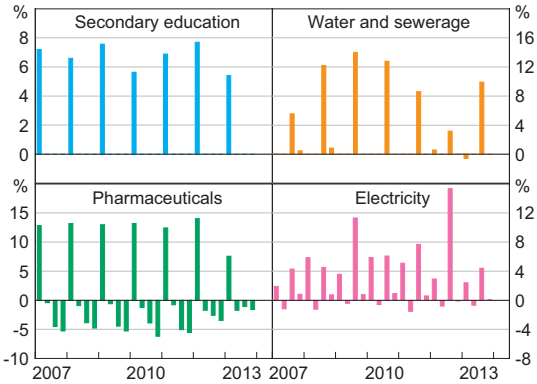
Psychological biases

The CPI uses extensive survey data on price movements and the weights of different items in consumers' baskets. By comparison, individuals have substantially less information on economy-wide prices and their relative importance. Research in Australia and internationally has found that individuals tend to place a greater weight on:[9]

- *prices that have risen, rather than fallen*. This is in line with the finding that people are 'loss averse', and so would prefer no change in prices to two offsetting price changes – either in the same item over time or in different items in the basket at the same point in time.
- *larger price changes, particularly those that change periodically rather than smoothly*. Consumers tend to take more note of prices that increase only once or twice each year (such as many administered prices like utilities, education and pharmaceuticals), rather than smoothly throughout the year (Graph 10). In the quarter that these periodic changes occur, their magnitude is typically much larger than price changes that are spread more evenly

9 This is referred to as 'availability bias'. For further discussion, see Tversky and Kahneman (1974), Bates and Gabor (1986), Fluch and Stix (2005), Jungermann *et al* (2007), Brachinger (2008), Ranyard *et al* (2008) and Bruine de Bruin, van der Klaauw and Topa (2011).

Graph 10
Consumer Price Inflation by Item
Non-seasonally adjusted, quarterly



Sources: ABS; RBA

throughout the year. In recent years many of these administered items have also experienced higher rates of inflation than the overall CPI.

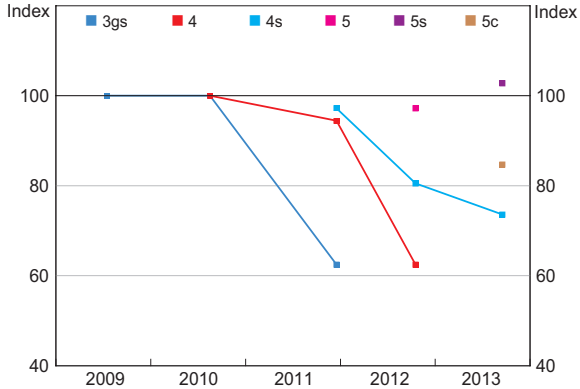
- *prices for items that are purchased frequently.* These include food and fuel, which have volatile prices, with periods of large price increases as well as decreases. In contrast, consumer durables such as computers and motor vehicles are purchased less frequently, and have declined in price (partly through improved quality) over the past decade.

Quality adjustment

While statistical measures of inflation are adjusted for changes in quality (where possible), it is difficult for individuals to adjust for quality changes when observing inflation. Recent advances in smartphone technology provide a case in point. Progressive releases of new iPhone models in recent years have been priced similarly; an individual could easily conclude that prices have been little changed, as it is difficult to determine what value to place on the improved features of newer models. However, a rough estimate of the improvement in value from improvements along dimensions such as processing speed, screen quality, etc, can be found by comparing the price of an iPhone 4 a few years after its release with that of the newer model, and adjusting for differences in storage capacity. This comparison suggests an effective price decline of around 35 per cent between 2010 and 2012 (Graph 11).[10]

More generally, items with large improvements in quality (and therefore value for money) have subtracted substantially from the pace of CPI inflation. An upper estimate of the size of this effect can be seen from excluding several items that have seen particularly large quality improvements – audio, visual & computing equipment, household appliances and motor vehicles. While other factors have also contributed to measured price falls for these items, together they have subtracted around ½ percentage point each year from the rate of aggregate inflation since 2003.

Graph 11
iPhone Prices*
By model, 3gs price in July 2009 = 100



* iPhone is a trademark of Apple Inc., registered in the U.S. and other countries; prices are adjusted to account for differences in storage capacity

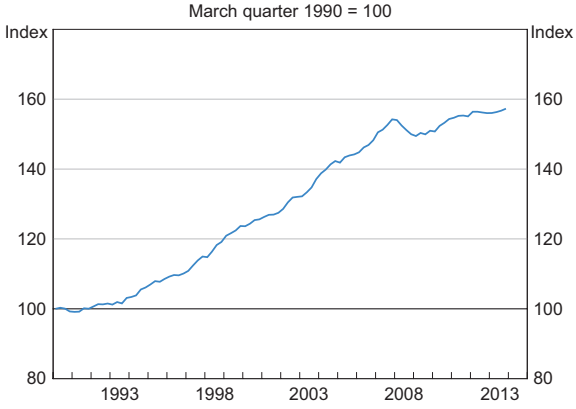
Sources: Apple; RBA

Changes in 'reasonable' living standards

Over time, individuals may not compare the cost of achieving the *same* standard of living, but rather that of a 'reasonable' standard of living. Real consumption per person has risen substantially over time, indicating that living standards have increased (Graph 12). Thereby, it is likely that the notion of

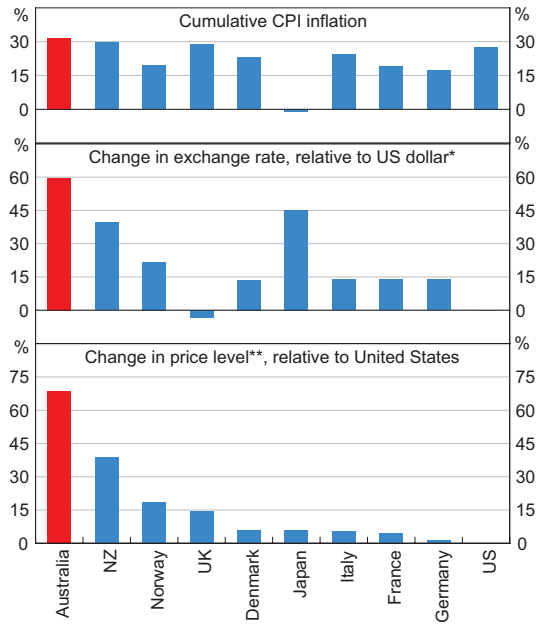
10 This figure of 35 per cent is calculated as the difference between the iPhone 4 price in 2012 and the price of the newly released iPhone 5 at the same point in time. All prices are adjusted for differences in storage capacity, as Apple generally only offers the older models in smaller storage capacities than the latest model. iPhone is a trademark of Apple Inc., registered in the United States and other countries.

Graph 12
Real Household Consumption per Capita
March quarter 1990 = 100



Sources: ABS; RBA

Graph 13
International Price Levels
2003–2012



* Positive number represents appreciation relative to US dollar
** Relative price levels are calculated as the ratio of PPPs for private final consumption expenditure to exchange rates; these numbers cannot be derived from the data in the top and middle panels
Sources: OECD; RBA

what is a reasonable standard of living has also increased, as households have become accustomed to consuming more goods and services and those of a higher quality. As a result, perceived increases in the cost of living may partly reflect the cost of attaining a *higher* standard of living for many households. There is also evidence that individuals' perceptions about their wellbeing are formed not purely in absolute terms, but partly by comparing themselves with those around them – colloquially termed 'keeping up with the Joneses' (Guven and Sørensen 2011).

International comparisons

Perceptions of the increase in the cost of living in Australia can also be affected by changes in the price of items in Australia relative to overseas. Over the past decade, prices in Australia have risen relative to those in many other developed economies when converted to a common currency, owing mainly to the appreciation of the Australian dollar over this period (Graph 13).[11] The increasing use of online shopping has also made overseas prices more visible than previously.

This rise in relative prices in Australia does not represent an increase in the cost of living for Australians. In fact, the appreciation of the exchange rate has also seen Australian incomes, paid in Australian dollars, rise relative to those of many other developed economies.

11 Australia has also had higher average inflation than most of these countries in recent years, owing to a slightly higher inflation target and generally better economic outcomes, which has meant that Australia has not undershot its inflation target like many other countries have since the global financial crisis.

Conclusion

On balance, the CPI has provided most households with a good gauge of the extent to which living costs have increased over time. According to the CPI and other measures, inflation has been moderate and consistent with the Reserve Bank's target for CPI inflation over the past decade. As would be expected, some households have experienced a rate of inflation above or below these aggregate measures. But such differences have not been particularly large and have mainly reflected changes in interest rates in the short term, as these have a greater effect on living costs for mortgagor households. However, over longer horizons, the effects of interest rate movements have tended to wash out and inflation rates across different groups in society have been similar. To the extent that differences have occurred,

these may have been specific to the time period considered and do not suggest that groups that experienced higher-than-average (or lower-than-average) inflation will continue to do so in the future.

Even though the CPI has been found to be a good proxy for increases in living costs for the bulk of households, the cost of living remains a concern for many in the community. This is despite nominal incomes generally having risen by more than the cost of living for all income groups, which suggests that spending should be less constrained by incomes than was the case a decade ago. The continued concern about living cost pressures might arise because the standard of living that can be sustainably afforded by households' incomes remains lower than many would like. Alternatively, it may be that many households perceive that their inflation has been higher than the measured rate over time, reflecting the inherent difficulty of assessing the rate at which the general price level has increased.

Appendix A: Biases in CPI Inflation as a Proxy for Cost-of-Living Inflation

This appendix expands on the discussion of potential biases in CPI inflation when used as a proxy for cost-of-living inflation. These biases reflect the conceptual basis of the CPI as a measure of inflation in the prices of goods and services, rather than of inflation in the cost of living, as well as practical issues of measurement. They are well known and are similar both in Australia and internationally. For further details, see ABS (2011). The following papers provide estimates of the potential magnitude of these biases: Boskin *et al* (1996); Cunningham (1996); Gordon (2006); Hoffman (1998); and Sabourin (2012).

Substitution bias

Because the CPI is based on a fixed basket, which is revised only every six or so years, it does not fully capture the moderating influence of substitution on the cost of living, biasing CPI inflation upwards. For example, if the price of beef increases by more than the price of fish, then consumers are likely to consume more fish and less beef. This bias is referred to as *upper-level substitution bias*, so-called because the CPI basket is fixed with respect to broad, upper-level groupings of goods and services (called expenditure classes).[12] One way in which this bias can be reduced is to update the basket more frequently, such as by using electronic transaction data from retail outlets. Such an approach has been implemented by some overseas statistical agencies (Ivancic 2010). The ABS is planning to introduce transaction data in the construction of the CPI (ABS 2013). In the first instance this will involve replacing prices collected 'in the field' with prices derived from transaction data, although in the future these data may be used for more frequent updating of the weights (below the expenditure class level) used in the index calculation.

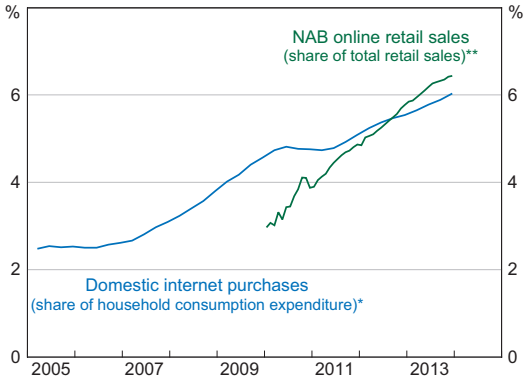
A related bias arises from consumers' ability to shop around between outlets. If consumers buy an item from an outlet with a lower price, the CPI is unaffected; the price difference is assumed to reflect service or convenience. However, over time some outlets may offer a genuine saving to consumers. The result is an *outlet substitution bias* whereby CPI inflation overstates true inflation in the cost of living. Overseas evidence suggests that outlet substitution bias tends to be small, amounting to around 0.1 percentage point each year. However, this bias may have risen in recent years with the increase in online shopping. The significant growth in the share of purchases made online suggests that consumers view the lower prices that are often available online as outweighing any loss in service or convenience, providing a genuine reduction in the cost of living (Graph A1).[13]

Altogether, upper-level and outlet substitution bias mean that CPI inflation is biased higher relative to

12 Another potential bias is 'lower-level' substitution bias, which refers to substitution within an expenditure class. Lower-level substitution bias is thought to be negligible as the construction of the Australian CPI allows for substitution between different types of the same item.

13 The ABS undertakes sample maintenance to ensure that collection is focused on representative outlets.

Graph A1
Online Purchases



* Purchases on Australians' personal and business cards at domestic merchants
** Excluding cafes, restaurants & takeaway food services
Sources: ABS; NAB; RBA

cost-of-living inflation. Across a range of countries, this is estimated to overstate inflation by around ¼ to ½ percentage point per year.[14]

Quality adjustment

Improvements in quality are a key driver of rising living standards over time. The CPI is adjusted for certain quality changes, using a variety of methods based on product size, production costs, expert judgement and more advanced statistical techniques ('hedonics'). However, adjusting for quality change is difficult in practice, and it can give cause to a number of biases of CPI inflation relative to cost-of-living inflation:

- *Incomplete quality adjustment*: It is difficult (if not impossible) to measure changes in the quality of many items, particularly services. Where this is the case, the ABS generally does not make explicit quality adjustments, potentially leading to an upward bias in CPI inflation relative to cost-of-living inflation. In particular, there is generally no explicit adjustment for changes in the quality of health, education, personal services, recreation and child care (although there are some implicit adjustments). This may explain some of the relatively high rates of measured inflation in these services over the past decade. As services have become a larger share of household spending over time, the overall importance of this bias may have increased.
- *Quality versus utility*: Explicit quality adjustments are made on the basis of measureable characteristics. However, these may not align precisely with the benefit that consumers receive from a product. For example, it is not clear how much a doubling in computer processing speed will add to consumer utility. This problem can cause statistical agencies to over- or underestimate the effect of quality change on consumer utility.
- *Forced upgrades*: When an improved model of a good is introduced, the older model often disappears from the market. This 'forced' upgrade may not result in an increase in utility and could cause quality adjustment to bias CPI inflation downwards.

Studies overseas have generally found incomplete quality adjustment to be the most important of these biases, resulting in an overall positive bias in the CPI relative to cost-of-living inflation. Estimates of the bias range from zero to around half a percentage point per year.[15]

New goods

As new types of products become available, the ABS must decide when to begin including them in the CPI. The ABS generally takes a conservative approach and only includes items that have clearly gained widespread acceptance (ABS 2011). New products that fall into a completely new expenditure class, such as DVD players when they were first introduced, are only included when the index is reviewed and reweighted every five or six years. Accordingly, the price declines that occur early in a new product's life – as production processes improve and economies

14 Results vary across time and country. An alternative approach using Engel curves suggests a bias estimate closer to 1 percentage point annually (e.g. Barrett and Brzozowski (2010) for Australia). However, this approach may itself be biased (Beatty and Crossley 2012).

15 The wide dispersion of estimates reflects the differing impact of quality bias across countries and over time, while studies of these biases are also exposed to many of the same difficulties as statistical agencies in attempting to quantify quality change.

of scale are achieved – are generally missed in the calculation of the CPI, which imparts an upward bias on the index. The effect of new products is generally thought to be small relative to the other sources of bias at around 0.1–0.2 percentage points annually.

Measurement approach

In Australia, the CPI measures prices at the point that items are acquired (the *acquisitions approach*). This suits the use of the CPI as a policy target, as it provides the best indication of current inflation pressures. However, the *use* of a good or service is more closely related to the cost of living, as it is the use of an item that provides utility (the *cost of use approach*). An alternative approach is to measure prices at the point of payment (the *outlays approach*), which is most consistent with calculating real incomes.

In many cases, the difference in approach is of little or only temporary consequence. However, the difference is significant for durable goods, which are used over an extended period of time after they are acquired, and which are often paid for only gradually with the use of credit. The most obvious example of this is owner-occupied housing (see ABS (2010)). Under the acquisitions approach, the price of owner-occupied housing is the price paid to acquire a new dwelling (excluding land), which is unaffected by whether borrowed funds are used. In contrast, the outlays approach measures the amount of interest paid on mortgages, as this is a necessary out-of-pocket expense to ensure continued use of the dwelling. The inclusion of mortgage interest is not appropriate for a measure of inflation used as a target for monetary policy, as changes in the cash rate directly affect the measure of inflation. This was a key reason for changing the conceptual basis of the CPI from the outlays to acquisitions approach in 1998. Finally, the cost of use approach is concerned with the economic cost of using the dwelling in the relevant period. This is measured by the implicit rental value, which is generally not observable and for owner-occupied housing must be imputed by using estimates from observed rents paid in the rental market.

Appendix B: Distribution of Inflation – Data and Method

This appendix provides further details regarding the use of HES data to estimate cost-of-living inflation rates at the household level and for different groups of households. The method applied is as follows:

- Data on consumption baskets are sourced from the 2003/04 HES and the 2009/10 HES. The HES is the main source of expenditure weights in the CPI. Changes in consumption baskets over this period are captured only once, and were introduced into the estimates of cost-of-living inflation from the June quarter 2011, in line with the construction of the CPI.[16]
- Data for inflation by disaggregated expenditure class and by capital city are sourced from the CPI. The rate of inflation of a particular item is assumed to be the same for all households within a state (although price levels may vary). The outlays approach is used, rather than the acquisitions approach used in the CPI. For measuring inflation of owner-occupied housing, mortgage interest indices are sourced from ABS Selected Living Cost Indexes. Inflation in these indices partly reflects house price inflation, as the interest payments on a loan with a given loan-to-value ratio would change with the size of the loan, which in turn would vary with the price of housing.[17] Repayments on higher education loans are also included rather than the total cost of the education. Gross insurance premiums are used rather than the value of premiums net of the expected value of claims, and the cost of financial services is excluded.
- The analysis of geographical differences in cost-of-living inflation is limited by the availability of data. The scope of the CPI is households living in capital cities, while the HES dataset also

16 Sampling weights were used when aggregating the HES households into population groups in order to ensure that the results obtained from the survey were representative of the population.

17 The drawback to this approach is that housing price inflation is unlikely to affect the cost of living of any specific household with a mortgage. Rather, its influence reflects the change in the cost of servicing a mortgage with fixed characteristics (with regards to its maturity and loan-to-value ratio), for a fixed quality of housing, over time.

includes households located outside capital cities. In addition, mortgage indices are only available at the national level.

There are reasons to be cautious when using these estimates. Substitution might act to reduce the width of the distribution of household-level inflation rates relative to our estimates. In addition, part of the estimated variation between household inflation rates reflects differences in whether households recorded expenditure on infrequently purchased items within the HES recall period. Working in the other direction, different households might experience different rates of inflation for the same item within the same state, which would lead to the width of the distribution being underestimated in the absence of this information.

References

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Exchange Rate Movements and Economic Activity

Marion Kohler, Josef Manalo and Dilhan Perera*

This article discusses estimates of the effect of movements in the real exchange rate on economic activity and inflation in Australia. The range of estimates suggests that a temporary 10 per cent depreciation of the exchange rate increases the level of GDP temporarily by ¼–½ per cent over one to two years. A permanent 10 per cent real depreciation is estimated to increase the level of GDP by around 1 per cent after two to three years and to increase year-ended inflation by ¼–½ percentage point over the same period. At an industry level, unsurprisingly, activity in trade-exposed industries is found to be more affected than in domestically oriented industries.

Introduction

Since the float of the Australian dollar in 1983, there have been large swings in the nominal exchange rate. In large part, these changes in the exchange rate reflect its role in cushioning the Australian economy from shocks. Since 1983, the exchange rate has appreciated or depreciated by 10 per cent or more over the preceding 12 months around one-quarter of the time. The real exchange rate (which accounts for differences in inflation rates across countries) experiences swings of a similar magnitude as most of the movements in the real exchange rate over horizons of one or two years can be explained by changes in the nominal exchange rate. Changes in the exchange rate of this magnitude – especially if they are sustained – can have significant effects on the real economy.

The exchange rate affects the real economy most directly through changes in the demand for exports and imports. A real depreciation of the domestic currency makes exports more competitive abroad and imports less competitive domestically, thereby increasing demand for domestically produced goods. Offsetting this to some extent is the effect of the higher cost of imported goods that cannot be substituted for domestically produced goods, including intermediate and capital goods required for the purposes of production. However, in most economies, the first effect is likely to dominate the second effect.[1] These effects do not occur immediately, but usually take several years to pass through the economy.

While the direction of the effect of movements in the exchange rate on the economy seems clear – with a depreciation usually associated with an expansion in activity and a rise in prices – the size of the effect and the sectors of the economy through which it is transmitted are less certain. This article reviews estimates of the effect of exchange rate movements on output and inflation, based on a range of models. One of these models also allows analysis of how exchange rate movements affect output in different parts of the economy, assessing which industries are more sensitive to the exchange rate than the economy as a whole.

* The authors are from Economic Analysis Department. They would like to thank Daniel Rees and Hao Wang for help with some of the model estimates.

1 These 'expenditure-switching' channels are the most obvious ways in which a depreciation (or appreciation) affects real activity. There are other channels through which real activity can be affected, such as through higher real debt burdens of unhedged debt denominated in foreign currency, or the impact on capital flows if the relative attractiveness of domestic and foreign investment is affected by the depreciation (see, for example, Mark (2001) or Montiel (2009) for more detail).

In order to concentrate on the effect of the exchange rate only, in this article the exchange rate is assumed to change exogenously, that is independently from changes in other macroeconomic variables. However, the exchange rate frequently moves in reaction to other developments in the economy, such as changes in the terms of trade, the domestic or global outlook for growth, or interest rate differentials. In all these cases, the combined effect will be different from the estimates presented here. For instance, if the exchange rate depreciation occurs alongside a fall in the terms of trade, the expansionary effect of the depreciation may only partially offset the contractionary impetus of the fall in the terms of trade. Such scenarios can in principle be analysed with a number of the models presented here, but are beyond the scope of this article.

The Exchange Rate and Aggregate Output

In order to identify the effect of movements in the real (trade-weighted) exchange rate on output, a model that controls for contemporaneous changes in other variables which can also affect activity is required. The estimated effect of exchange rate movements on GDP is likely to depend on the model chosen, and on whether the change in the exchange rate is assumed to be temporary or permanent. In this article the results from a range of models are compared. The models chosen are a structural vector auto regression (SVAR) model based on Lawson and Rees (2008); a dynamic stochastic general equilibrium (DSGE) model based on Jääskelä and Nimark (2011); and estimates derived from separate models of exports and imports. All these models include lags of variables to account for the protracted nature of the pass-through of exchange rate changes. More details about the models are provided in Appendix A.

Table 1 summarises the estimates from these models. The first set of results suggest that a temporary depreciation – in which the real trade-weighted exchange rate index (TWI) depreciates by 10 per cent and then gradually returns to its initial level over approximately two years – increases the level of GDP by around ¼–½ per cent over one to two years, before it gradually returns to its initial level. The second set of results show that the effect of a permanent depreciation is larger, raising the level of GDP permanently by around 1 per cent after two to three years. This implies that GDP growth over these two years is (cumulatively) higher by around 1 percentage point than it would have been otherwise.

Table 1: Effect of the Exchange Rate on Output
Estimated response to a 10 per cent real TWI depreciation

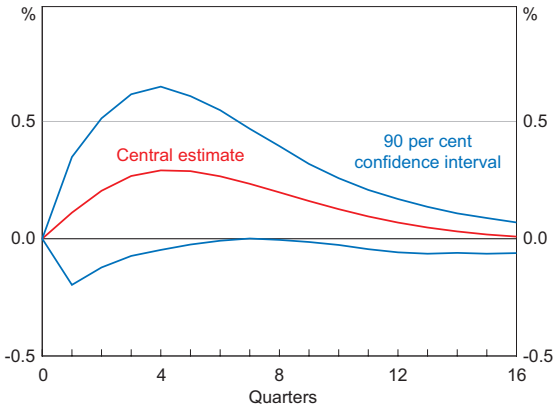
	Temporary change in the exchange rate	
	Peak effect on level of GDP	Peak Timing
Model	Per cent	Quarters after depreciation
SVAR	0.3–0.6[(a)]	4–6
DSGE	0.4	2

	Permanent change in the exchange rate		
	Effect on the level of GDP		
	Per cent		Number of quarters for three-quarters of total effect to occur
Model	After two years	Total effect	
SVAR	0.7–0.9	0.9–1.1	7–9
DSGE	0.9	0.9	3
Export and Import	1.2	1.4	2

(a) The results from the SVAR model depend on how many lagged changes are included; see Appendix A
Source: RBA

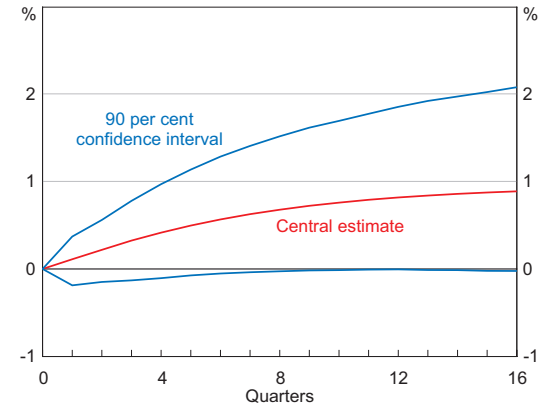
These estimates vary across the different models, but they are also subject to estimation uncertainty within each model. Confidence intervals are one way to illustrate how well an estimate fits the data, and therefore how likely it is that the true value is near that estimate. Graphs 1 and 2 illustrate this uncertainty with confidence intervals around the effect on the level of GDP of a 10 per cent depreciation for the SVAR model. In the case of a temporary depreciation, the 90 per cent confidence interval for this effect is 0–¾ per cent after about one year. In other words, even though the effect is most likely 0.3 per cent (the 'point estimate'), there is a 90 per cent probability that the 'true' effect is between 0 per cent and ¾ per cent after about one year. In the case of a permanent shock, the confidence interval for the effect is 0–1½ per cent after two years.

Graph 1
Gross Domestic Product
Effect of a temporary 10 per cent real TWI depreciation*



* Impulse response function and error bands based on the SVAR model with two lags
Source: RBA

Graph 2
Gross Domestic Product
Effect of a permanent 10 per cent real TWI depreciation*



* Impulse response function and error bands based on the SVAR model with two lags
Source: RBA

The Exchange Rate and Industry Activity

Different industries are more or less sensitive to exchange rate movements and so the impact on the output of individual industries is likely to be larger or smaller than the aggregate effects reported above. Since much of the first-round effect of a depreciation is on exports and imports (through 'expenditure switching'), it could be expected that those industries that are more exposed to trade experience larger effects. Table 2 shows the trade exposure of a number of industries in Australia using different measures derived from the ABS input-output tables.

A depreciation, which makes domestically produced goods and services cheaper relative to foreign production, is expected to provide a greater benefit to industries with a high export share, or to those industries with a high exposure to import competition. The mining, manufacturing and transport industries have the largest share of production that is exported (with more than half of mining production being exported). The least export-exposed industries are construction, business services and education & health. Similarly, manufacturing has significant import competition, while construction, business services and education & health have very few competing imported goods and services. Mining imports are a significant share of the domestically available supply of mining goods; however, it is less clear to what extent these imports are substitutes for domestic production (for instance, Australia produces and exports different types of crude oil products to those that it imports).

A depreciation also increases the cost of imported goods and services that are used in production, raising costs (and potentially reducing profits). This effect will be bigger in those industries that

Table 2: Trade Exposure by Industry
2009/10, per cent

	Export share of production	Imported input share[(a)]	Import penetration[(b)]
Mining	56	4	12
Manufacturing	20	15	34
Construction	0	4	0
Transport, wholesale and retail trade	12	5	3
Business services[(c)]	2	3	3
Personal services[(d)]	6	9	5
Education and health[(e)]	3	4	1

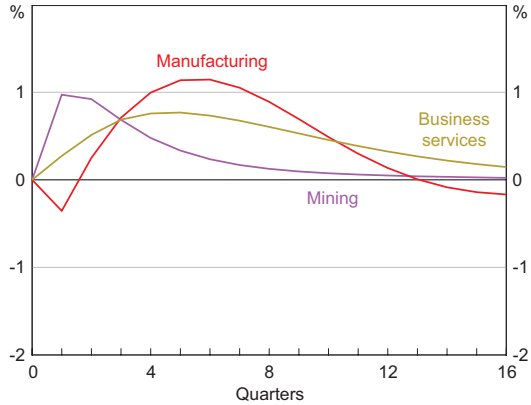
(a) Imported inputs as a share of domestic production in the industry; retail and wholesale production do not include the cost of the good being sold
(b) Competing imports as a share of the total supply (domestic output plus imports) of the industry
(c) Includes information media & telecommunications, rental, hiring & real estate services, professional, scientific & technical services and administrative & support services; excludes financial & insurance services in the definition used here
(d) Includes accommodation & food services, arts & recreation services and other services
(e) Includes education & training and health care & social assistance
Sources: ABS; RBA

use a larger share of imports in production such as manufacturing. In this case, the higher costs of inputs that result from a depreciation would offset some of the expansionary impact of increased export competitiveness. For retail trade, the share of imported inputs (relative to domestic production in the industry) is only 2 per cent; this may appear surprising at first glance, since many retail goods are imported. However, production in retail and wholesale trade is measured in the national accounts as the value of the distribution service provided, which includes labour, rent and margins, but does not include the value of the good itself.

Econometric estimates can quantify the overall effect of a depreciation on different industries. The SVAR model in Lawson and Rees (2008) used above also provides estimates of exchange rate effects on industry output, measured as gross value added. Graphs 3 and 4 summarise the results for a temporary depreciation of the real TWI by 10 per cent.[2]

After about one year, output in most sectors is higher than prior to the depreciation. This is likely to reflect two effects: the increase in export competitiveness and the reduction in competition from imports for trade-exposed industries, and the second-round effect of higher aggregate domestic demand due to higher employment and income from the positively affected industries. Consistent with these effects, the two most trade-exposed industries – manufacturing

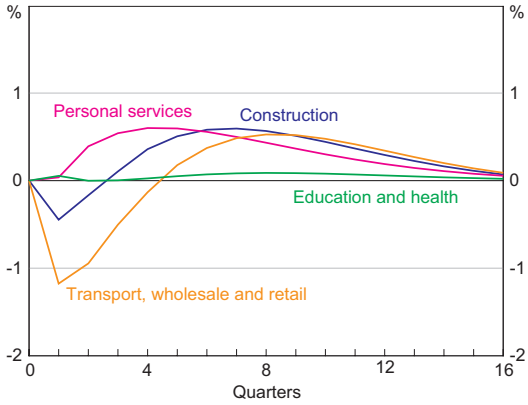
Graph 3
Industry Output 1
Effect of a temporary 10 per cent real TWI depreciation*



* Impulse response functions based on the industry SVAR model with two lags; business services include information media & telecommunications, rental, hiring & real estate services, professional, scientific & technical services and administrative & support services
Source: RBA

2 Agriculture, forestry & fishing, electricity, gas, water & waste and public administration & safety have been excluded from this analysis, because activity in those sectors is significantly influenced by supply-side developments. Financial & insurance services, which were estimated to experience a protracted negative effect from a depreciation, are not discussed in the results presented here. The result for this sector is difficult to explain, and may be a consequence of difficulties in modelling activity in this industry.

Graph 4
Industry Output 2
Effect of a temporary 10 per cent real TWI depreciation*



* Impulse response functions based on the industry SVAR model with two lags; personal services include accommodation & food, arts & recreation and other services
Source: RBA

and mining – experience the larger and more rapid increases in output; a 10 per cent exchange rate depreciation causes output in these industries to be higher by around 1 per cent after ½–1½ years. The large effect on mining is somewhat at odds with large capital costs and long investment times typical for this industry, which would suggest that supply in this industry would not typically respond quickly. Rather, the estimated effect may imply that it is possible to work the existing capital a little harder when output prices are higher, but not for a long time; this could also explain why the estimated effect is short lived compared with other industries. The effect on business services is also substantial, which may be due to the flow-on effect from the higher activity in other industries such as manufacturing and mining, given that the trade exposure of business services is not very high. Output for most other service industries increases to a smaller extent, which may reflect their lower exposure to trade. While the construction industry is subject to very little export demand or import competition, construction output tends to be highly cyclical, and the exchange rate effect, which is similar to that of most services, could reflect strong second-round effects of the impact of the depreciation on overall economic activity.

For a number of sectors, the estimates suggest that an exchange rate depreciation causes output to decrease in the first few quarters. For industries more directly exposed to household spending, such as retail services, this could reflect the initially negative effect on spending resulting from the higher cost of imports. Moreover, while retail and wholesale trade have a low share of imported inputs in the production of the distribution service, the demand for this service is linked to the cost of the good sold, which accounts for about half of the final price of the good. Since a large share of retail goods is imported, their cost varies with the exchange rate and so activity associated with their distribution is also likely to vary with the exchange rate. Beyond the effect on household spending, an exchange rate depreciation may also have a negative effect on firms' profits, owing to the increased cost of imported investment goods and intermediate inputs. This could explain the initially negative effect on manufacturing, which – as noted above – has a comparatively high share of imported inputs. The large initial negative effect on the transport, wholesale and retail sector could also be partly due to the initial profit effect, since imported inputs in the transport industry largely consist of fuel, where prices adjust very quickly, and in full, to exchange rate changes. Of course, similar to the estimates of the effect of the exchange rate on aggregate output, the estimates of the industry effects are subject to large confidence intervals and so a number of these effects may not be statistically significantly different from zero.

The Exchange Rate and Inflation

Exchange rate movements also affect consumer price inflation, directly through their effect on prices of imported consumer goods and indirectly through the cost of imported goods used in production and the increased demand for domestic goods. The effect of exchange rate movements on inflation has been discussed in detail in a previous *Bulletin* article (Chung, Kohler and Lewis 2011). These results are summarised in Table 3, together with the estimates from the SVAR and DSGE models.

Table 3: Effect of the Exchange Rate on Consumer Prices[a]
Estimated response to a 10 per cent permanent TWI depreciation

Model	Total effect on price level Per cent	Peak effect on year-ended inflation Per cent	Peak timing Quarters after depreciation
Mark-up model	1.1	0.4	9
Phillips curve	0.8	0.3	8
SVAR	1.7[b]	0.7[b]	12[b]
DSGE	1.0[b]	0.5	4

(a) Inflation refers to trimmed mean inflation; peak timing refers to effect on year-ended inflation; SVAR results are from two-lag model
(b) Effect after three years
Source: RBA

For most models, a permanent depreciation of 10 per cent leads to an increase in year-ended trimmed mean inflation of around ¼–½ percentage point over each of the following two to three years.

Conclusion

This article reviews estimates of the effect of real exchange rate changes on Australian output. The range of models analysed suggests that a temporary 10 per cent depreciation of the exchange rate increases the level of GDP temporarily by ¼–½ per cent over one to two years; a permanent 10 per cent real depreciation is estimated to increase the level of GDP by around 1 per cent after two to three years. Year-ended inflation is estimated to be higher by ¼ to ½ percentage point in the two to three years following a permanent 10 per cent depreciation.

At an industry level, unsurprisingly, output in the trade-exposed mining and manufacturing industries is most affected, as well as in business services, which often benefit from activity in these industries. It should be noted, however, that such estimates are subject to significant uncertainty. Moreover, for any given episode of exchange rate depreciation (or appreciation), output is also likely to react to other concurrent macroeconomic factors, including those that may have triggered the exchange rate depreciation, such as a change in the terms of trade.

Appendix A

This article reports estimates from a number of models used at the Bank that allow analysis of the impact of exchange rate movements on activity and inflation.

SVAR

The structural vector auto regression (SVAR) model is based on work by Lawson and Rees (2008). An updated and modified version (which underlies the estimates in this article) is in Manalo, Perera and Rees (forthcoming). The model is estimated with data from 1985:Q1 to 2013:Q2.

The aggregate model includes Australian and US GDP (deviations from trend), the terms of trade, trimmed mean inflation, the cash rate and the real TWI. Note that this model relates the level of the exchange rate to the inflation rate – not to the price level, as in the single equation models in Chung *et al* (2011) – and so changes in the exchange rate relate to changes in the inflation rate. Because of this specification, changes in the exchange rate can appear to have permanent effects on the inflation rate.

Each industry model is estimated separately, and includes industry output (deviation from trend) in addition to the variables included in the aggregate model. The sum of the estimates from each industry model, weighted by industry shares, suggests a very similar profile to the aggregate SVAR for the results considered here, even though those models

are estimated separately. The size of the estimated model responses differ somewhat between a specification including two lags and three lags, but it is difficult to select a preferred specification out of these two options.

In this type of model, a change in the exchange rate is usually modelled as a temporary shock to the exchange rate. All variables in the model (including the exchange rate itself) are allowed to respond endogenously, except for the cash rate, which is held constant for the estimates presented here. The model responses return to their starting point after some time, so the exchange rate endogenously (and gradually) returns to its baseline level after the initial shock. A permanent shock is modelled as a sequence of temporary shocks, which (together with the lagged responses of the exchange rate to the preceding shocks) force the exchange rate to remain at the higher level for the period analysed.

DSGE

The dynamic stochastic general equilibrium (DSGE) model is based on the model in Jääskelä and Nimark (2011). The model is estimated with data from 1993:Q1 to 2013:Q2.

The model includes Australian GDP, household consumption, private investment, government expenditure, exports, imports, trimmed mean inflation, the real exchange rate and hours worked. Foreign variables are major trading partner GDP, G3 interest rates and G7 inflation. As with the SVAR model, the exchange rate relates to inflation and so changes in the exchange rate relate to changes in the inflation rate (rather than the price level).

Again, this model naturally allows for temporary shocks in the exchange rate, with the model estimates (including the exchange rate) returning to the steady state after some time. The cash rate is not held constant for the estimates presented here. A permanent shock is implemented as a sequence of shocks that holds the exchange rate at the desired level for two years, before allowing it to revert endogenously to its baseline value.

Export and import equations

A third approach simply models the expenditure-switching effect on exports and imports, and then scales the export and import effects according to their share of GDP. This approach does not take account of additional effects on GDP arising from a change in domestic demand. Single equation models do not take explicit account of feedback from the dependent variable to independent variables, or feedback within the independent variables. They are also more suited to an analysis of permanent, rather than temporary, changes to an independent variable.

Exports are modelled with separate equations (error-correction models) for manufactures and services exports. In line with previous literature, resource exports are assumed to not be sensitive to changes in the exchange rate in the short to medium term, owing to the large capital costs and long investment times typical for this industry. For a few quarters, it may be possible to lift production by working the existing capital a little harder, but this cannot usually be kept up for longer periods without installing new capital. For manufactures exports, the model is as follows:

$$\Delta man_t = \alpha_1 + \alpha_2 man_{t-1} + \alpha_3 mtp_{t-1} + \alpha_4 rer_{t-1} + \alpha_5 era_{t-1} + \sum_{i=0}^{2} \beta_i \Delta mtp_{t-i} + \sum_{j=1}^{4} \gamma_j \Delta rer_{t-j} + \epsilon_t \quad \text{(A1)}$$

In words, manufactures export volumes (*man*, in logs) are modelled as a function of their own lags; major trading partner GDP (*mtp*, in logs); the real exchange rate (*rer*, export weighted, in logs); the effective rate of assistance (*era*); and an error term ϵ_t. The equation is estimated from 1985:Q1 to 2013:Q3.

A 10 per cent depreciation increases manufactures export volumes by 5 per cent overall and the effect is comparatively fast, with most of this complete within two years. Since manufactures exports comprise 2 per cent of GDP, this would increase GDP by 0.1 per cent. For service exports, the model is as follows:

$$\Delta services_t = \delta_1 + \delta_2 services_{t-1} + \delta_3 mtp_{t-1} + \delta_4 rer_{t-1} + \sum_{i=1}^{4} \theta_i \Delta services_{t-i} + \sum_{j=0}^{2} \vartheta_j \Delta mtp_{t-j} + \mu \Delta rer_t + \phi_1 olympics + \phi_2 SARS + \phi_3 Sep11 + \phi_4 timetrend + \epsilon_t \quad \text{(A2)}$$

Service exports (*services*, in logs) are a function of their own lags; major trading partner GDP (*mtp*, in logs); the real exchange rate (*rer*, in logs, export weighted); and an error term. *Olympics* is a variable that takes the value of one in 2000:Q3 (the date of the Sydney Olympics) and the value of minus one in 2000:Q4 (and zero otherwise); *SARS* and *Sep11* are dummies that are one in 2003:Q2 and 2001:Q4, respectively, and zero otherwise; and *timetrend* is a time trend. The equation is estimated from 1991:Q1 to 2013:Q3.

A 10 per cent depreciation increases service export volumes by 13 per cent overall, but the effect is quite slow and after two years service exports have increased by around 8 per cent. Service sector exports are 3 per cent of GDP, resulting in an increase of GDP by 0.2 per cent after two years. For imports, the model is as follows:

$$\Delta import_t = \omega_1 + \omega_2 import_{t-1} + \omega_3 dom_{t-1} + \omega_4 relprice_{t-1} + \varphi_1 \Delta dom_t + \varphi_2 \Delta relprice_t + \varphi_3 \Delta import_{t-2} + \tau_1 cashrate_{t-1} + \tau_2 \Delta inventory_t + \epsilon_t \quad \text{(A3)}$$

Import volumes (*import*, in logs) are modelled as a function of their own lags; domestic demand (measured as final consumption expenditure plus gross fixed capital formation minus ownership transfer costs) plus exports (*dom*, in logs); the relative price of imports to the price of domestically produced and consumed goods (measured by the implied deflators of imports and of GDP minus exports) (*relprice*, in logs); the cash rate (*cashrate*, in logs); inventories; and an error term, ϵ_t. The equation is estimated from 1987:Q2 to 2013:Q3. The exchange rate affects imports through the relative price of import goods, which has a long-run coefficient of –0.55. The import price equation is specified as in Chung *et al* (2011), which yields a long-run coefficient for exchange rate changes of 0.8.

A 10 per cent depreciation increases import prices by 8 per cent, which in turn decreases imports by 4.4 per cent. Imports have a share of 20.1 per cent of GDP, yielding an addition to GDP of 0.9 per cent. Most of this is passed through after two years.

Mark-up model and Phillips curve

These single equation models for inflation are based on those discussed in Chung *et al* (2011), derived from an import price model and then a model that relates import prices to consumer prices. The models are estimated using data from 1990:Q1 to 2013:Q2. As mentioned above, single equation models are less well suited to capture some second-round effects and are also better suited to an analysis of permanent shocks, rather than temporary shocks.

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Australia after the Terms of Trade Boom

Tim Atkin, Mark Caputo, Tim Robinson and Hao Wang*

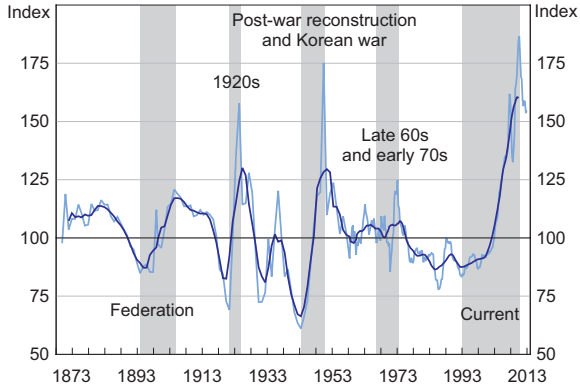
The Australian economy has in recent years experienced the longest terms of trade boom in its history. This boom has had important macroeconomic outcomes – such as an elevated real exchange rate, large-scale investment in the resources sector and higher national income. The terms of trade have declined since their peak in September 2011 and are expected to ease further in coming years. This article draws extensively on Atkin *et al* (2014) and compares recent macroeconomic developments to those that occurred historically around major peaks in the terms of trade, while also highlighting key differences in the nature of the current cycle and the macroeconomic policy framework compared with those in the past.

Introduction

Australia's terms of trade – the ratio of export prices to import prices – have increased significantly over the past two decades, with particularly large increases in export prices occurring from 2004 onwards (Graph 1). The terms of trade reached their highest level in history at their most recent peak – nearly 85 per cent above the average of the preceding century. This was also the longest terms of trade boom in Australia's history and the terms of trade today remain at a very high level by historical standards.

Australia has experienced five major terms of trade episodes over the past 150 years. Upswings in the terms of trade typically have been triggered by the industrialisation of overseas economies, supply disruptions (such as drought) or major conflicts, resulting in surges in the prices of some export commodities. Prior to the most recent episode, terms of trade booms had been relatively short-lived and driven largely by wool prices. Wool accounted for more than half of Australia's goods exports at its peak in the early 1950s, and Australia was the largest supplier to the global market. Today, resource exports account for over 60 per cent of goods exports and Australia is the largest supplier to the traded market of iron ore and coking coal, the two key inputs for the production of crude steel.

Graph 1
Terms of Trade*
1900/1901–1999/2000 average = 100



* Dates correspond to December quarter of calendar year; annual data up to 1958/59, quarterly data thereafter; shaded regions represent major expansions in the terms of trade as defined by Atkin *et al* (2014); smoothed line is a five-year centred moving average
Sources: ABS; Atkin *et al* (2014); Gillitzer and Kearns (2005)

The most recent terms of trade episode is unique in several aspects. It has been driven by strong demand for steel and energy from China, which has a much larger population relative to previous industrialising economies. Uncertainty about the boom's duration appears to have held back investment in additional capacity in the resources sector initially. Together with the long lead times until this investment

* The authors are from Economic Analysis Department.

became productive, this delay prolonged the supply response, and therefore helped to sustain the upswing in commodity prices (see Garnaut (2012) and Plumb, Kent and Bishop (2013)). Relatedly, the terms of trade have remained at a high level two years after the peak, which is in contrast to some past episodes when they declined sharply. For example, over the two years after the peak of the Korean War wool boom, the terms of trade fell by around one-third to be less than 20 per cent above their average level of the 20th century. Another distinguishing feature of the recent episode is the high degree of foreign-funded investment in the resources sector, which has important consequences for the distribution of subsequent income gains (see Connolly and Orsmond (2011)). Finally, the policy settings and institutional framework in the most recent episode have enabled the Australian economy to respond to the boom in a relatively flexible way compared with those in the past.

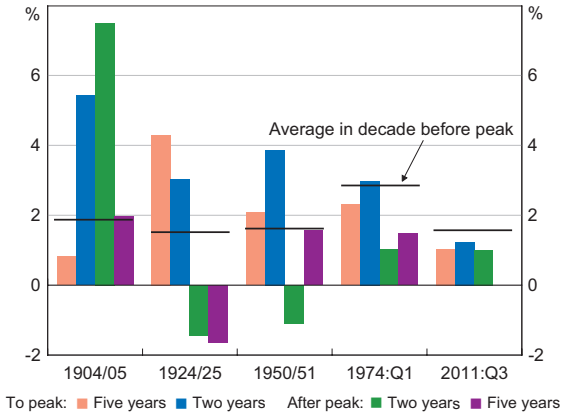
Terms of Trade Swings and the Australian Economy

Movements in the terms of trade can have a significant impact on the Australian economy. Upswings in the terms of trade increase the real purchasing power of domestic output. Historically, upswings have tended to coincide with above-average growth rates of GDP per capita and have boosted national income considerably (Graph 2).[1] In addition, falls in the terms of trade generally have coincided with a two-year period of below-average growth in GDP per capita and lower national income (with the notable exception of the outcome after the 1904/05 peak, which partly reflected the recovery in domestic growth following the severe recession of the 1890s in which real GDP had declined by almost 20 per cent).

Historically, the macroeconomic outcomes during downswings in the terms of trade have varied considerably, in part reflecting factors other than the terms of trade. The most severe downturn in economic activity since Federation occurred following the 1920s boom, with the onset of the Great Depression worldwide. The unemployment rate reached close to 20 per cent by the early 1930s, with conditions in Australia only worse during the 1890s depression. In contrast, the decline in GDP per capita in the 1950s was short-lived. In part, this reflected strong global growth and policy responses to the transitory boom in wool prices. In the mid 1970s, the decline in the terms of trade, reflecting subdued global economic conditions associated with the global oil price shock, contributed to below-average growth in output per capita. A tightening in domestic monetary policy, rigidities in the labour market and an overvalued exchange rate also contributed to this outcome.

As during other terms of trade cycles, in the two years following the most recent peak, GDP per capita grew at a below-average pace (Graph 2). However, growth has been relatively stable compared with past episodes. In part, this is due to the global financial crisis and weak multifactor productivity tempering output growth prior to the peak, as well as the greater flexibility in the macroeconomic policy framework. Following the peak, growth has continued to be

Graph 2
Per Capita GDP Growth*
Average annual percentage change



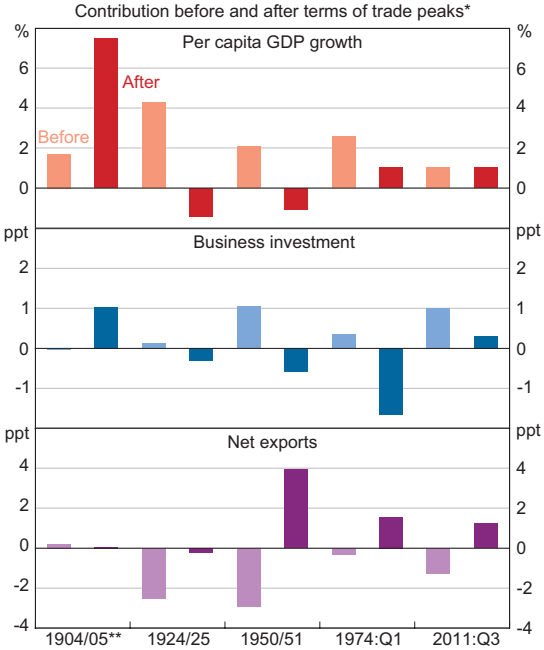
* Dates are terms of trade peaks defined in Atkin *et al* (2014)
Sources: ABS; Atkin *et al* (2014); Butlin MW (1977); Butlin NG (1962)

1 Growth in national incomes includes changes in output as well as changes in the purchasing power of exports and net primary income receivable from non-residents. For more information, see Sheehan and Gregory (2013).

supported by the ongoing large-scale investment in liquefied natural gas (LNG) projects, an increase of resource exports and stimulatory monetary policy.

Cycles in the terms of trade affect all of the major expenditure components of GDP. However, in the current episode, business investment and trade have been of particular importance (Graph 3).[2]

Graph 3
Per Capita GDP Growth
Contribution before and after terms of trade peaks*



* Selected average annual contributions to growth five years before and two years after terms of trade peaks
** Before peak based on data between 1900/01 and 1904/05
Sources: ABS; Atkin *et al* (2014); Butlin MW (1977)

Investment

Cycles in private business investment have often coincided with large movements in the terms of trade. When the terms of trade are increasing, investment typically contributes to GDP per capita growth as capacity is expanded in response to higher prices (Graph 3). Private business investment then generally declines in the two years following the peak in the terms of trade. This is likely to reflect lower investment in the booming sector as prices fall partly due to the increase in supply resulting from past investment becoming productive. Investment in some of the other sectors of the economy may also be subdued, reflecting the weakening in national income and possibly confidence, and may subsequently take some time to improve.

In the recent upswing in the terms of trade, resource investment increased significantly, reaching a historically high share of GDP in 2012/13. Reflecting this, the contribution to growth from private business investment in the five-year period preceding the terms of trade peak was large compared with most previous booms (Graph 3). Initially, this was driven by large-scale investment in both iron ore and coal. More recently, there has also been significant investment in the production of LNG, which has been facilitated by Asia's growing energy demand and the development of more economical means of extraction. While for most investment, including in the agricultural sector, there are delays until it becomes productive, these delays are particularly pronounced in the resources sector.[3]

Resource investment is expected to continue to decline over coming years, with the current level of iron ore and coal prices less conducive to investment in new projects. Investment in LNG projects has continued to be high in the two years following the peak in the terms of trade, with investment generally supported by long-term supply contracts. However, resource investment is expected to decline significantly in the next few years as current projects are completed. Meanwhile, non-resource business investment has been subdued following the peak, with domestic demand growing at a below-average rate.

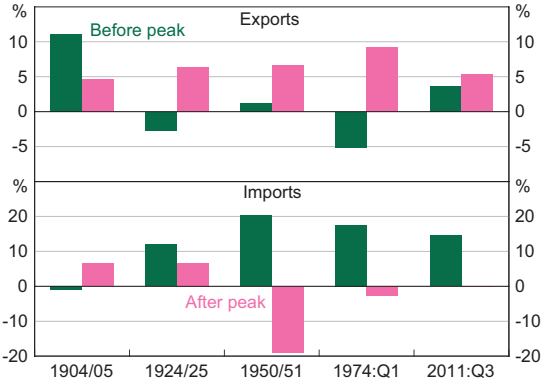
Trade

Prior to peaks in the terms of trade, export volumes growth has typically been weak and import volumes growth strong (Graph 4). This reflects several factors.

2 See Atkin *et al* (2014) for a discussion of other expenditure components.

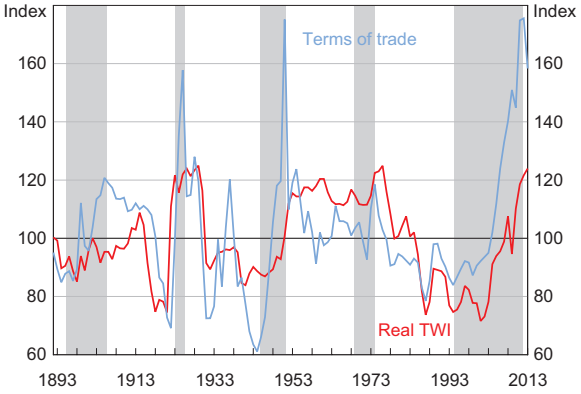
3 See Cordon and Neary (1982) and Plumb *et al* (2013) for descriptions of the phases of a mining boom.

Graph 4
Export and Import Volumes Growth*



* Average annual growth two years before and two years after terms of trade peaks
Sources: ABS; Atkin *et al* (2014); Butlin MW (1977)

Graph 5
Real Exchange Rate and Terms of Trade
1900/1901–1999/2000 average = 100, financial years



* Shaded regions represent expansionary phases of the terms of trade
Sources: ABS; Atkin *et al* (2014); Gillitzer and Kearns (2005); McKenzie (1986); RBA

First, the lead times associated with increasing supply in the booming sector limit growth in exports. Second, the real exchange rate – a measure of Australia's competitiveness in world markets – typically moves closely with the terms of trade (Graph 5). Terms of trade booms historically have been associated with a loss of competitiveness, which hampered exports from the non-booming traded sector and made imports attractive relative to domestic products. Strong growth in domestic final demand often also promoted growth in imports.

As the terms of trade decline, the external sector typically contributes sizeably to output growth (Graph 3). This is, in many ways, the flipside to developments during the boom. Export volumes grow as previous investment becomes productive (Graph 4). The fall in the terms of trade is typically accompanied by a depreciation in the real exchange rate, making exports from outside the booming sector more competitive (Graph 5). Historically, imports have grown more slowly, or even declined, following peaks in the terms of trade.

In the two years since the most recent peak, export volumes have increased at an average annual rate of 5½ per cent, buoyed by growth in resource exports, although the high level of the exchange rate has restrained growth in non-resource exports. Import volumes have declined slightly, reflecting subdued domestic demand and lower resource investment, although investment in LNG projects, which is particularly import intensive, is still underway. Overall, the recent contribution of the external sector to output growth per capita has been broadly comparable with that following the peak in the 1970s (Graph 3).[4]

Australian Macroeconomic Policy and the Terms of Trade

Macroeconomic policy and institutional frameworks play an important role in how cycles in the terms of trade affect the Australian economy. Over recent decades, monetary, fiscal and labour market policies have allowed the economy to respond to shocks in a relatively smooth way. While not all parts of the economy have benefited directly from the recent terms of trade upswing, these policy changes helped to achieve better macroeconomic outcomes than occurred in past booms and are expected to do likewise as the terms of trade decline further.[5]

4 In the current episode, exports to China and east Asia excluding Japan have accounted for more than half of Australia's goods exports. This concentration of exports to one part of the world is not unusual; in the first three agricultural-based terms of trade booms, Australia's trade was highly concentrated with the United Kingdom.

5 Battellino (2010) and Connolly and Orsmond (2011) also discuss the greater flexibility of macroeconomic policy today relative to past mining booms.

Monetary policy

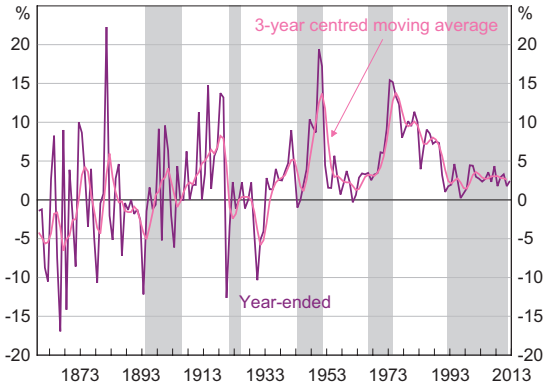
Monetary policy frameworks in Australia have historically sought to limit monetary expansion and contain inflation (Cornish 2010). The effectiveness of these policies in earlier cycles was constrained by factors such as a highly regulated financial system and the fixed nominal exchange rate.[6]

As discussed previously, the real exchange rate and the terms of trade tend to move together closely. The appreciation of the real exchange rate is an important mechanism that encourages the reallocation of resources within the economy towards the booming sector. Prior to the floating of the Australian dollar in 1983, in the 1950s and 1970s episodes this real exchange rate appreciation occurred through a surge of inflation, as the terms of trade boom boosted incomes and demand. With the benefit of the floating exchange rate and an inflation target, the inflation outcome in the current episode has been markedly different (Graph 6).

Historically, devaluations in the nominal exchange rate as the terms of trade declined appear to have been insufficient to fully insulate the Australian economy. Since the most recent peak in the terms of trade, the nominal exchange rate has depreciated by around 10 per cent, although for a period it did remain higher than suggested by some fundamentals (Kent 2014).

The floating exchange rate regime has allowed the Bank to set the cash rate based on domestic economic considerations, including the impact of terms of trade shocks on the domestic economy. The adoption of the inflation-targeting framework in 1993 also articulated a clear objective for monetary policy. The cash rate has been reduced substantially since the peak in the terms of trade, providing stimulus to domestic demand as the high level of resource investment declines.[7]

Graph 6
Consumer Price Inflation*



* Shaded regions represent expansionary phases of the terms of trade
Sources: ABS; Atkin *et al* (2014); RBA

Fiscal policy

The role of the public sector in the Australian economy has changed considerably over the past century. Public revenue and expenditure have become larger as a share of the economy. For example, tax revenue has increased from 5 per cent of GDP at the turn of the 20th century to over 20 per cent today. Meanwhile, there has been a shift away from indirect taxation, which had been favoured in part due to reasons of feasibility (Reinhardt and Steel 2006), towards personal and company income taxation. The earlier reliance on indirect taxation meant that the responsiveness of tax revenue to macroeconomic developments was slight (Pincus 1988).

The changes to the taxation system overall are likely to have increased the sensitivity of revenues to fluctuations in the terms of trade and economic activity in the current episode.[8] The larger size of government means that the operation of automatic stabilisers has a more significant effect on overall economic activity. Over the first half of the 20th century, balancing the budget was seen as a

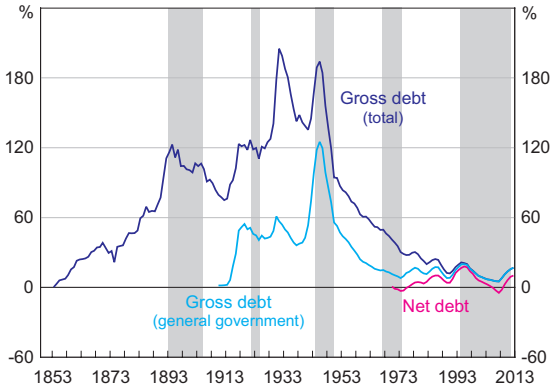
6 See Debelle and Plumb (2006) for a historical overview of Australia's exchange rate policy. Other factors include the commitment among policymakers in the 1960s and 1970s to full employment with less emphasis on managing inflationary expectations, as well as limited public communication with regard to monetary policy (Cagliarini, Kent and Stevens 2010).

7 For a further discussion of monetary policy following the terms of trade boom, see Stevens (2013).

8 A caveat is that the resources sector is capital intensive, and deductions for depreciation, along with other factors, have dampened the growth in tax receipts in recent years.

priority for policymakers, and countercyclical fiscal policy was limited. Also, in some previous episodes when the terms of trade declined, the government's ability to respond to weaker economic conditions was constrained by a high level of public debt limiting further borrowing (Graph 7).

Graph 7
Public Debt in Australia*
Per cent of GDP



* Federal, state and local governments; financial years; shaded regions represent expansionary phases of the terms of trade
Sources: ABS; Atkin *et al* (2014); Australian Government budget papers; Australian Office of Financial Management; Australian Treasury; RBA; Vamplew (1987)

Labour market policy

The institutional structure of the labour market in the current episode has been the most flexible during any terms of trade episode since Federation. Higher export prices tend to increase the demand for labour in the booming sector. This places upward pressure on wages in that sector relative to those in the rest of the economy, which provides an important signal for labour to shift across sectors. Historically, Australia had a highly centralised wage-setting system that limited the development of sectoral wage differentials (Freebairn and Withers 1977). This lack of flexibility also meant that wage pressures could spread across the economy.

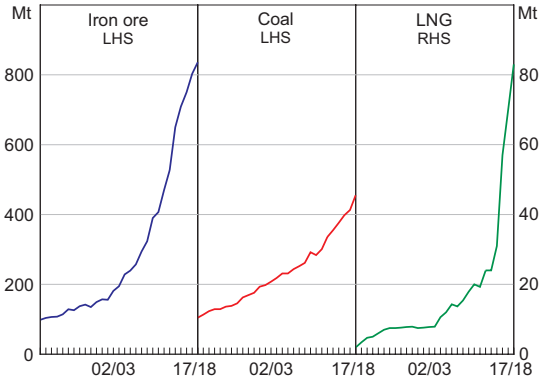
Greater flexibility in the wage-setting framework enabled considerable wage differentials between the mining sector and the rest of the economy to arise in the most recent episode (Plumb *et al* 2013). These wage differentials were of particular importance given the geographically isolated nature of many mining projects.[9]

Outlook

History suggests that growth of output per capita is typically slower for several years following a terms of trade boom compared with the period before, and that the weakness in national income is even more protracted. Past episodes suggest that per capita growth tends to return to an around-average rate within five years. While the current episode has parallels with those in the past – for example, being largely driven by a narrow range of commodities – the most recent terms of trade boom has lasted much longer than those in the past and the lag from investment to production in the resources sector has been considerable, particularly for LNG investment.

The transition from the investment to production phase of the resources boom has been underway for some time in the iron ore and coal sectors (Graph 8); coupled with increased supply from elsewhere in the world, it is likely to weigh on global prices. Indeed, an easing in prices is likely despite some estimates suggesting that Chinese steel demand will

Graph 8
Bulk Commodity Exports Projections*
Annual



* BREE projections for 2013/14–2017/18 as at September 2013
Source: Bureau of Resources and Energy Economics

9 Another example of the increased flexibility of the labour market is that during the global financial crisis considerable adjustment occurred as a decline in average hours worked, mitigating the increase in unemployment.

not peak until the mid 2020s (Berkelmans and Wang 2012). Nevertheless, while long-run commodity price forecasts are inherently highly uncertain, it seems unlikely that the prices of these commodities will return to their levels prior to the boom, reflecting the relatively high cost of the new global supply that has come online over recent years. Consequently, the terms of trade are expected to decline more gradually than in some episodes in the past.

A large part of the run-up in investment in the current episode was in the LNG sector. The delays between investment and production for LNG are long, and consequently strong growth in production is only expected from 2015/16 onwards (Graph 8). This is likely to contribute sizeably to GDP per capita growth. The high degree of foreign ownership in the resources sector, however, will mute the income gains retained domestically as production increases. It also means that foreigners are sharing the risks associated with any downswing in commodity prices.

As the real exchange rate and the terms of trade tend to move closely together, further declines in the terms of trade could also be accompanied by a further real depreciation. This increase in competitiveness is important in facilitating the transition in the sectors that contribute to output growth, as it promotes growth in the tradable sector outside of resources. A nominal depreciation is one way such an increase in competitiveness may occur; higher productivity growth and real wage restraint would also support Australia's competitiveness. In coming years, measured national productivity will be boosted by the growth of production in the resources sector; however, productivity growth in the rest of the tradable sector will also be of importance in increasing Australia's competitiveness.

In addition, there is likely to be a considerable reduction in demand for labour from the resources sector as the shift to the production phase continues. Wages in the resources sector, relative to those elsewhere in the economy, may decline (Plumb *et al* 2013). Such a change in relative wages would be a signal to assist the reallocation of labour and would have been less likely to occur under the more centralised wage-setting systems of the past.

Overall, the expected decline in the terms of trade over coming years will pose challenges for both firms and policymakers. Nevertheless, the greater flexibility present in the economy today – such as the wages system and the floating exchange rate – should help to facilitate the necessary adjustments.

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Housing Trends in China and India

Patrick D'Arcy and Alexandra Veroude*

Residential construction has made an important contribution to China's economic growth over recent decades. Given China's large population and the extensive use of steel in its urban residential development, this investment has also been an important driver of growing demand for Australia's exports of iron ore and coking coal. India's population is of a comparable size to that of China. However, despite its faster population growth, India's slower pace of urbanisation and less intensive use of steel in its housing construction has meant that housing activity in India has not been a major source of demand for iron ore and coal. This article explores the trends in the main factors that influence the amount and nature of investment in housing in China and India, and assesses the long-term outlook for residential construction in these two economies.

Introduction

A key part of the development process in emerging economies is growth in residential investment, which typically makes up a significant share of investment and is a major contributor to improved living standards. A range of factors influence the pace of growth in residential investment, in particular population growth, income growth and patterns of urbanisation. Further, depending on the type of construction undertaken, investment in residential housing may be resource intensive, with high-density and high-rise residential developments in particular requiring significant inputs of concrete and steel. As such, trends in residential investment in large emerging economies can influence global markets for iron ore and coking coal, Australia's two largest resource exports.

As discussed in Berkelmans and Wang (2012), residential construction associated with rapid urbanisation has been an important source of economic growth in China, with the share of dwelling investment in GDP estimated to have increased steadily over the past decade. In contrast, urbanisation in India has proceeded at a slower pace, with a range of factors – including planning difficulties and slower income growth – constraining residential investment and discouraging investment in large, steel-intensive housing developments in particular.

Although not always directly comparable, the data on housing stock and construction activity in China and India highlight these divergent developments. Not only has the stock of dwellings in China grown faster than that in India (Graph 1), but the Chinese housing stock also consists of a greater proportion of dwellings constructed with steel – which is of particular relevance for Australia – than is the case for India.[1] As Indian steelmakers import much of the coal required for production, with Australian coking coal a major source of supply, steel-intensive housing construction in India is also important for Australia.[2]

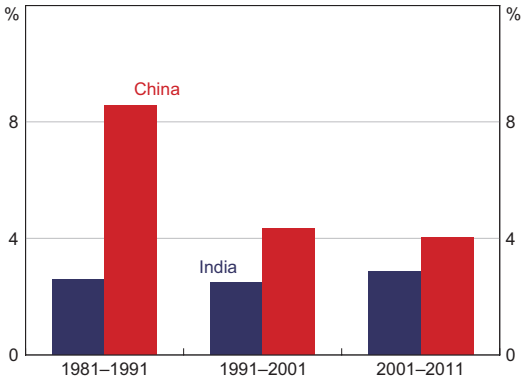
This article compares the current Chinese and Indian housing stocks and assesses the factors that affect the path of residential investment in these two

* The authors are from Economic Group.

1 The measure of the stock of dwellings in China has been boosted by the significant increase in the average size of dwellings over this period. The measure for India is based only on the number of houses, not their size.

2 Hyvonen and Langcake (2012) note that India's demand for iron ore (used with coking coal to create steel) is currently met through the extraction of high-quality hematite reserves.

Graph 1
Dwelling Stock Growth*
Average annual growth over decade



* Growth in India's dwelling stock is calculated using number of houses in the census; for China, this is calculated using the growth in aggregate residential floor space
Sources: Ministry of Home Affairs, Government of India; National Bureau of Statistics of China; RBA

countries. The first section reviews the demographic and urbanisation trends underlying the demand for housing; the second section explores the nature of the housing stock and factors influencing residential construction in China and India.

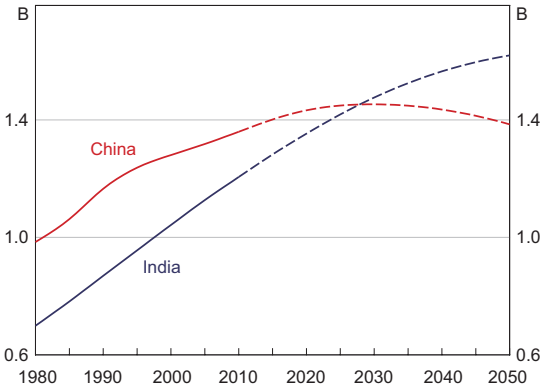
Demographic and Urbanisation Trends

China and India account collectively for almost 40 per cent of the world's population, with populations of 1.3 billion and 1.2 billion, respectively. Over the past three decades, India's population has grown at a much faster rate than in China, although the annual population growth in both countries has slowed over this period (Graph 2). Projections from the United Nations suggest that while India's population will continue to grow, albeit at a somewhat slower pace than in the past, China's population will increase more slowly and eventually begin to decline around 2030 when India's population is expected to surpass that of China (in its central scenario).[3]

Growth in the demand for housing is heavily influenced by the growth in the number of

3 The central scenario assumes a continuation of recent patterns and policies on migration in each nation (UN 2013).

Graph 2
Population*

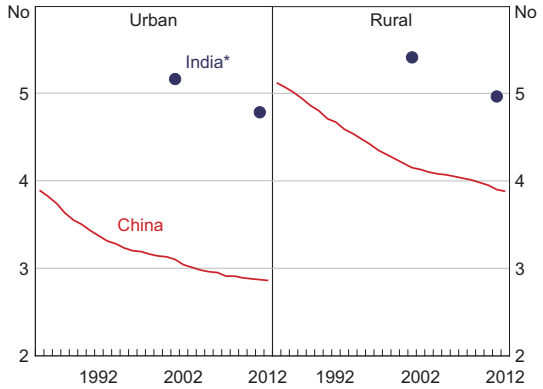


* Dashes indicate projections
Source: United Nations

households, which in turn is determined by the pace of population growth and changes in the average household size.

Although population growth is projected to slow in both China and India, the decline in the average household size is likely to support the demand for housing in both countries (Graph 3). In principle, the more rapid pace of population growth in India over the past few decades could have been expected to have encouraged greater housing demand than in China. However, the average household size is much lower in China than in India, both in rural and urban areas. This has made a larger contribution to the growth in

Graph 3
Average Household Size
Number of residents

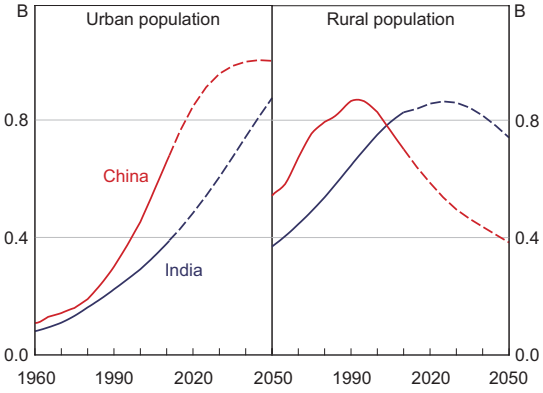


* Data from 2011 and 2001 census
Sources: CEIC Data; Ministry of Home Affairs, Government of India; RBA

the number of households in China compared with India.[4] The smaller average household size, and the larger population, mean that there are currently over 160 million more households in China than India, most of which are in China's urban areas. Although larger households potentially require a larger house, the significant number of additional households in China is likely to have bolstered their overall level of housing investment compared with that in India.

Urbanisation is another key factor driving investment in housing. Since the 1980s, China's population has undergone rapid urbanisation, with the current population approximately evenly split between urban and rural areas (Graph 4).[5] In contrast, in India only around 30 per cent of its 1.2 billion people live in urban areas, and its urban population is not expected to surpass the rural population for another 30 years (UN 2012). Even though India is projected to overtake China as the world's most populous nation by 2030, it is estimated that there will still be 350 million more urban residents in China at that time. The more moderate pace of urbanisation in India means that it may not experience a surge in demand for high-density dwellings of a similar magnitude to that observed in China.

Graph 4
Urban and Rural Population*



* Dashes indicate projections
Sources: RBA; United Nations; World Bank

4 High levels of housing construction in China could have also supported growth in the number of households, as there may be fewer multigenerational households if there is sufficient housing supply.

5 Due to limitations, Graph 4 uses backdated data on urban populations from the World Bank database. All projections are from the United Nations.

The Nature of the Housing Stock

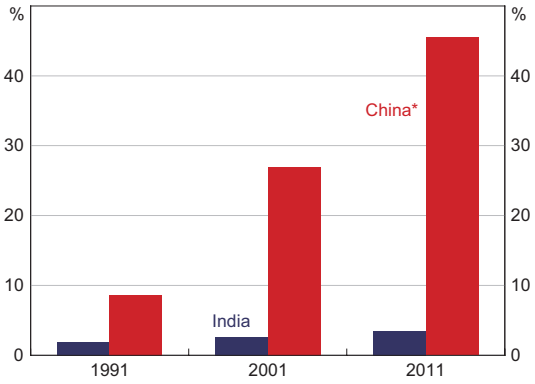
While the overall number of households and urbanisation patterns are important elements of housing demand, the quality of the housing stock is an important factor in determining the type and resource intensity of housing investment, in particular the use of steel in construction. From similar starting points three decades ago, when both populations were primarily living in traditional housing structures in rural areas, the differences in the pace of urbanisation and average household size, and especially income growth, have led to considerable differences in the quality of the housing stock in the two countries today.

Data on the construction quality of Chinese housing are only available for rural households, and so could be expected to be a lower bound for Chinese dwelling quality.[6] There has been a very large increase in the share of rural dwellings in China classified as having a 'reinforced concrete structure', from 9 per cent of the dwelling stock in 1991 to 45 per cent in 2011 (Graph 5). As there has been faster growth in the urban population – where concrete dwellings are more common – than in the rural population, the share of concrete dwellings in the whole of China is likely to have grown even faster than this.

Given the high population density of India, residential construction has the potential to use steel intensively. However, unlike China, the share of concrete dwellings in India has increased only modestly over the past two decades and remains at low levels. According to the Indian census, only 3.5 per cent of households live in a dwelling with concrete walls. Steel would not be likely to be found (in any significant way) in buildings made of any other material, so these data suggest that the use of steel in residential dwellings is currently quite low.

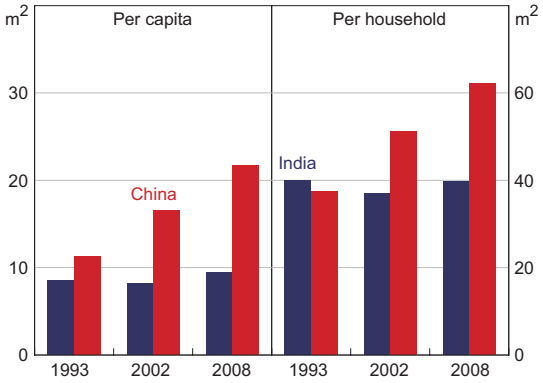
6 As suggested in Berkelmans and Wang (2012), many of the areas classified as rural, as published by the National Bureau of Statistics of China, may later be reclassified as urban areas. As dwellings measured as a 'reinforced concrete structure' are likely to be multistorey structures built on urban fringes, these data are not likely to reflect a true rural environment .

Graph 5
Concrete Dwellings
Per cent of dwellings



* National Bureau of Statistics of China measure of rural dwellings
Sources: Ministry of Home Affairs, Government of India; National Bureau of Statistics of China; RBA

Graph 6
Urban Residential Floor Space



Sources: CEIC Data; Ministry of Statistics and Programme Implementation, Government of India; RBA

Indeed, even though India's *current* level of GDP per capita is similar to that of China in 2002, the Chinese housing stock in 2002 consisted of a far greater proportion of houses constructed with steel than is the case for India today. In 2002, around 29 per cent of Chinese 'rural' households lived in a 'reinforced concrete structure', a larger percentage than the current concrete intensity in any major Indian city.[7] The composition of the housing stock in India today is more similar to that in China between 1985 and 1990 when per capita incomes in China were less than one-third of India's current levels.

In addition to being constructed using higher quality materials, Chinese houses are also generally larger than in India. Between 1993 and 2008, urban residential floor space per capita in China increased by 10 square metres, while in India it increased by at most 1 square metre (Graph 6).[8] Despite the larger average household size in India, estimates of urban residential floor space per household are significantly larger in China. In India, smaller dwellings on average and little growth in average floor space are likely to have been associated with lower demand for raw materials for housing construction, relative to China.

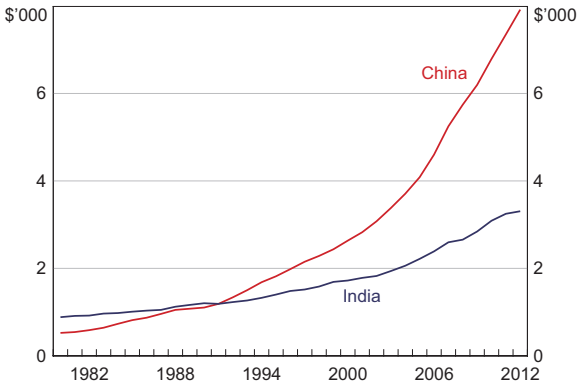
Average income growth has been a key reason behind these different trends in the quality of the housing stock. The urbanisation process in China has transferred large numbers of workers from relatively low productivity jobs in the rural sector to higher productivity jobs in urban areas. This movement has been a driver of the rapid growth in incomes in China over the past three decades, which has far exceeded the growth in incomes in India (Graph 7). Over time, Chinese households have chosen to spend their higher income on higher quality dwellings and dwellings with larger floor space and, as a consequence, the share of concrete dwellings and residential floor space per capita has increased.

Higher incomes increased the demand for higher quality buildings in China and so, as Berkelmans and Wang (2012) note, demolitions occur at a high rate as low-quality dwellings are replaced. As incomes in India rise, demolitions may also increase due to the high percentage of households currently living in dwellings constructed with 'informal materials' – material other than burnt brick, concrete or stone packed with mortar. The Indian census finds that almost 40 per cent of all households in India live in a dwelling with walls made from informal materials. However, it may be that these households seek to

7 Data are available annually on the share of concrete dwellings in 'rural' areas in China, but the equivalent measure in India is only measured every 10 years in the census.

8 Berkelmans and Wang (2012) estimate an average dwelling size per capita that is smaller than official estimates because the official estimates appear not to include the migrant worker population. Indian floor space data are collected from the National Sample Surveys. These surveys report lower average household sizes than the census data.

Graph 7
Income Per Capita*



* Based on PPP, 2005 constant prices in US dollars
Source: World Bank

upgrade their rural dwellings rather than relocate to high-density urban areas, in which case it is not likely that the demand for steel will increase significantly.

While income growth has supported the demand by households for higher-quality, medium-density dwellings, housing development also typically requires an increased level of supporting infrastructure. In China, various levels of government have played an important role in coordinating the urban development process, supporting growth in higher-density housing development. In contrast, many areas of large Indian cities do not have the power supply, water and sewerage facilities or transportation infrastructure to support dense housing areas (McKinsey Global Institute 2010). Moreover, it has been suggested that a range of state and city laws across India result in project delays, illegal construction and inefficient land use, which constrain urban development (Panagariya 2008). These impediments not only make residential construction more difficult in India but could also impede the urbanisation and productivity cycle that is a significant driver of residential development. Selected indicators from the World Bank database on the development of crucial infrastructure show that India generally lags in these aspects in comparison with China (Table 1).

Looking ahead, while these constraints are currently restricting high-density residential developments in India, the construction of necessary infrastructure, such as bridges and railways, is likely to increase the demand for steel over time. The Delhi-Mumbai Industrial Corridor is one project that is likely to contribute to India's steel demand. Initially, the project proposes to develop seven cities along the 1 483 kilometre Western Dedicated Rail Freight Corridor into global manufacturing and commercial hubs with world-class physical infrastructure to facilitate freight movement (Planning Commission, Government of India 2013). The McKinsey Global Institute (MGI) estimates that by 2030, US$1.2 trillion of capital investment will be necessary to meet the projected demand in India's cities and 7 400 kilometres of metros and subways will need to be constructed (McKinsey Global Institute 2012). In addition, MGI estimate that, by 2030, 700–900 million square metres of commercial and residential space needs to be built to accommodate urbanisation in India.

From Australia's point of view, the combined investment in housing construction in China and India is significant because of the overall impact on the demand for Australian commodities. Continued growth in urban populations and their incomes will support demand for steel-intensive construction in both China and India. In addition, if the expansion of

Table 1: China and India – Development Indicators

	China	India
Roads paved, per cent of total roads, 2008	54	50
Per cent of urban population with access to improved sanitation facilities, 2011	74	60
Electricity consumption, kWh per capita, 2011	3 298	684
Internet users per 100 people, 2012	42	13

Source: World Bank

infrastructure in India meets the projected demand, Indian commercial construction has the potential to have a large impact on the global demand for raw materials.

Conclusion

Differences in demographic, urbanisation and income trends in China and India have been key factors underlying variations in the use of steel in housing construction. In China, the declining average household size and rapid urbanisation as well as strong income growth have underpinned investment in high-quality and high-density housing. In contrast, slower urbanisation and income growth in India, alongside administrative difficulties associated with undertaking housing developments, have limited the demand for steel, iron ore and coal for housing construction in India. However, the magnitude of essential infrastructure needs throughout India indicates that there is the potential for significant increases in demand for these commodities as infrastructure is developed and incomes continue to rise. At the same time, as the large proportion of households living in informal dwellings, particularly in rural areas, seek to upgrade their dwelling or relocate to urban areas, this will add to the demand for steel-intensive housing.

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Developments in Banks' Funding Costs and Lending Rates

Leon Berkelmans and Andrew Duong*

This article updates previous Reserve Bank research on how developments in the composition and pricing of banks' funding have affected their overall cost of funding and the setting of lending rates (Deans and Stewart 2012; Robertson and Rush 2013). The main findings are that the absolute levels of banks' funding costs and lending rates have fallen over the past year, and spreads between these rates and the cash rate have narrowed marginally. The decline in these spreads largely reflects the shifts in the composition of banks' funding liabilities and the narrowing of wholesale debt spreads. Lending rates have tended to move in line with funding costs over the past 12 months.

Introduction

In setting lending rates, banks consider a number of factors. A key consideration is their cost of funding, which is a function of the composition and price of different liabilities (Fabbro and Hack 2011). Banks also take into account risk premia, including the credit risk associated with loans, and the liquidity risk involved in funding long-term assets with short-term liabilities. Banks' growth strategies, competitive pressures and the desire to provide a return to equity holders also affect banks' lending rates.

An important element in determining the overall cost of banks' funding is the level of the cash rate, which acts as an anchor for the broader interest rate structure of the domestic financial system. Nevertheless, changes in the level of compensation demanded by investors to hold bank debt, competitive pressures and non-price factors can exert significant influences on banks' funding costs. There is typically some delay before the full effect of changes in these factors flows through to funding costs and lending rates. In part, this reflects the time that it takes for balance sheet liabilities to be repriced, particularly those with longer terms to maturity. The Reserve Bank Board takes these developments into account when it determines the appropriate setting of the cash rate to ensure that the structure of interest rates faced by households and businesses is consistent with the desired stance of monetary policy.

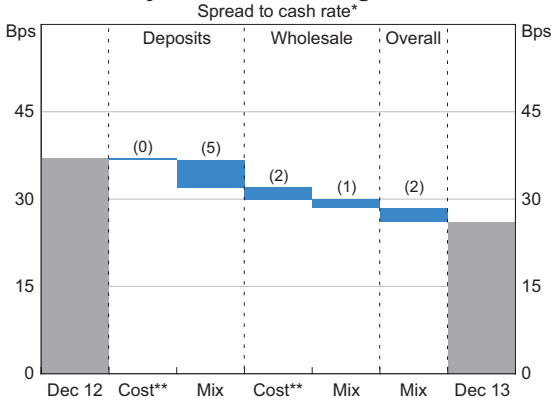
* The authors are from Domestic Markets Department.

Banks' Cost of Funding[1]

The absolute level of banks' funding costs is estimated to have fallen by slightly more than the reduction in the cash rate over 2013. The cost of deposits fell, while the cost of outstanding wholesale debt also declined, particularly in the latter part of the year. In addition, there has been a shift in funding toward slightly cheaper sources. Relative to the cash rate, the major banks' funding costs are estimated to have declined by about 11 basis points over the year (Graph 1). Nonetheless, funding costs relative to the cash rate continue to remain significantly higher than pre-financial crisis levels.

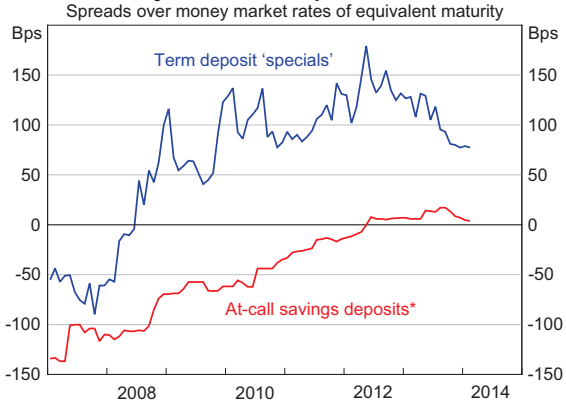
1 The Reserve Bank uses a wide range of information to derive the estimates presented in this article. It supplements the analysis with detailed discussions with financial institutions. See Appendix A for some details of the methodology used.

Graph 1
Major Banks' Funding Costs
Spread to cash rate*



* Bracketed numbers represent negative contributions to the overall change in the spread and may not add to the total due to rounding
** Includes the cost or benefit of interest rate hedges
Sources: APRA; Bloomberg; RBA; UBS AG, Australia Branch

Graph 2
Major Banks' Deposit Rates
Spreads over money market rates of equivalent maturity



* Spread to cash rate; existing customers only; excludes temporary bonus rates
Sources: Bloomberg; CANSTAR; RBA

Deposit funding

Over 2013, the direct contribution of changes in deposit spreads to changes in banks' funding spreads was negligible. A decline in term deposit spreads was offset by increased spreads in other products, notably transaction accounts. Changes in the deposit funding mix, however, contributed 5 basis points to the overall fall in banks' funding costs relative to the cash rate, as funding shifted from relatively expensive term deposits to other accounts. The fall in the overall cost of deposits was in sharp contrast to the years immediately following the global financial crisis, where deposit market developments were often a key driver of the increase in banks' funding costs.

Deposit interest rates

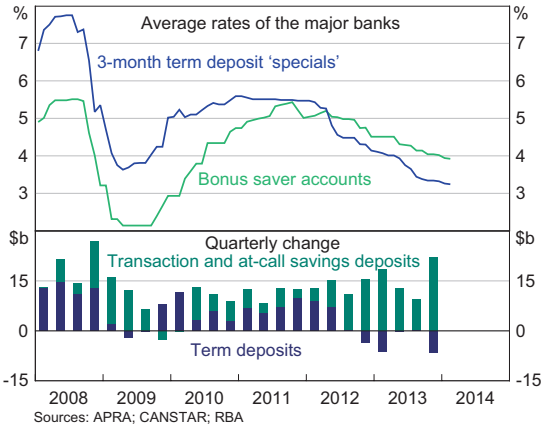
The average spread of the major banks' advertised term deposit 'specials' over equivalent term benchmark rates decreased by about 50 basis points over the past year, and by about 100 basis points from its peak in mid 2012 (Graph 2). While the level of spreads is still high, the reduction in spreads has coincided with a decline in wholesale interest rates, as market conditions improved over the year (see 'Wholesale funding' below). The cost of outstanding term deposits relative to the cash rate has also declined.

In contrast to term deposits, the pricing of at-call savings deposits has remained at elevated levels relative to its benchmark – the cash rate. As depositors have substituted away from term deposits, bonus saver accounts, in particular, have been an attractive alternative (Graph 3). These accounts are useful to banks because they are a relatively stable source of funding. This owes to their contractual requirements for minimum monthly deposits or limitations on withdrawals in order to receive a higher interest rate for that month. Moreover, these deposits may qualify for a similar liquidity charge to term deposits in the new Australian Prudential Regulation Authority's liquidity standards.[2] Although bonus saver deposits are estimated to currently represent less than 10 per cent of the major banks' deposit funding, their growth has been particularly strong since 2012 as the competition for these deposits has intensified, and interest rates on these deposits continue to remain elevated relative to the cash rate.

Traditional online savings accounts continue to offer interest rates close to the cash rate. In an attempt to attract deposit funding, some banks have continued to offer new customers of online saver accounts introductory bonus rates of interest.

2 For details, see APRA (2014).

Graph 3
Household Deposits



Sources: APRA; CANSTAR; RBA

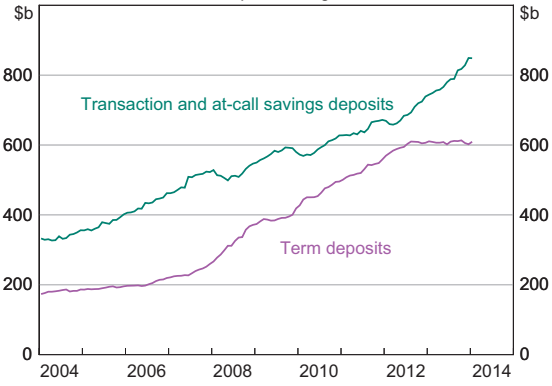
Some banks have recently introduced new notice-of-withdrawal (NOW) accounts. These accounts require depositors to provide advance notice (generally a minimum of 31 days) of their intention to withdraw funds from the account in an effort to further increase their stable funding base, which in part has been driven by regulatory developments. Advertised interest rates for these accounts have been similar to those available for bonus saver accounts and some term deposit 'specials'. Nonetheless, as a nascent product, NOW accounts currently only represent a small share of banks' total deposit funding.

For transaction accounts and some cash management accounts, the interest rates offered are generally close to zero. Hence, as monetary policy eased over the year, the difference between rates on these deposits and the cash rate increased by about 50 basis points. This increase is estimated to have contributed about 5 basis points to the major banks' funding costs relative to the cash rate, which offset some of the falling spreads on term deposits. Banks often attempt to buffer changes in the relative cost of transaction deposits by using interest rate hedges. However, the recent sustained low interest rate environment has led banks to roll over these hedges at rates that have increased the hedged cost of funding – that is, net payments to banks on new hedging contracts are estimated to be lower than net payments on expiring contracts.

Deposit mix

Since mid 2012, the level of funding from term deposits has been largely unchanged, while transaction and at-call savings deposits have continued to grow (Graph 4). Because the cost of outstanding term deposits relative to the cash rate is higher than most at-call savings deposits and all transaction deposits, this shift in the mix has lowered the cost of deposit funding. Banks have decreased their use of term deposits as the relative cost of new term funding from the wholesale market has become more attractive. Moreover, some depositors may have been reluctant to lock in fixed interest rates at low levels, particularly if their expectations of future interest rates differed from market expectations. Nonetheless, term deposits are still an important source of deposit funding, representing about 40 per cent of banks' total deposit liabilities.

Graph 4
Domestic Deposits*
Authorised deposit-taking institutions



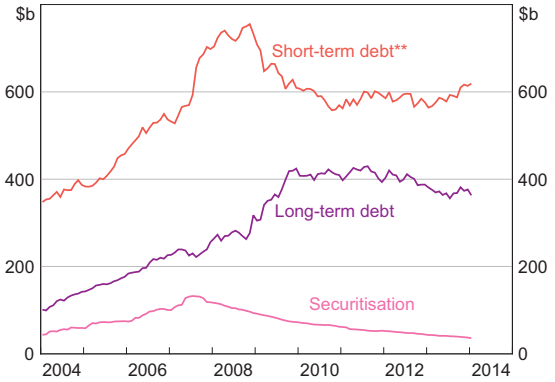
* Break-adjusted; not seasonally adjusted; excludes foreign currency deposits, intragroup deposits and certificates of deposit

Sources: APRA; RBA

Wholesale funding

Changes in the overall cost of wholesale funding are estimated to have contributed about 4 basis points to the fall in the major banks' cost of funding relative to the cash rate. The composition and level of wholesale funding has been little changed over the past year as banks have continued to focus on funding new lending with deposits (Graph 5).

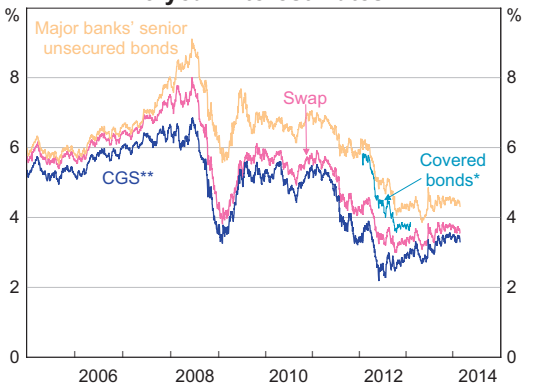
Graph 5
Wholesale Funding of Banks in Australia*



* Adjusted for movements in foreign exchange rates; tenor of debt is estimated on a residual maturity basis
** Includes deposits and intragroup funding from non-residents
Sources: APRA; RBA; Standard & Poor's

The absolute cost of issuing long-term wholesale debt rose slightly over the past year, following the increase in benchmark risk-free rates, which was offset slightly by a narrowing of spreads on bank bonds to these rates (Graph 6). Nonetheless, spreads continue to remain above their pre-crisis levels following investors' reassessment of the amount of compensation required for taking on bank credit risk.

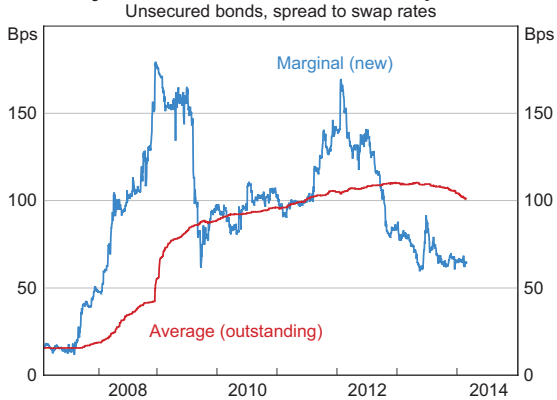
Graph 6
5-year Interest Rates



* 5-year covered bonds data are unavailable after 5 February 2013
** Commonwealth Government Securities
Sources: Bloomberg; RBA; UBS AG, Australia Branch

Even though the spread on new issuance is now at around its lowest level since 2009, the recent improvement in wholesale market conditions has only had a limited effect on banks' funding costs because new issuance has been relatively subdued over 2013 (Graph 7). As bonds issued during 2008 and 2009 at relatively high rates mature over the next year, the average outstanding bond spread is likely to continue to decline if spreads on new issuance remain around current levels. Bonds issued during 2008 and 2009, many of which are government guaranteed, represent about 70 per cent of the maturing bonds in 2014.

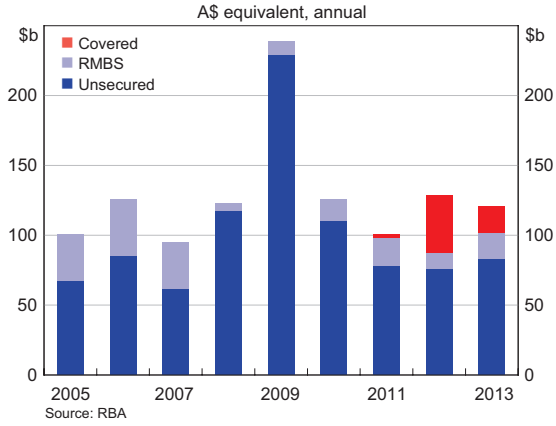
Graph 7
Major Banks' Domestic Bond Spreads
Unsecured bonds, spread to swap rates



Sources: Bloomberg; RBA; UBS AG, Australia Branch

Banks' issuance of covered bonds has been subdued over the past year (Graph 8). Covered bonds generally attract lower interest rates than unsecured bonds due to their dedicated pool of collateral, as well as the expanded investor base to which these securities appeal. However, Australian banks' covered bond issuances are capped at 8 per cent of domestic assets.[3] Banks continue to maintain some spare

Graph 8
Australian Banks' Wholesale Issuance
A$ equivalent, annual



Source: RBA

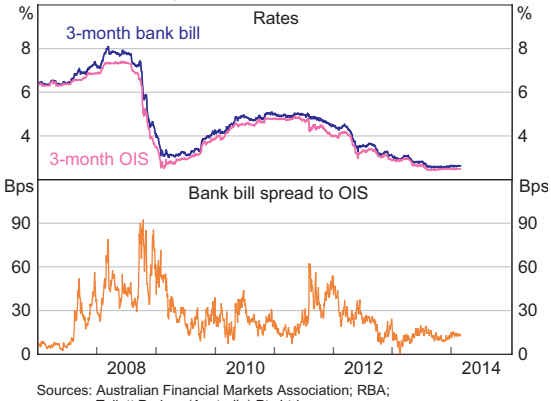
3 For further details on covered bonds, see RBA (2012).

capacity to issue covered bonds in the event of heightened stress in global financial markets. In 2013, securitisation, particularly of residential mortgage-backed securities (RMBS), has continued to recover after it declined sharply in 2007. RMBS spreads to the bank bill swap rate were roughly flat over the year.

Over the past year, interest rate hedges on banks' wholesale debt are estimated to have increased banks' hedged funding costs slightly, somewhat offsetting the reduction in the unhedged cost of wholesale debt. Once again, this is because net payments to banks on new hedging contracts are estimated to be lower than net payments on expiring contracts.

Banks' use of short-term wholesale funding has remained little changed over 2013. The composition of short-term debt remains fairly evenly split between domestic and offshore sources. Domestic short-term wholesale debt tends to be based on 1- and 3-month bank bill rates. In contrast, offshore short-term debt issuance tends to have longer maturities – often up to one year – as offshore markets are deeper and more liquid. Relative to expectations of the cash rate (as implied by the 3-month overnight indexed swap rate) the cost of short-term wholesale debt has declined over the past year to be only slightly above its pre-crisis levels (Graph 9).

Graph 9
Money Market Interest Rates

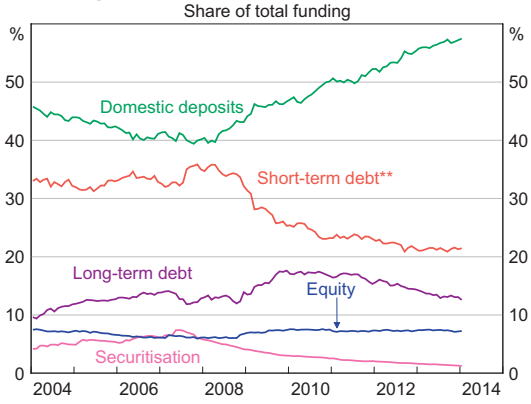


Sources: Australian Financial Markets Association; RBA; Tullett Prebon (Australia) Pty Ltd

Funding composition

The trend toward a greater use of deposit funding that has been evident over the past five years has continued and has been accompanied by a decline in the share of funding from wholesale debt (Graph 10). The shift over the year is estimated to have contributed 2 basis points to the fall in the major banks' funding costs relative to the cash rate, as some long-term wholesale funding was replaced with cheaper deposit funding.

Graph 10
Funding Composition of Banks in Australia*
Share of total funding



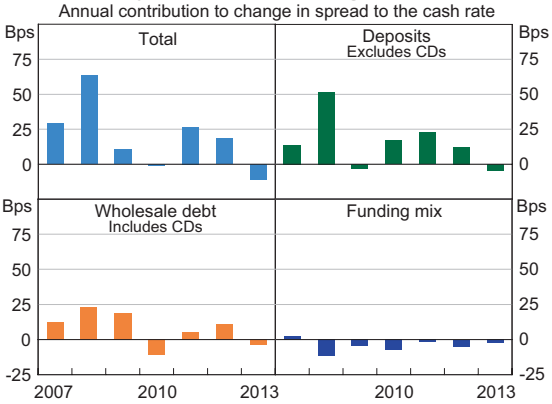
* Adjusted for movements in foreign exchange rates; tenor of debt is estimated on a residual maturity basis
** Includes deposits and intragroup funding from non-residents
Sources: APRA; RBA; Standard & Poor's

Overall cost of funding

As noted previously, there are a number of factors that influence banks' total debt funding costs, including changes in risk sentiment and competition for funding sources. These factors affect both the price of banks' funding liabilities and the composition of their balance sheets. Taking the cost of the individual funding sources noted above and weighting them by their share of total bank funding provides an estimate of banks' overall funding costs.

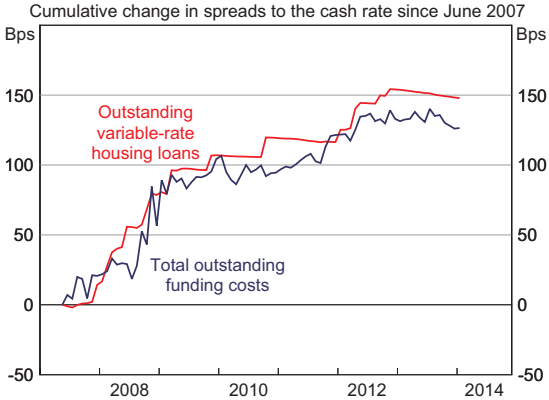
Over the past year, the fall in overall funding costs reversed a trend of increases since the onset of the global financial crisis (Graph 11). Nonetheless, the major banks' funding costs are estimated to remain close to 130 basis points higher than prior to that event. For a discussion of methodological changes introduced this year, see Appendix A.

Graph 11
Major Banks' Funding Costs*
Annual contribution to change in spread to the cash rate



* RBA estimates
Sources: APRA; Bloomberg; RBA; UBS AG, Australia Branch

Graph 12
Major Banks' Lending and Funding
Cumulative change in spreads to the cash rate since June 2007



Sources: ABS; APRA; Bloomberg; Perpetual; RBA; UBS AG, Australia Branch

Banks' Lending Rates

In setting lending rates, banks take account of the cost of funding liabilities, the required return on equity, as well as the risk margin designed to cover potential losses from making a loan. Since the onset of the global financial crisis, increases in the cost of some of these factors – predominantly an increase in banks' funding costs – have contributed to a widening of the spread between lending rates and the cash rate. Nonetheless, movements in the banks' net interest margin since 2007 have been minor when compared with the broad compression they experienced over the two decades prior to that.

During 2013, the average interest rate on outstanding variable-rate housing loans drifted lower relative to the cash rate. The average interest rate on new variable-rate housing loans fell by about 10 basis points relative to the cash rate as discounts were increased. Moreover, the average interest rate on some new fixed-rate housing loans relative to expectations of the cash rate also fell over 2013. This was consistent with the small reduction in banks' overall funding costs relative to the cash rate over the period, suggesting that risk and profit margins remained largely unchanged (Graph 12).

The interest rates on around two-thirds of business loans are typically set relative to the bank bill swap rate rather than the cash rate. Nonetheless, relative to the cash rate, spreads on both small and large business lending rates have fluctuated within a tight range over the past year. Business lending spreads today continue to reflect the reassessment of funding and lending risks since the crisis.

Appendix A: Revisions to the Funding Cost Methodology

The Bank has changed its methodology for calculating funding costs in a number of ways. The first change relates to the hedging of interest rate risk, which arises from a mismatch in the size and maturity of a bank's fixed-rate liabilities and fixed-rate assets. Fixed rate liabilities represent about half of the major banks' funding liabilities.[4] In contrast, less than a fifth of the major banks' assets are fixed rate. Banks are able to hedge the mismatch in their funding by converting the effective payments on fixed-rate liabilities into variable-rate liabilities through the use of interest rate swaps.

The Reserve Bank's estimate of funding costs presented in this article assumes that the major banks fully hedge their funding interest rate risk exposures. That is, to the extent that funding liabilities are not naturally hedged by offsetting fixed-rate assets, interest rate swaps are assumed to be used. This assumption represents one bound to

4 Fixed-rate liabilities includes transaction deposits, term deposits and fixed-rate, long-term wholesale debt.

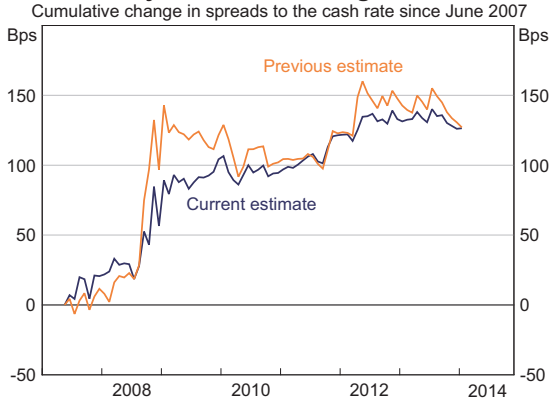
funding costs. The unhedged cost of funding, which had been the assumption underlying calculations in previous *Bulletin* articles on this topic, represents another bound. In practice, banks would adopt a strategy somewhere within the range of these two alternatives.

The hedged funding cost estimates also include the cost of hedges on transaction deposits, which are essentially fixed rate as the interest rate remains either close to or at zero. The portfolio of swaps on these transaction deposits, which are typically for terms of 3 to 5 years, is commonly referred to as a 'replicating portfolio'.

Another change relates to the composition of deposits. Based on the availability of more granular data on the composition of deposits, the major banks' deposit funding composition has been revised. Incorporating the effect of these changes has had a modest effect on estimates of banks' funding costs. Most noticeably, the data indicate that there has been a shift in deposits towards bonus saver accounts recently.

The current funding cost estimates for the major banks, which incorporates the cost of hedging and the revision to banks' deposit composition, along with some other minor refinements, are similar to the previous Reserve Bank funding cost estimates (Graph A1). However, there have been gaps between these series in the past. Over recent years, this gap was largest following the reductions in the cash rate in 2008 and 2009 as interest rate hedges cushioned the effect of unexpected movements on banks' funding costs. Since then, both the current and previous estimates have broadly moved together.

Graph A1
Major Banks' Funding Costs
Cumulative change in spreads to the cash rate since June 2007



Sources: APRA; Bloomberg; RBA; UBS AG, Australia Branch

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Non-dealer Clearing of Over-the-counter Derivatives

Ashwin Clarke and Paul Ryan*

In 2009, the G20 leaders agreed that all standardised over-the-counter (OTC) derivatives should be cleared through central counterparties (CCPs). Accordingly, an increasing proportion of OTC derivatives are now centrally cleared, particularly where the trading counterparties are large 'dealer' firms. However, for many smaller financial institutions and non-financial corporations, there remain material challenges in adopting central clearing. Such firms usually access CCPs indirectly through arrangements with larger dealer firms – so-called 'client clearing' arrangements. While non-dealers have long used such arrangements for their exchange-traded activity, increased CCP clearing of OTC derivative products has prompted market participants and policymakers to examine more closely these arrangements. Aspects of the design of client clearing arrangements, such as collateral requirements, operating schedules, and the degree of segregation of positions and collateral, can all have material implications for the costs and risks a firm faces in its OTC derivative trading activity. Some of these aspects could also have broader implications for financial stability.

Introduction

Much of the underlying demand for OTC derivatives originates from non-dealer financial institutions, such as institutional investors, or non-financial corporations (collectively referred to as 'non-dealers' in this article). Often, such firms use OTC derivatives to hedge financial risks arising from their investments or real economic activities. A life insurance provider, for instance, may use OTC interest rate derivatives to better match the interest rate exposure of its assets and liabilities. In some cases, a firm may also use derivatives to gain a 'synthetic' exposure to a particular risk without transacting directly in the underlying asset, perhaps as a temporary measure to smooth investment flows. For example, a fund manager that has received an inflow of investment funds may initially use credit derivatives as an efficient and timely means of gaining a desired exposure before gradually building a position in the underlying securities. Non-dealer activity is generally intermediated by dealers, typically large financial institutions. These firms then execute offsetting transactions with other dealers to maintain a broadly balanced overall position.[1]

To date, both dealers and non-dealers have tended to clear OTC derivatives bilaterally; that is, the financial exposures arising from the transaction have remained between the bilateral counterparties. However, largely in response to regulatory reforms, dealers and some non-dealers are increasingly clearing their OTC derivatives through CCPs. A CCP interposes itself between the original counterparties to a financial transaction and manages the risk that either defaults before settling its obligations. Dealers typically become direct clearing participants of CCPs, while non-dealers usually access CCPs indirectly through 'client clearing' arrangements with direct

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1 Indeed, each transaction between a dealer and a non-dealer may trigger several offsetting interdealer transactions. Accordingly, the majority of outstanding OTC derivative positions are between dealers.

clearing participants (referred to as 'clearing agents' in this article).

The design of client clearing arrangements will influence the benefits, direct costs and risks faced by non-dealers and their clearing agents. It may also have financial stability implications. The Australian financial regulators – the Australian Prudential Regulation Authority (APRA), the Australian Securities and Investments Commission (ASIC) and the Reserve Bank of Australia (RBA) – will consider such issues when formulating their recommendation to the Australian Government on whether mandatory requirements to centrally clear interest rate derivatives should extend to non-dealers. Some of these issues are also relevant for the RBA and ASIC when assessing the client clearing services offered by the CCPs they oversee. This article describes the key features of client clearing arrangements, identifying some issues for consideration by policymakers.

Background

A CCP, by definition, acts as a central counterparty to all trades in a given market. This occurs through a process known as 'novation', whereby the contract between the original parties to a trade is replaced by two contracts: one between the buyer and the CCP; and one between the seller and the CCP. To manage the risks it takes on, a CCP maintains a comprehensive, conservative and transparent risk management framework. Rigorous risk-management standards and close regulatory oversight are essential, since an unavoidable result of replacing a bilateral network with a CCP is concentration of counterparty credit risk and operational dependence on the CCP.

A CCP's risk management framework usually involves three layers of risk controls:[2]

- *Participation requirements and participant monitoring*. A CCP typically sets minimum financial and operational requirements for direct participation, and monitors compliance with these requirements.
- *Margin*. Participants face variation and initial margin requirements. Initial margin protects a CCP from potential future exposures on outstanding positions, while variation margin is exchanged to reflect price movements that have already occurred.
- *Additional default resources*. A CCP holds additional prefunded pooled financial resources to cover exposures in the event that a participant defaults and its initial margin is insufficient to cover realised losses. These resources typically include a mix of a CCP's own capital and participant contributions to a mutualised default fund.

In September 2009, the G20 countries, which include Australia, committed to ensuring that standardised OTC derivatives were centrally cleared (G20 2009). G20 leaders also committed to imposing higher capital charges where banks retained non-centrally cleared OTC derivative exposures and later also undertook to develop margin requirements for non-centrally cleared OTC derivatives (G20 2011). The promotion of central clearing reflects the view that CCPs can enhance the resilience of the financial system in a number of ways, including by reducing interconnectedness between market participants, enhancing and streamlining counterparty credit risk management, and providing a coordinated means of dealing with participant defaults.

To date, the United States is the most advanced in implementing the G20 commitments by mandating that a wide range of dealer and non-dealer firms centrally clear certain specified OTC derivative products. The Australian authorities, as well as those in a number of other jurisdictions, are considering similar requirements.[3] Even where there are no mandatory requirements to centrally clear OTC derivatives in a particular jurisdiction, the incentive to clear is becoming stronger. Globally, at least between dealer counterparties in the interest rate derivative market, pricing and liquidity are now more favourable if transactions are centrally cleared. Accordingly, more

2 For more information on CCP risk management practices, see ASIC and RBA (2009) and Rehlon and Nixon (2013).

3 The Australian financial regulators recommended in their July 2013 Report on the Australian OTC Derivatives Market that large financial institutions be required to centrally clear OTC interest rate derivatives denominated in the major currencies (APRA, ASIC and RBA 2013).

than half of the notional value outstanding in OTC interest rate derivatives globally is now cleared via CCPs.[4] This trend is also observed in Australia, where two CCPs are now licensed to centrally clear OTC interest rate derivatives for Australian participants: ASX Clear (Futures) and LCH.Clearnet Limited (LCH.C Ltd). Both CCPs initially made their services available to direct participants only. LCH.C Ltd permits client clearing in its international service and now intends to make this service available to its Australian-based participants. ASX Clear (Futures) has also developed a client clearing service, which it plans to launch in April 2014.

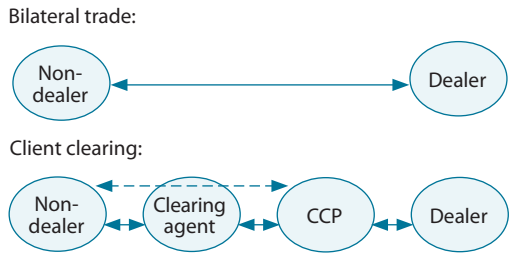
Client Clearing Arrangements

Non-dealers may be unable or unwilling to meet a CCP's participation requirements or to commit to contributing to its default resources. Under such circumstances, a non-dealer may choose to access a CCP indirectly via a client clearing arrangement, under which a clearing agent centrally clears the non-dealer's trades on its behalf.

Client clearing allows non-dealers to access many of the benefits of participating directly in a CCP, such as netting, and high counterparty risk management standards. The netting benefits of CCP clearing, however, will depend on the extent to which offsetting trades can be cleared with the same CCP. Given that the motivation for many non-dealers to use OTC derivatives is to hedge an underlying exposure, their OTC derivative positions will often be directional (that is, individual trades will not be offsetting). Accordingly, many non-dealers may derive fewer netting benefits than would a dealer with a largely balanced portfolio.[5]

Under most client clearing arrangements, the client's primary relationship is with the clearing agent (Figure 1). The clearing agent is held responsible for its clients' trades to the CCP, including any associated margin requirements or other financial obligations. The nature of the relationship between the non-dealer and the CCP varies between CCP offerings and jurisdictions.[6] Usually, the client would only have a direct relationship with the CCP if its clearing agent were to default.

Figure 1: Structure of Client Clearing Relationships



Note: Dotted line represents the non-dealer's relationship with the CCP if the clearing agent were to default
Source: RBA

The terms of a client clearing arrangement generally reflect details of the relevant CCP's products on offer, including its risk frameworks and operational arrangements. These can vary significantly across CCPs. For example, even where multiple CCPs accept the same products, their margin methodologies and operating arrangements may differ. The main dimensions across which CCP arrangements may vary are presented in Table 1.

4 The incentive to centrally clear in the absence of a mandate in part reflects the cross-border reach of other jurisdictions' regulation – in particular that of the United States – and also lower bank capital requirements on centrally cleared OTC derivative exposures relative to bilaterally cleared exposures.

5 Indeed, central clearing could in some circumstances increase exposures. This may be the case if potentially offsetting positions with a bilateral counterparty are 'unnetted', with some cleared centrally while others remain bilaterally cleared. See Duffie and Zhu (2011) and Heath, Kelly and Manning (2013).

6 Broadly, the legal relationship between the client and CCP follows one of two models. Under the first model, the clearing agent acts solely as agent for the client (the so-called 'principal-to-agent' model), with the client also having a contractual relationship with the CCP. The principal-to-agent model is prevalent in the United States, where it has been mandated by regulators. ASX Clear (Futures) will also use an agency-style clearing model to support its new client clearing service. Under the second model, the clearing agent contracts as principal with the CCP in respect of its clients' trades (the so-called principal-to-principal model) and the client has no direct contractual relationship with the CCP. To centrally clear under the principal-to-principal model, for each client trade, the clearing agent would typically create an identical trade with the CCP. Despite differences in the legal relationships between parties, the models are generally similar economically. However, there may be slight differences. For example, the principal-to-agent model usually involves standardised legal documentation with common terms. In contrast, under the principal-to-principal model, there can be more flexibility in the terms of the arrangement between the client and the clearing agent.

Table 1: Key Features of CCP Arrangements for Non-dealers

Feature	Description
Products cleared	The range and type of products centrally cleared by the CCP.
Account structure	The CCP's account structure determines the level of segregation of positions and collateral that is available to clients (see below).
Margin and collateral	A CCP's choice of margin methodology and parameters affects the level of margin a client must pay. Some CCPs allow direct participants and non-dealer clients to recognise offsets in their positions across product classes or currencies, which reduces margin requirements.[(a)] CCPs may also differ in the types of collateral they accept as margin, which may affect the cost to non-dealers of meeting margin requirements.
Trading counterparties	To centrally clear a transaction, both counterparties must have access to the same CCP. A non-dealer's choice of CCP will therefore depend at least in part on the clearing arrangements of its existing and prospective trading counterparties.[(b)]
Operating arrangements	A CCP's operating hours and procedures, and connectivity requirements.
Legal jurisdiction	The legal jurisdiction of a CCP determines the particular legal regime and regulations that govern its operations.

(a) For example, ASX Clear (Futures) allows direct participants to offset OTC and exchange-traded interest rate derivatives, while LCH.C Ltd allows participants to offset OTC interest rate derivatives denominated in different currencies; ASX Clear (Futures) intends for the offset to apply for non-dealers that use its proposed client clearing service

(b) Central counterparty interoperability can permit trades to be centrally cleared even where they have been executed between participants of different CCPs; however, such arrangements have not yet emerged for OTC derivatives – for more information see Garvin (2012)

Source: RBA

Regulatory requirements are also an important determinant of a CCP's operations and, in turn, the services that are available to non-dealer clients. In particular, new international standards set minimum requirements in respect of a number of the above factors (see 'Box A: Principles for Financial Market Infrastructures'). These have formed the basis for the RBA's and ASIC's assessment of the client clearing service to be offered by ASX Clear (Futures), and will similarly form the basis of their assessment of LCH.C Ltd's service.

While the terms of a client clearing arrangement are shaped by the relevant CCP's product offerings, and its risk management and operational arrangements, a number of aspects will also be the subject of negotiation between non-dealers and their clearing agents. Common economically significant terms that must be negotiated include:

- *Position limits*. A clearing agent may place a limit on the size, concentration or market risk exposure of the positions it is willing to accept on behalf of clients – either collectively, or individually. Since the clearing agent assumes financial risk vis-à-vis its clients, it may manage this risk not only through margin (see below), but also by applying exposure limits.
- *Margin and collateral*. A clearing agent will typically pass on to clients at least the margin requirement imposed by the CCP. Client clearing arrangements may vary, however, in terms of whether the clearing agent collects more than the CCP's margin requirement, the range of eligible collateral, operational arrangements, time lines for delivery of margin and any restrictions on the re-use of clients' margin by the clearing agent.
- *Trade termination and 'change' clauses*. The client clearing agreement will set out the circumstances in which the clearing agent may impose additional requirements on a client, place restrictions on its activity or even terminate the client's trades.

As in any negotiation, the bargaining power of the parties is important in determining the outcome. Larger non-dealers, especially those that have a broader relationship with a clearing agent, may be able to negotiate more favourable terms.

Box A
Principles for Financial Market Infrastructures

In April 2012, international standard setters (the Committee on Payment and Settlement Systems (CPSS) and the Technical Committee of the International Organization of Securities Commissions (IOSCO)) released the *Principles for Financial Market Infrastructures* (Principles; CPSS-IOSCO 2012). Consistent with the increasing use of CCPs and other financial market infrastructures, the Principles update, harmonise and strengthen the pre-existing standards for CCPs (and other financial market infrastructures). The RBA and ASIC have fully implemented the Principles for CCPs in Australia.[1]

The Principles set minimum requirements in respect of the design and operation of CCPs' services. They cover areas such as the general organisation of the CCP (e.g. governance and legal arrangements), credit and liquidity risk management (including minimum standards with respect to collateral and margin), default management, access, efficiency and transparency.

Within these categories, several requirements are directly relevant to the design of client clearing arrangements. These are:

- Principle 14: *Segregation and portability.* A CCP should have rules and procedures that enable a participant's customers' positions and collateral to be held in segregated accounts at the CCP and allow transfer of these positions and collateral to an alternative participant if the original participant were to default. This requirement is discussed further in 'Account segregation and portability'.
- Principle 19: *Tiered participation arrangements.* A CCP is required to identify, monitor and manage the material risks to the CCP arising from indirect access to the CCP.

The Principles also require CCPs to have objective, risk-based and publicly disclosed criteria for participation, which permit fair and open access. This requirement is discussed further in 'Concentration and Access'.

1 For CCPs in Australia, the Principles related to financial stability have been implemented by the RBA, while all other Principles have been implemented by ASIC. For more information on the implementation of the Principles in Australia, see RBA and ASIC (2013).

Issues for Consideration

The benefits of central clearing are well known and understood by regulators and market participants. While client clearing arrangements provide an efficient means for non-dealers to access these benefits, they naturally entail some direct costs and risks. These will differ according to the particular characteristics of the non-dealer.

Establishing a client clearing arrangement is itself a costly process, which can take a number of months. It typically involves the negotiation of commercial terms, due diligence, the drafting of legal documentation, and the establishment and testing of operational arrangements. On an ongoing basis, a non-dealer must pay clearing fees to its clearing agent and also meet any variation and initial margin requirements arising from its trades. Large non-dealers – particularly those with ready access to liquid assets that may be used to meet margin requirements – are more likely to be able to absorb the high fixed cost of establishing client clearing arrangements, and to accommodate ongoing fees and margin costs.

As in the case of direct participation, client clearing concentrates counterparty credit risk in CCPs. Accordingly, clients remain exposed in the highly unlikely event that a CCP faces financial difficulties.[7] In contrast to direct participation, however, a non-dealer client may also be exposed to its clearing agent – and, in some cases, other clients of its clearing agent. In particular, if a clearing agent were to default and client positions were closed out by the CCP, clients would have to incur the potentially high cost of entering the market to replace their positions (either clearing these via a new clearing agent, which may not be feasible at short notice, or bilaterally). Innovations in CCP account structure aim to mitigate this risk.

The remainder of this section considers in more detail the costs and risks associated with margin and collateral requirements, and CCP account structures.

Margin and collateral

While a growing number of non-dealers regularly post variation margin for bilaterally cleared OTC derivatives, it is not yet standard practice, either in Australia or internationally, to exchange initial margin. This will change with new international standards for the margining of bilaterally cleared OTC derivatives, which will be phased in over the coming years (BCBS-IOSCO 2013). In the meantime, adjusting to CCP margin requirements would entail material changes to many non-dealers' business and operational practices.

For these firms, it may be necessary to hold additional liquid funds or secure costly lines of credit to guarantee that regular variation margin calls could be met. Similarly, a non-dealer that was not a natural holder of high-quality liquid assets would need to reallocate a portion of its investments to ensure that it could satisfy a CCP's collateral eligibility criteria for initial margin requirements. Holding such assets may be expensive for some non-dealers, especially in light of a system-wide increase in demand for high-quality collateral due to wider use of CCPs and other financial regulation.[8]

Non-dealers could be assisted in meeting their collateral needs by an expansion in the availability of collateral optimisation services. These services aim to allocate available collateral assets most efficiently by scanning a collateral giver's securities holdings and identifying, within the range of the collateral receiver's eligibility criteria, which assets will be cheapest to deliver. Collateral costs could also be eased if CCPs expanded (within prudent limits and consistent with regulatory standards) the range of collateral types they are willing to accept to meet

7 One channel by which a client may face a financial exposure is through loss allocation under a CCP's 'recovery plan', which sets out how it would respond in the event of a threat to its ongoing viability. For more information on recovery and resolution in the Australian context, see Gibson (2013). Some non-dealers may also face additional legal risk if the CCP holds collateral in a foreign jurisdiction.

8 In some jurisdictions, such as Australia, these costs may be higher than in some other jurisdictions due to shortages in the supply of high-quality collateral. For more information on the demand and supply conditions of high-quality Australian dollar assets, see Heath and Manning (2012).

initial margin requirements. For example, both CME Clearing and LCH.C Ltd have expanded their lists of eligible collateral in recent years.[9]

Some non-dealers may also make use of new 'collateral transformation' services, under which the provider transforms lower quality or less liquid assets into assets that would be eligible to meet a CCP's margin requirements. However, these services remain in their infancy and could introduce new sources of cost and risk to non-dealers, and potentially to the system more broadly (see 'Box B: Collateral Transformation').

A non-dealer's capacity to meet margin requirements will largely depend on its characteristics. For non-dealers that naturally hold liquid and high-quality assets – such as non-dealer banks – the incremental cost of meeting margin requirements may be manageable. In contrast, for non-dealers that do not routinely hold these assets – such as managed funds that invest solely in equities or infrastructure – the incremental cost could be high.

Account segregation and portability

CCP account structure is an important determinant of both the risks and costs of client clearing. In particular, account structure can determine whether a non-dealer faces financial risk from its clearing agent and its clearing agent's other clients. It also has implications for the probability that client positions could be transferred or 'ported' between clearing agents in the event of a clearing agent default, as well as for the protections afforded to assets posted as collateral. Account structure may also determine the cost to a clearing agent (and indirectly to its clients) of meeting a CCP's collateral requirements, as well as the operational complexity of the clearing process. Increasingly, CCPs are offering a wide variety of account segregation options, reflecting non-dealers' growing awareness of costs and risks as well as changes in regulatory requirements.

A CCP's account structures may offer segregation along various dimensions. First, the CCP may segregate its records at two levels: at the open position level and at the collateral level. In addition, for 'omnibus' accounts that are used for multiple clients, CCPs' account structures may also differ in whether positions are netted across clients. Second, the CCP may segregate clients' positions and collateral from the clearing agent's proprietary positions, either as a group or individually.

The Principles set minimum requirements for the account structure options offered by a CCP (Principle 14). At a minimum, the Principles require that a CCP segregate client positions and collateral from the clearing agent's proprietary positions such that client collateral could not be used to meet a shortfall in a clearing agent's proprietary account in the event of the clearing agent's default. Within these bounds, presently, CCPs typically offer from among four broad classes of account structure:

- *Net omnibus*. A single net position is calculated for all of the clients of a clearing agent and margin is called on the basis of this net position. This level of segregation offers the maximum netting benefit, since individual clients' positions may be offsetting. While the clearing agent will typically continue to collect 'gross' margin from each client to manage its own exposure to clients, the benefit of net margining from the CCP may be passed on to clients in the form of lower fees. An omnibus account is also operationally simple. While potentially cheaper and more efficient for clients, this structure carries so-called 'fellow customer risk' for clients. That is, if both the clearing agent and another client in the account were to default, *any* collateral in the client account could be used to cover losses arising from the client default. Since the collateral in the account is the net of all clients' positions, any individual position may be insufficiently margined and therefore losses could be imposed on non-defaulting clients.

9 In 2011, LCH.C Ltd expanded its list of eligible collateral to include non-sovereign bonds and other government-guaranteed bonds, such as US agency mortgages. LCH.C Ltd already accepts Australian government bonds to meet initial margin requirements, but intends to expand the list of Australian dollar assets it accepts, including Australian dollar cash. In 2012, CME Clearing expanded its list of eligible collateral for its OTC interest rate swap clearing service to include corporate bonds.

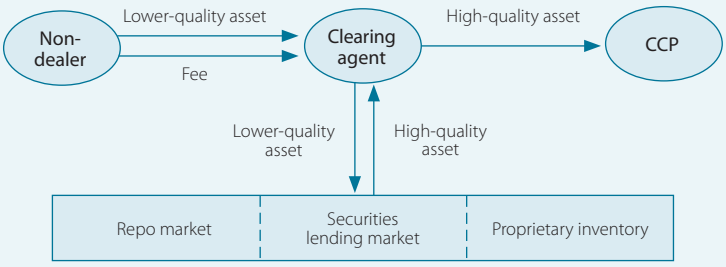
Box B
Collateral Transformation

Collateral transformation refers to a transaction whereby a financial institution offers to exchange lower-quality assets for high-quality collateral or cash, for a fee, to meet a customer's initial or variation margin requirement (Figure B1). Transformation services may be provided by a non-dealer's clearing agent, but may also be provided by a third party. The service provider typically applies a haircut to the lower-quality asset provided, which will depend on the quality of the asset. The collateral transformation provider may either source the high-quality collateral from its own balance sheet, or act as an intermediary for access to the repurchase agreement (repo) or securities lending markets. Transactions are usually short-term, in part due to the underlying liquidity in the repo and securities lending markets, as well as regulatory constraints that make longer-term repurchase agreements more costly.

While collateral transformation services could help a non-dealer meet a CCP's margin requirements, they may also introduce new costs and risks for the non-dealer. Since collateral transformation transactions would generally be of a shorter duration than a non-dealer's centrally cleared OTC derivatives, the non-dealer would face a maturity mismatch, and the risk that it was unable to roll over a transformation transaction or that the cost to do so had increased substantially. A non-dealer may also need to meet obligations arising from changes to the value of the collateral it has provided. In addition, transformation adds an extra layer of transactions to the margining process, which could increase cost and operational risk.

More broadly, collateral transformation could be a new source of interconnectedness in the market, undermining an important goal of central clearing, which is to simplify the network structure of the OTC derivatives market. By using collateral transformation services, non-dealers may also be more exposed to problems in repo and securities lending markets, and idiosyncratic shocks to these markets.

Figure B1: The Mechanics of Collateral Transformation



Source: RBA

- *Gross omnibus*. The CCP calculates positions and margin for each client individually. While gross omnibus accounts may still carry fellow customer risk, this risk would be reduced because with gross margining any individual position would be less likely to be insufficiently margined. While position information is collected for each client, neither positions nor assets posted as collateral in this structure are legally attributed to individual clients. This means that clients are not assured of having the specific assets they post returned to them in the event of a default, even if the value is returned.[10]
- *Legal segregation with operational commingling (LSOC)-style*.[11] This type of account structure shares many of the features of gross omnibus. However, this structure also offers clients protection against fellow customer risk by legally segregating positions and assuring (non-defaulting) clients the value of the collateral they posted.
- *Full individual segregation*. Both positions and individual assets posted as collateral are attributed to individual clients. Each client is protected from the default of its clearing agent and other clients, and assured of the return of the specific collateral that it has posted. Since each line of collateral must be allocated and recorded separately for each client, however, this level of segregation can be operationally intensive and therefore more costly for the clearing agent relative to the above. These costs would likely be passed on to the client in the form of higher fees.

The ease and likelihood with which client positions could be transferred to another clearing agent in the event of the default of a clearing agent, known as portability, is dependent on the level of account segregation. As explained above, client positions in a net and gross omnibus account are not legally segregated. Therefore, it may be challenging to transfer positions unless all clients were to port their positions to the same alternative clearing agent. Furthermore, if one or more clients were also to default, the surviving clients' positions could be under-margined, which would add further complexity to the transfer. The LSOC-style and full individual segregation structures, by contrast, may facilitate portability by allowing for positions and collateral to be legally separated and transferred.

The timely transfer of positions and collateral would also typically require that a client had arrangements in place with an alternative clearing agent. Given the high fixed cost of establishing a clearing arrangement, this may only be feasible for larger non-dealers that conduct a significant volume of OTC derivative business. Importantly, establishing a back-up arrangement may only guarantee the operational capability to execute a transfer – it may not guarantee that the alternative clearing agent would be willing and able to take on a non-dealer's positions at the time a default occurred. Particularly if the default of a client's primary clearing agent was associated with extreme stress in the financial system, an alternative clearing agent may refuse to accept new positions.

Concentration and Access

Another relevant matter is the market structure of client clearing service provision. Clearing agents must meet the participation requirements of one or multiple CCPs. In addition, client clearing services generally require significant technological and operational investments, and therefore benefit from economies of scale. As a result, presently, client clearing services tend to be provided by a small group of large international banks domiciled in Europe or the United States (CGFS 2011).

While such concentration offers operational and cost efficiencies, it may exacerbate the risks faced by some non-dealers in their client clearing

10 This could be a concern for a client with an investment mandate that restricts which assets may be held, or that has purchased the security posted as collateral for a separate specific purpose.

11 LSOC generally refers to account structures used by CCPs and clearing agents operating within the United States regulatory framework, which affords specific protections to clients. This article uses LSOC-style to encompass account structures that have a similar risk profile to the LSOC account structure.

arrangements. For instance, concentration may make portability more difficult by both limiting the choice of alternative clearing agents and increasing the volume and value of positions to be ported in the event of a clearing agent's default. In addition, the larger and more complex the business model of the clearing agent, the higher the risk that the recovery of clients' collateral could require a lengthy legal negotiation in the event of a default. Such legal risk may be exacerbated when the clearing agent and its client are located in different jurisdictions.

The risk profile of CCPs may also change due to concentration among clearing agents. Many CCPs' largest exposures are already generally to large international banks. If these banks were also to centrally clear the majority of non-dealer transactions, the risk that CCPs faced from these entities could further increase.

Finally, concentration could delay the uptake of client clearing arrangements. In particular, given the resources involved in establishing a client clearing arrangement, a small number of clearing agents may have limited capacity to conclude agreements with many clients simultaneously. Some non-dealers could therefore face delays in the transition to central clearing, especially smaller non-dealers that may be less profitable to the clearing agent.

The Principles aim to address some of these issues. First, they require that a CCP provide fair and open access to its services based on reasonable risk-related participation requirements (Principle 18). While in theory this may facilitate direct membership for a broader group of market participants, most non-dealers are in practice likely to remain unable to meet CCPs' participation requirements, or to find it uneconomical to participate directly.[12] The Principles also require that CCPs manage material risks arising from indirect access, including dependencies between direct and indirect participants (Principle 19). A CCP could, for instance, reserve the right to require that a clearing agent deposit additional collateral for a particularly large client's position. However, it remains to be seen how effective such regulatory measures will be in mitigating the concentration in client clearing services.

12 Lane, Dion and Slive (2013) provide a more comprehensive analysis of CCP access and participation requirements in the context of the Principles.

Conclusion

The benefits of central clearing for market participants and for the financial system are well recognised by regulators. While client clearing provides an efficient means for non-dealers to centrally clear their OTC derivatives, it may also introduce new costs and risks. The Australian financial regulators will consider such costs and risks in their forthcoming assessment of whether to recommend that mandatory requirements to centrally clear interest rate derivatives should extend beyond large internationally active dealers. Consideration of some of these issues has also been relevant to the assessments by the RBA and ASIC of the client clearing service that ASX Clear (Futures) intends to launch. The RBA and ASIC will undertake a similar assessment of LCH.C Ltd's client clearing service.

Until new international standards for margining bilaterally cleared OTC derivatives are implemented, non-dealers will face an incremental cost from meeting CCP margin requirements. The capacity of a non-dealer to accommodate these costs will depend on its particular characteristics, including how it uses derivatives and the assets it holds. For instance, the cost may be higher for a non-dealer that uses derivatives primarily to hedge underlying positions in less liquid markets. And while market innovations may ease some costs and risks, some may introduce new concerns that warrant close scrutiny by regulators. Collateral transformation, for instance, may make it easier for non-dealers to access high-quality collateral; however, it carries new risks and reintroduces interconnectedness.

The new client clearing models that CCPs intend to offer in Australia have been or will be assessed against the relevant regulatory standards. They are

designed to provide appropriate segregation and protect each individual client's collateral, at least in value terms. The RBA recognises, however, that portability of positions could be difficult in times of stress. Larger non-dealers may be better able to meet the fixed cost of maintaining multiple client clearing arrangements to reduce dependence on any one clearing agent and increase the probability that a transfer is successful.

Looking ahead, the benefits, costs and risks of non-dealer clearing will be influenced by how the market structure evolves. An important question is whether non-dealer clearing activity continues to be concentrated among relatively few clearing agents. Concentration could limit access to client clearing services and could amplify the impact of a clearing agent default. Again, larger non-dealers may be able to manage this risk by establishing relationships with multiple clearing agents, but for the system as a whole, this may be a vulnerability.

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Most of the publications listed below are available free of charge on the Bank's website (www.rba.gov.au). Printed copies of these publications, as well as a wide range of earlier publications, are also available on request; for details refer to the enquiries information at the front of the *Bulletin*.

Statement on Monetary Policy

These statements, issued in February, May, August and November, assess current economic conditions and the prospects for inflation and output.

Financial Stability Review

These reviews, issued in March and September, assess the current condition of the financial system and potential risks to financial stability, and survey policy developments designed to improve financial stability.

Annual Reports

- *Reserve Bank of Australia Annual Report*
- *Payments System Board Annual Report*
- *Equity & Diversity Annual Report*

Research Discussion Papers (RDPs)

This series of papers is intended to make the results of current economic research within the Bank available for discussion and comment. The views expressed in these papers are those of the authors and not necessarily those of the Bank.

Abstracts or introductions of all RDPs, and the full text of RDPs published since 1988, are available on the Bank's website.

Conference Volumes

Conference volumes have been published on the Bank's website since 1993. The most recent titles are:

- *Liquidity and Funding Markets*, December 2013
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- *The Australian Economy in the 2000s,* December 2011
- *Reserve Bank of Australia 50th Anniversary Symposium,* July 2010
- *Inflation in an Era of Relative Price Shocks,* May 2010
- *Lessons from the Financial Turmoil of 2007 and 2008,* October 2008
- *The Structure and Resilience of the Financial System,* November 2007

Other Publications

The Bank periodically produces other publications that may take the form of submissions to inquiries, surveys or consultation documents. Some recent examples include:

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- *Submission to the Inquiry into Affordable Housing,* February 2014
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- *2013 Self-assessment of the Reserve Bank of Australia – Systemically Important Payment Systems,* December 2013
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