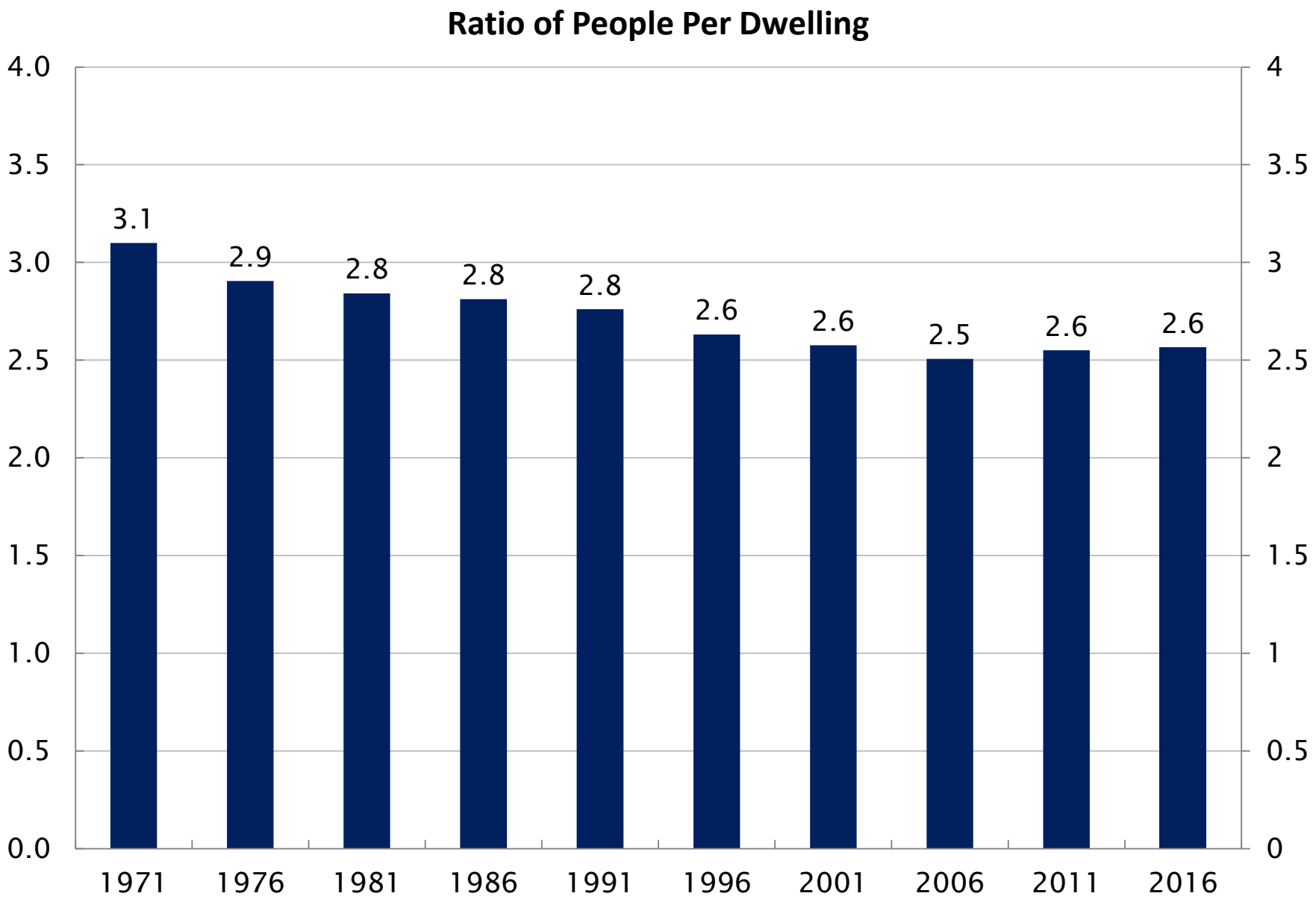
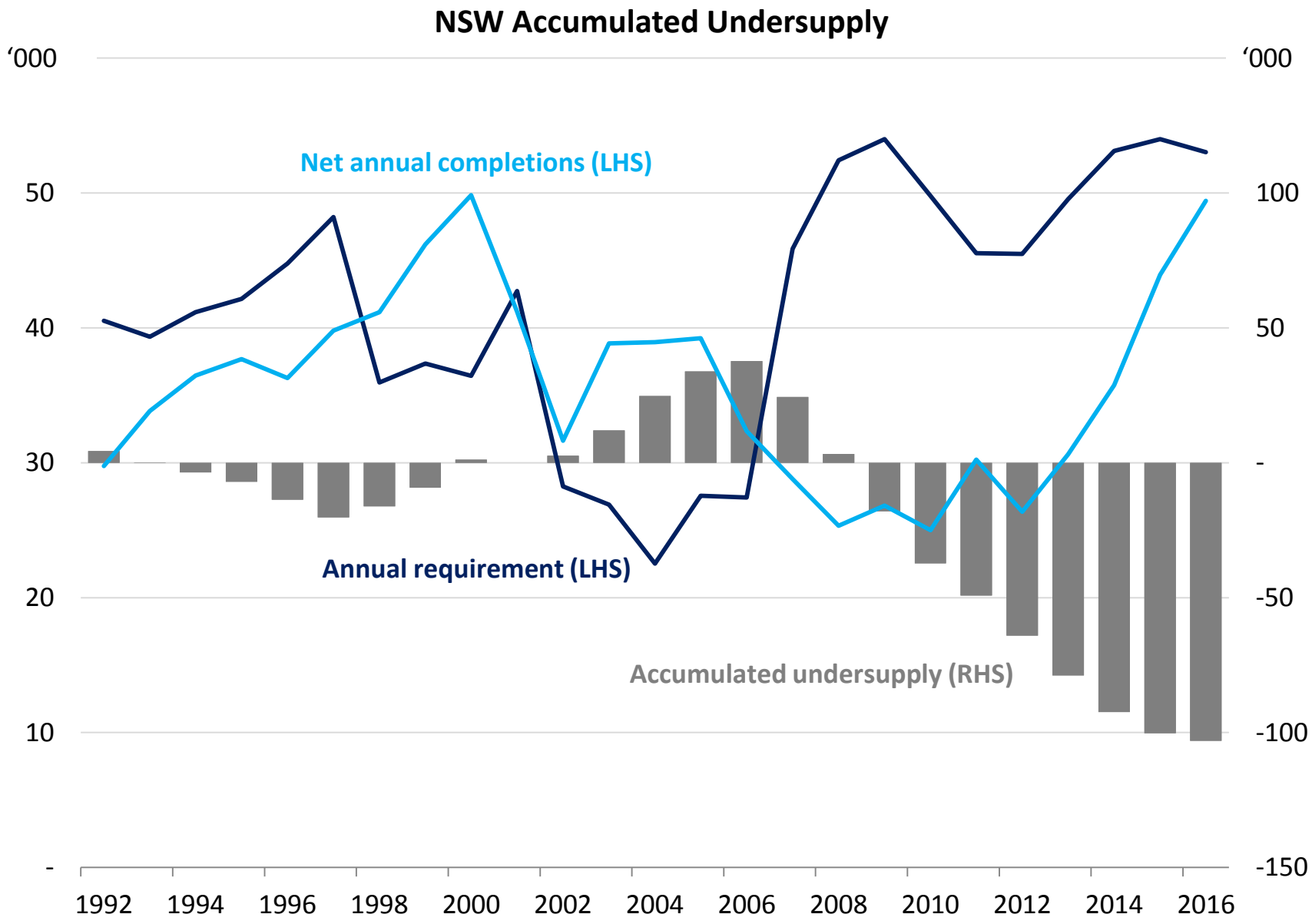
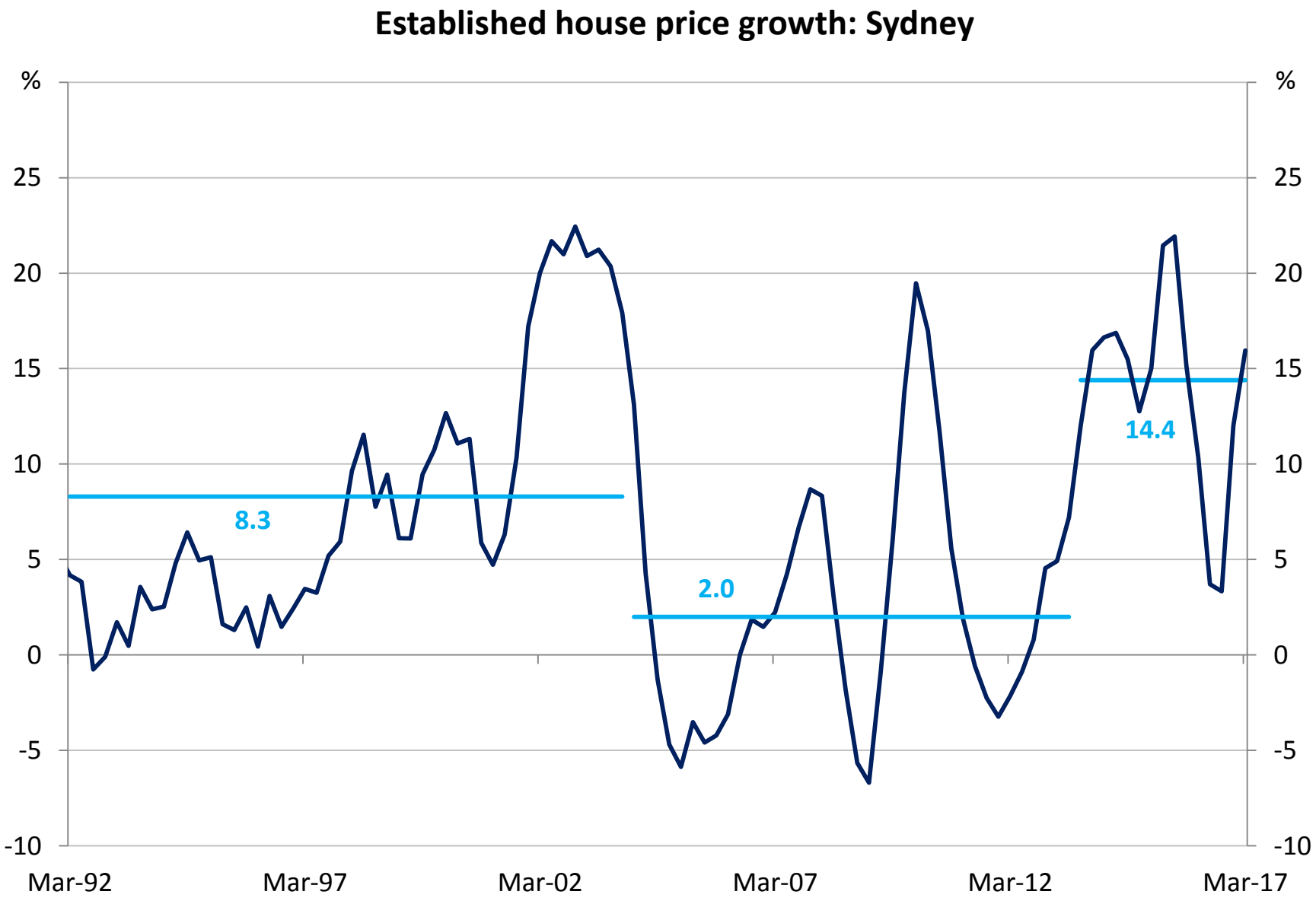
Housing Prices and Migration Flows


Ratio of People Per Dwelling
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
4
3.5
3
2.5
2
1.5
1
0.5
0
3.1
2.9
2.8
2.8
2.8
2.6
2.6
2.5
2.6
2.6
1971
1976
1981
1986
1991
1996
2001
2006
2011
2016


NSW Accumulated Undersupply
'000
'000
Net annual completions (LHS)
Annual requirement (LHS)
Accumulated undersupply (RHS)
50
40
30
20
10
-
100
50
-
-50
-100
-150
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016


Established house price growth: Sydney
%
25
20
15
10
5
0
-5
-10
8.3
2.0
14.4
Mar-92
Mar-97
Mar-02
Mar-07
Mar-12
Mar-17

Key Policy Questions

- How much can a single jurisdiction in Australia affect its own housing prices by acting, in isolation, to improve its own housing supply?
- How do changes in the pace of national net in-migration to Australia affect housing prices, and how might this vary across States?

Presentation Structure

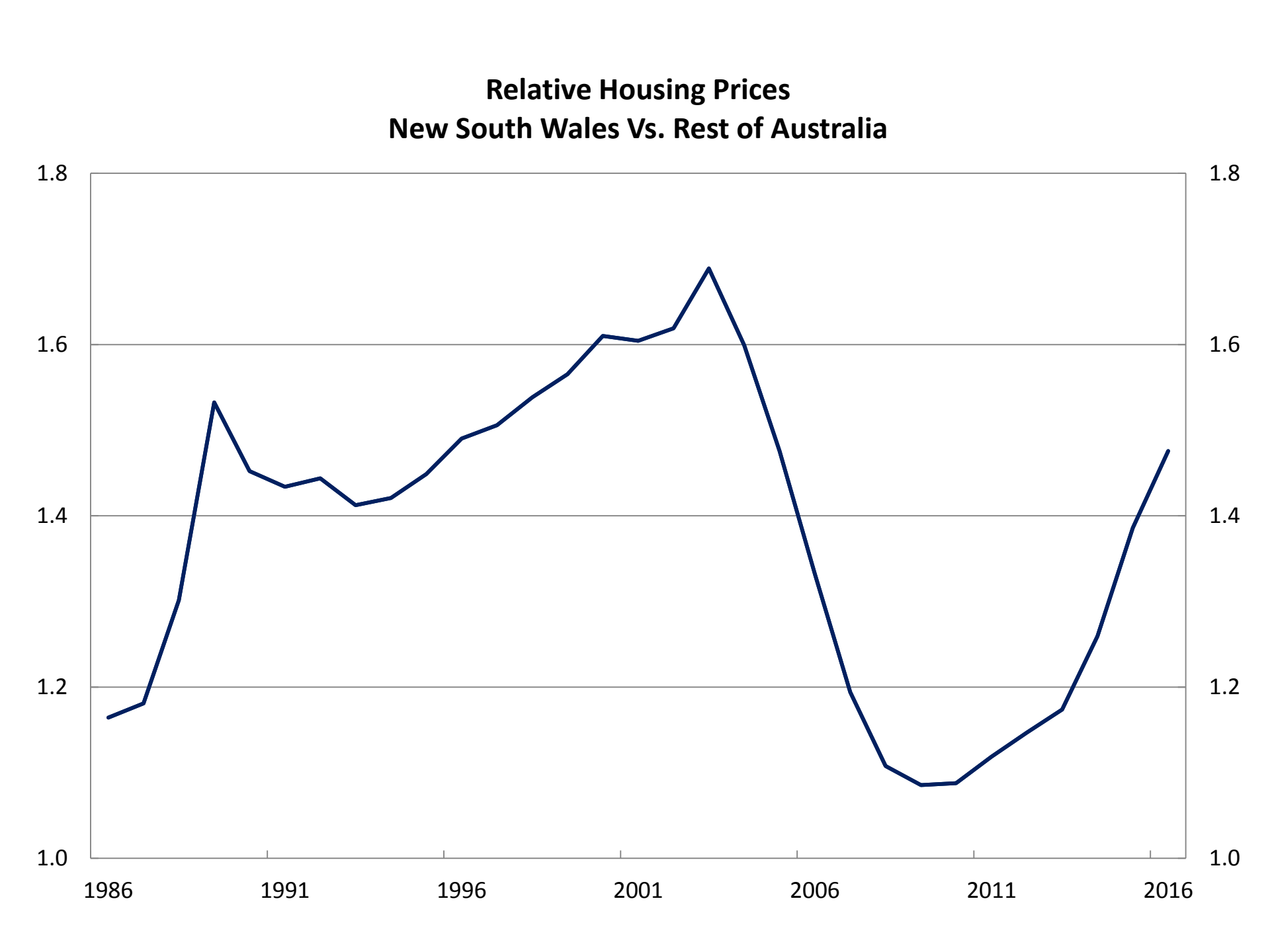
- Model overview
- Modelling results
  - Housing supply shock scenarios
  - Net overseas migration shock scenario
- Conclusions

The Model

- Large two-region – NSW and Rest of Australia (RoA) – cohort component demographic model, overlaid with a housing and migration flows module
- Annual frequency, for generating projections over 40 years (to capture demographic echoes of migration or other changes)
- Lots of identities – but only four key behavioural equations

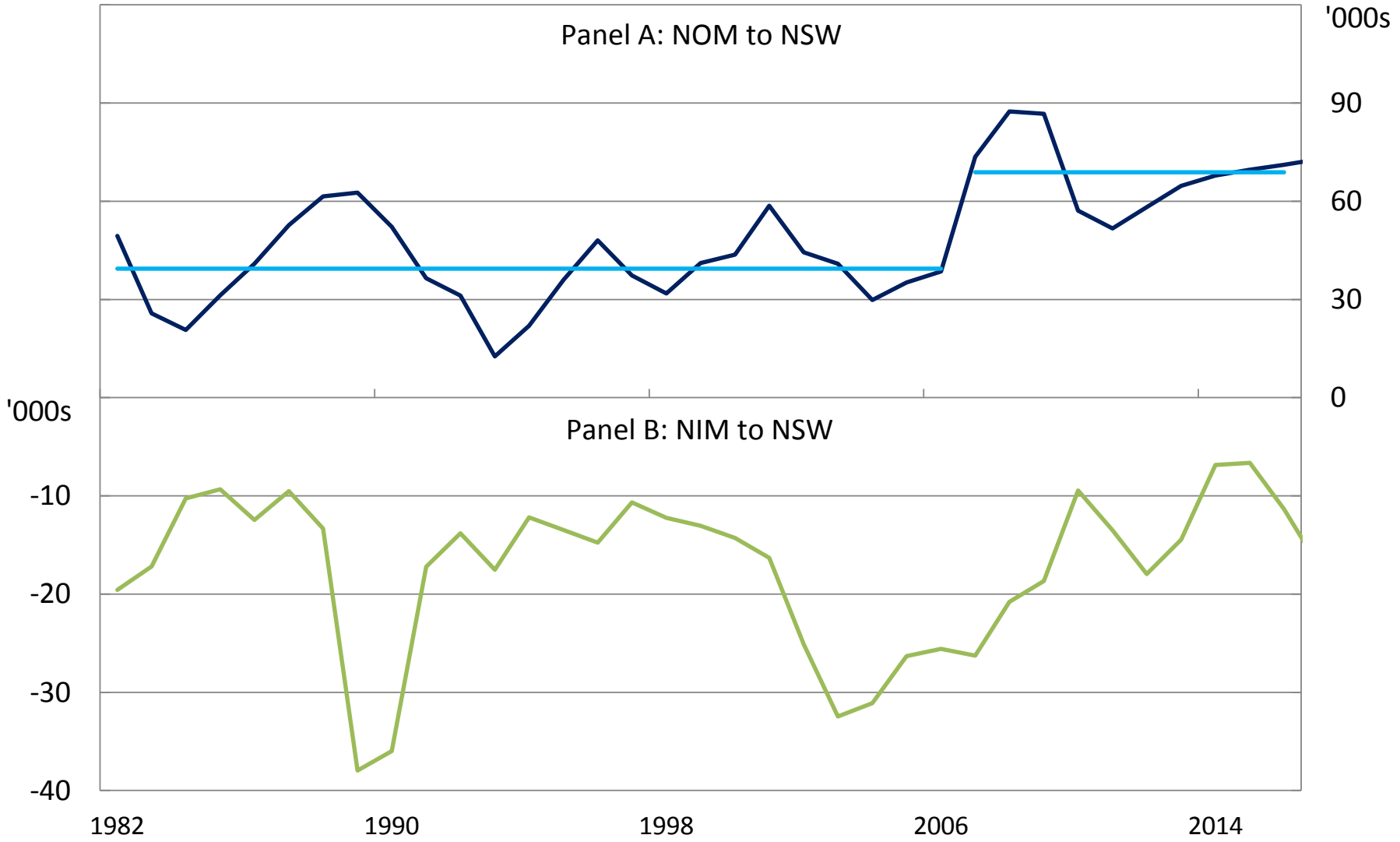
Estimated Behavioural Equations

- Relative housing price equation
- Net Overseas Migration (NOM) share equation (NOM to NSW as share of total NOM)
- Net Interstate Migration (NIM) share equation (NIM to NSW as share of total NSW population)
- Australian housing price growth equation


Relative Housing Prices
New South Wales Vs. Rest of Australia
1.8
1.6
1.4
1.2
1.0
1986
1991
1996
2001
2006
2011
2016

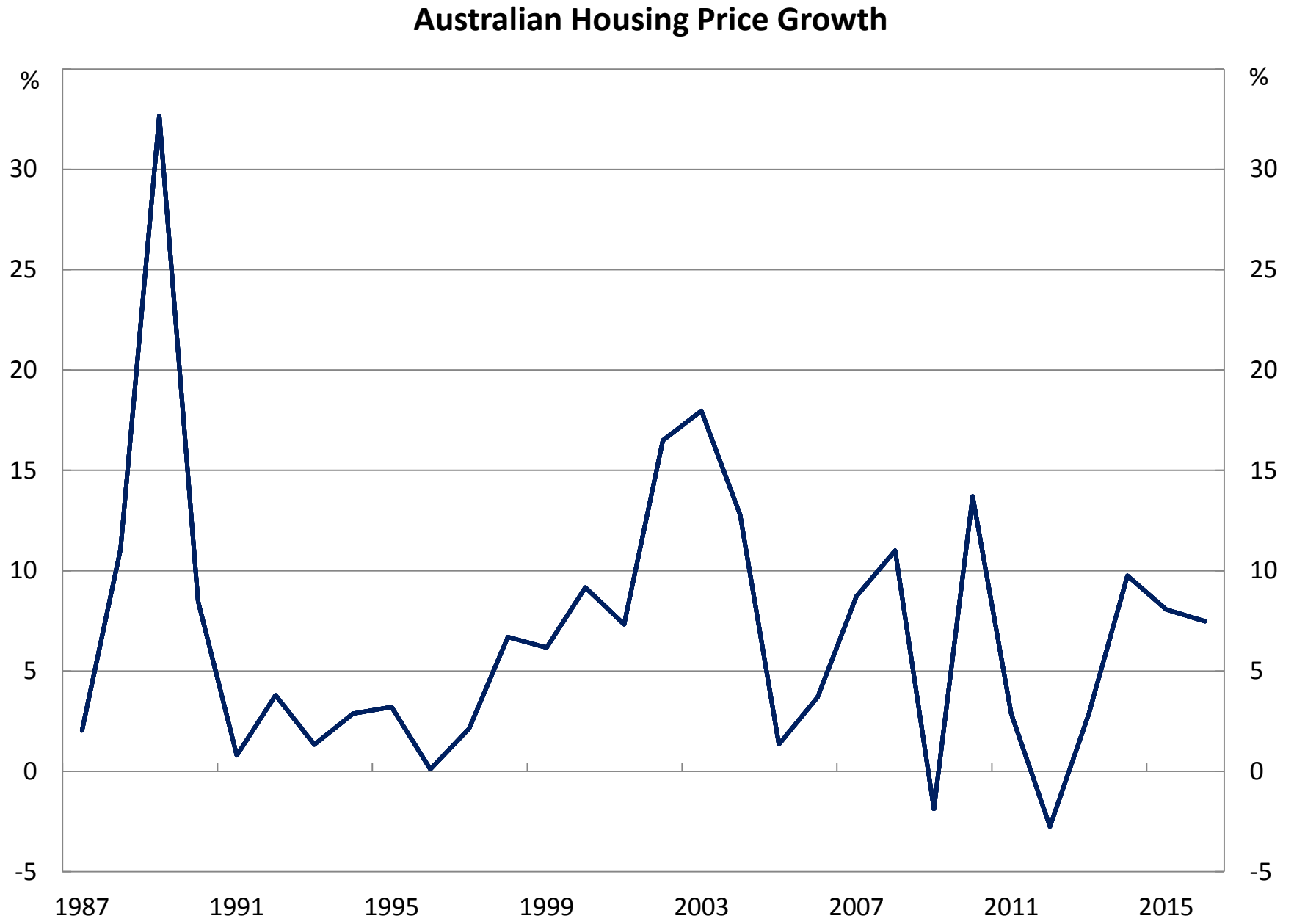
Relative Housing Price Equation

- Key explanators
  - Relative under-/over-supply of housing in NSW vs the RoA
  - Annual changes in the NSW to RoA population ratio
  - Relative earnings in NSW vs the RoA


NOM and NIM to NSW in Thousands of Persons
Panel A: NOM to NSW
'000s
90
60
30
0
'000s
Panel B: NIM to NSW
-10
-20
-30
-40
1982
1990
1998
2006
2014

NSW NOM and NIM Share Equations

- Key explanators
  - The unemployment rate differential between NSW and the RoA
  - Annual changes in mining investment as a share of GDP
  - Relative housing prices in NSW vs the RoA
  - Relative earnings in NSW vs the RoA (NOM share equation only)

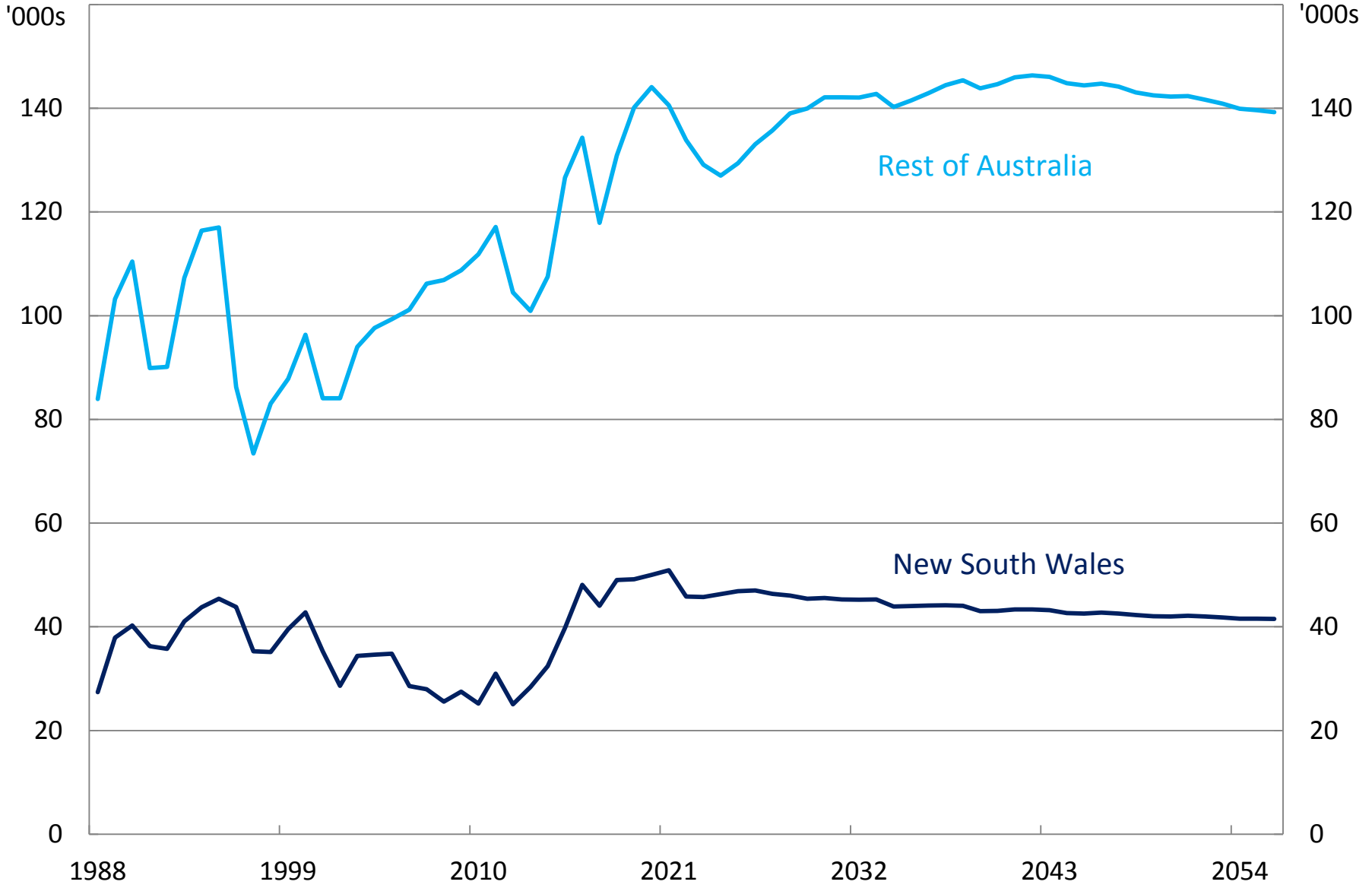

Australian Housing Price Growth
%
30
25
20
15
10
5
0
-5
1987
1991
1995
1999
2003
2007
2011
2015

Australian Housing Price Growth Equation

- Key explanators
  - Required ratio of mortgage payments to household disposable income for a new mortgage (error-correction-type term)
  - Level and changes in national housing under-/over-supply per capita
  - Real variable mortgage interest rates
  - Simple GFC dummy

Model Results

Chart 3.1: Annual NSW and RoA Housing Supply Profiles



Scenario A

Increase of 5,000 p.a. to NSW Housing Supply

Chart 3.5: Impact of an Increase in Annual NSW Housing Supply

Response to a permanent 5,000 p.a. increase

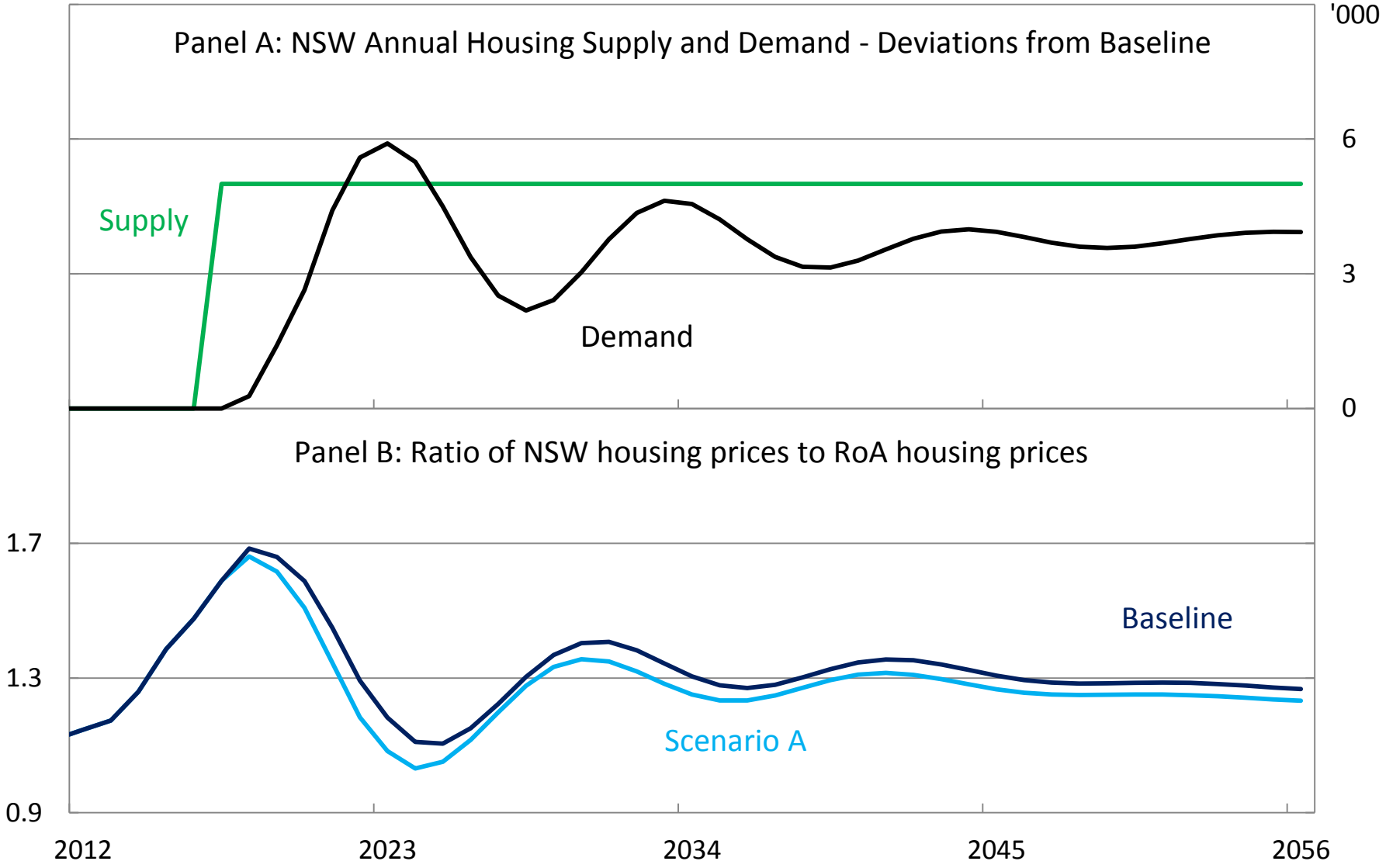


Chart 3.6: Impact of Increase in Annual NSW Housing Supply

Response to a permanent 5,000 p.a. increase

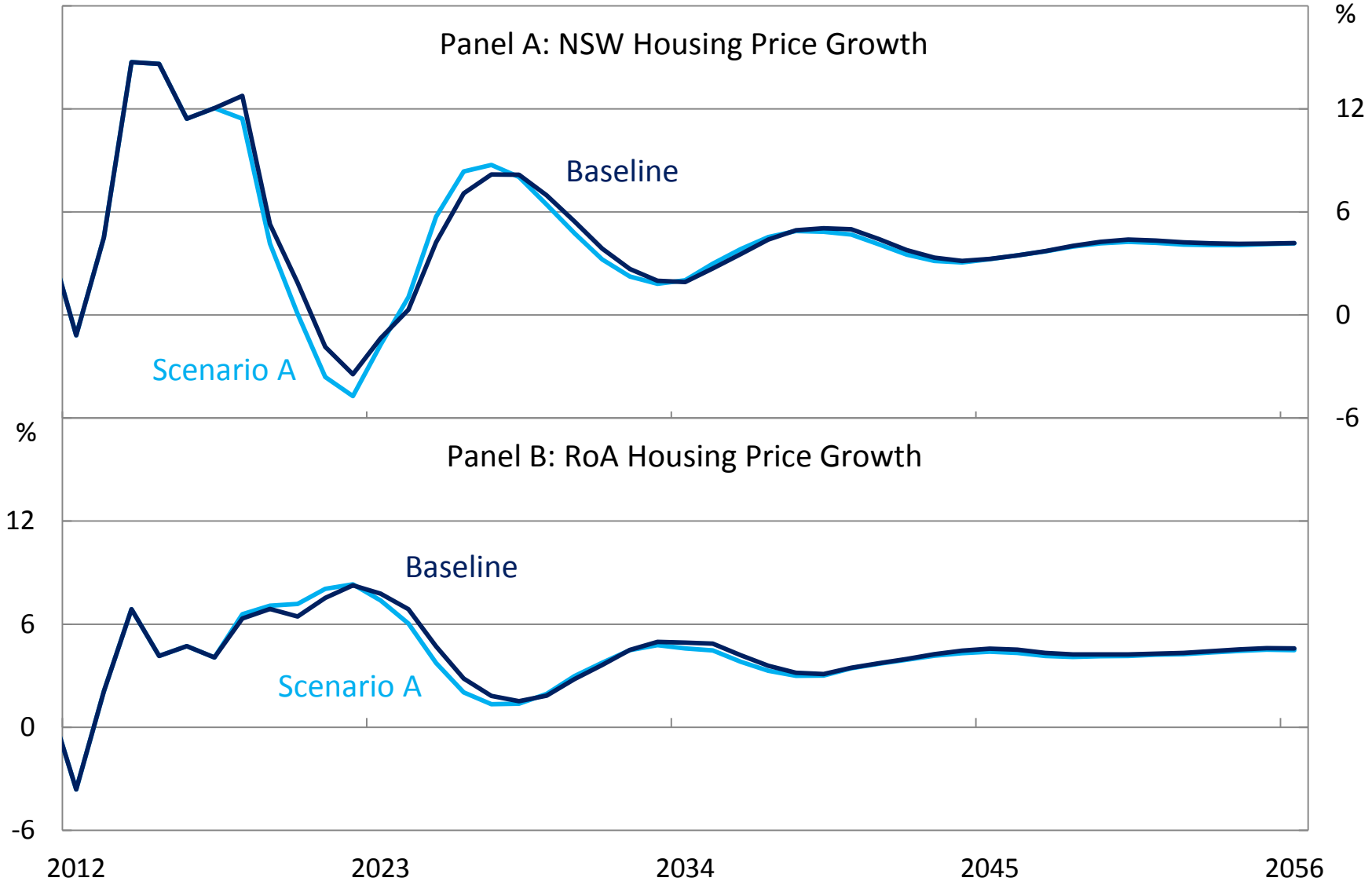


Chart 3.7: NSW Housing Supply and Demand under Scenario A

Deviations from baseline, with demand changes disaggregated by source

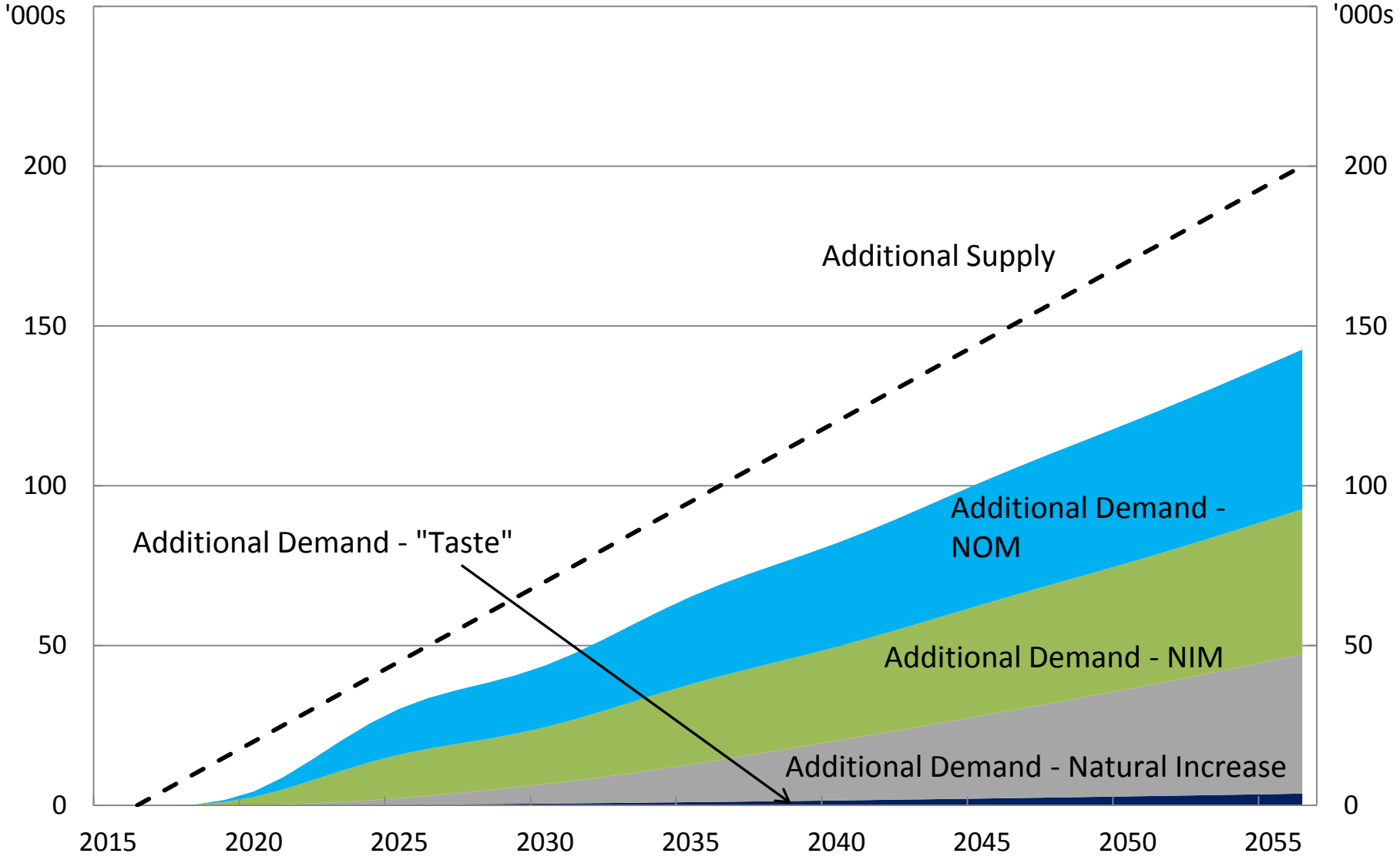


Table 3.1 – Impact of a Sustained Boost to Annual NSW Housing Supply

Deviations of Key Indicators from Baseline for a 5,000 p.a. Supply Increase

Indicator	Impact at Given Forecast Horizon Percentage change relative to baseline, unless otherwise stated			
	2-year	5-year	10-year	40-year
Relative Housing Prices				
(NSW versus the RoA)	-1.4	-7.1	-2.5	-2.6
Housing Price Growth (a)				
Australia	-0.4	-0.3	-0.2	-0.1
NSW	-1.3	-1.7	1.2	0.0
RoA	0.2	0.5	-0.8	-0.1
Housing Price Level				
Australia	-0.4	-1.3	-2.2	-5.4
NSW	-1.2	-5.7	-3.9	-7.2
RoA	0.2	1.6	-1.4	-4.7
Annual Net In-Migration (b)				
Australia	0.0	0.0	0.0	0.0
NSW	0.7	10.6	5.9	4.6
RoA	-0.7	-10.6	-5.9	-4.6
Housing Under-/Over-Supply (c)				
Australia (d)	10.0	25.3	51.1	203.3
NSW	9.7	16.0	16.2	57.2
RoA	0.3	9.3	34.9	146.0
Population				
Australia	0.0	0.0	0.0	0.0
NSW	0.0	0.3	0.9	2.9
RoA	0.0	-0.1	-0.4	-1.1

(a) Change relative to baseline measured in percentage points.
(b) Change relative to baseline measured in thousands of persons.
(c) Change relative to baseline measured in thousands of houses, rather than in percentage terms. A positive number indicates a reduction in under-supply (or increase in over-supply).
(d) Note that although the total supply increase nationwide in Scenario A, relative to baseline, is exactly 200,000 over the 40-year forecast horizon, the Australia-wide change in housing under-/over-supply can differ from this figure (albeit only in a very minor way), even though total net overseas migration to Australia is the same in both cases. Primarily, this reflects that the model's projected equilibrium levels of housing stock per capita are slightly different for NSW versus the RoA (always very modestly higher in the latter). As a result, differing population flows between the two regions, in Scenario A versus the baseline, will alter the model's assessed level of equilibrium housing demand Australia-wide.

Scenario B

15,000 p.a. Increase to National Housing Supply

(5,000 p.a. in NSW, 10,000 p.a. in the RoA)

Chart 3.8: NOM and NIM to NSW under Scenarios A and B

Deviations from baseline

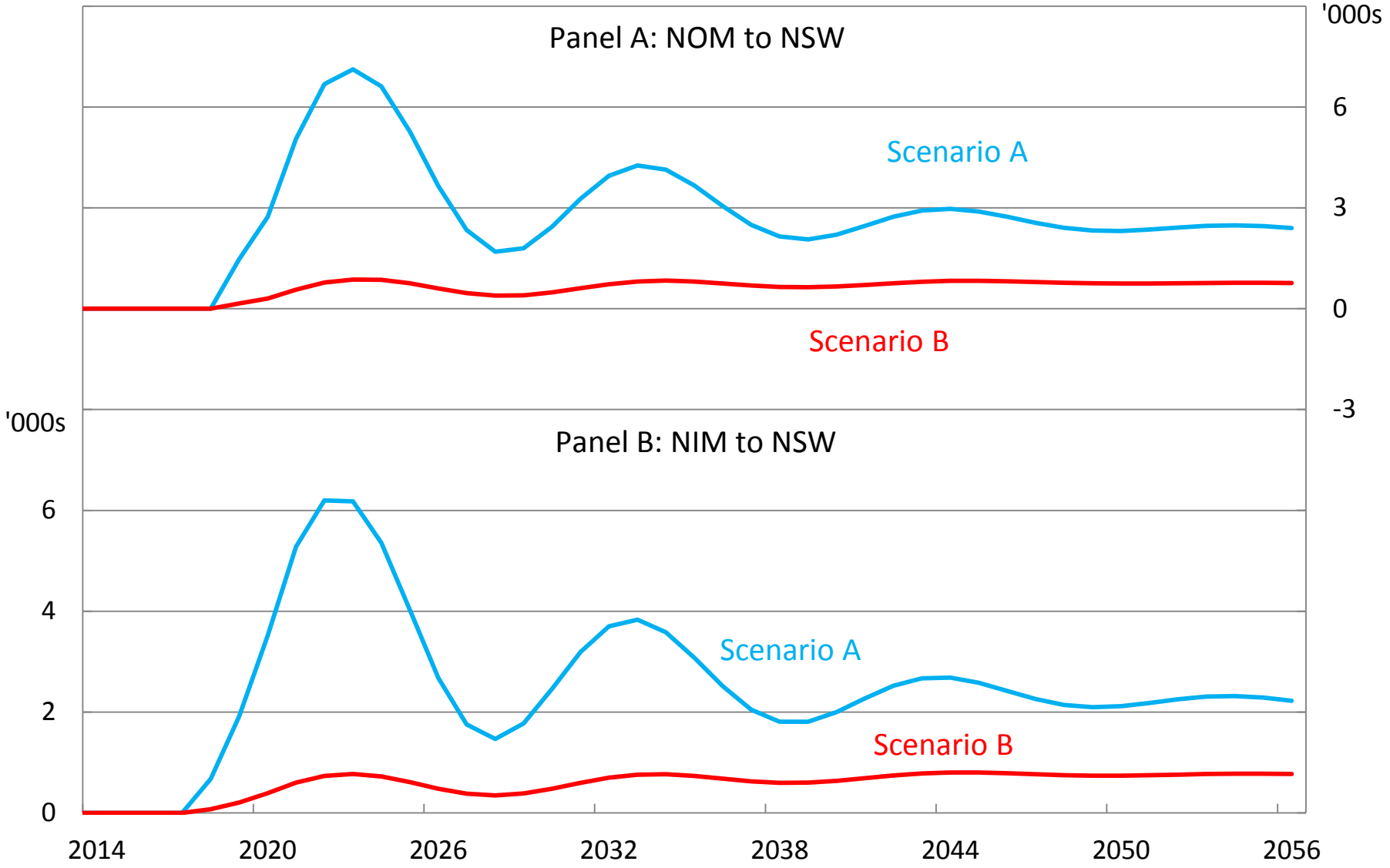
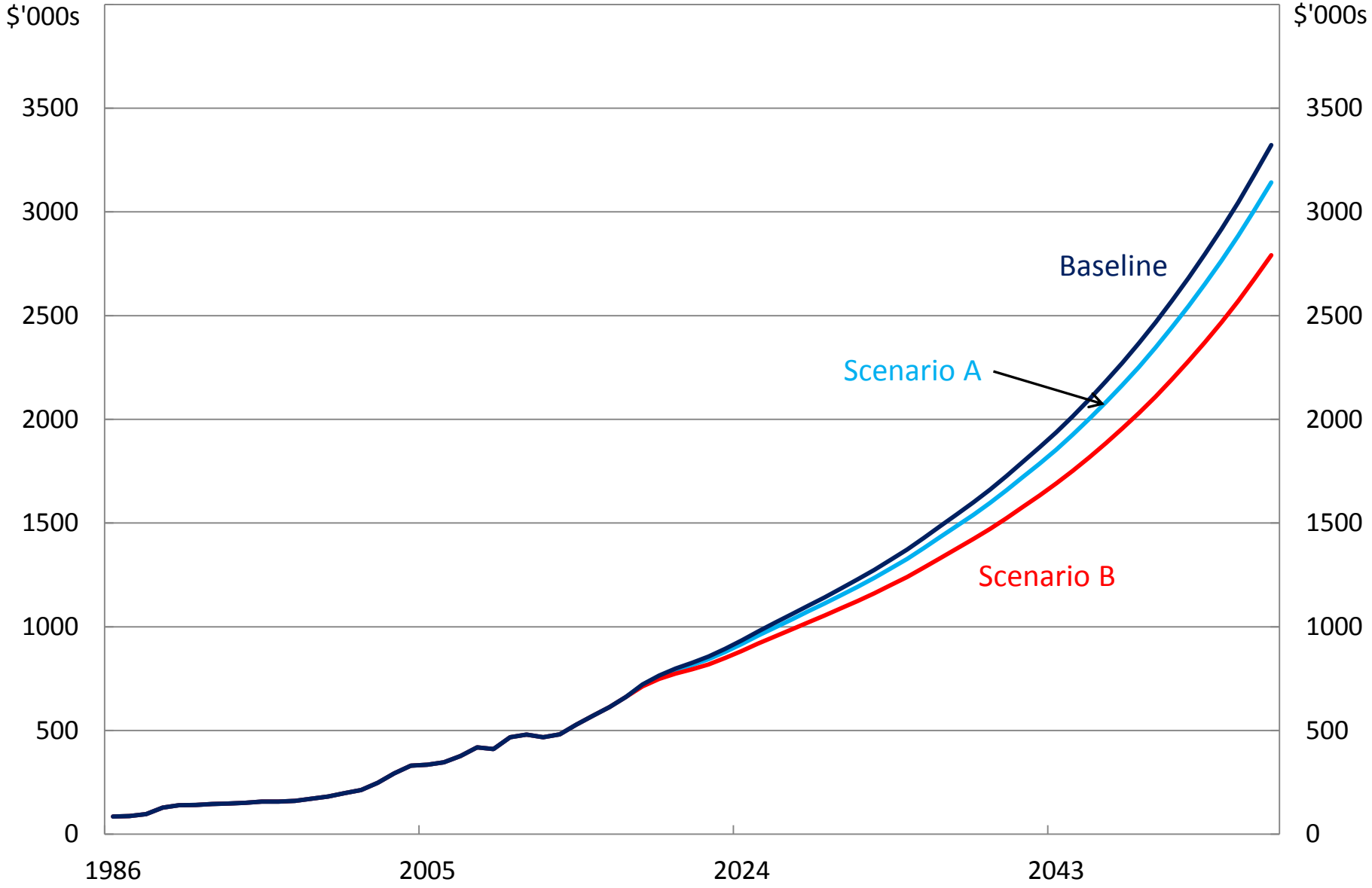


Chart 3.9: Australian Housing Price Levels under Different Scenarios



Scenario C

Temporary Reduction in Annual Net Overseas Migration to Australia

(Average Cut of 64,000 p.a. for Five Years)

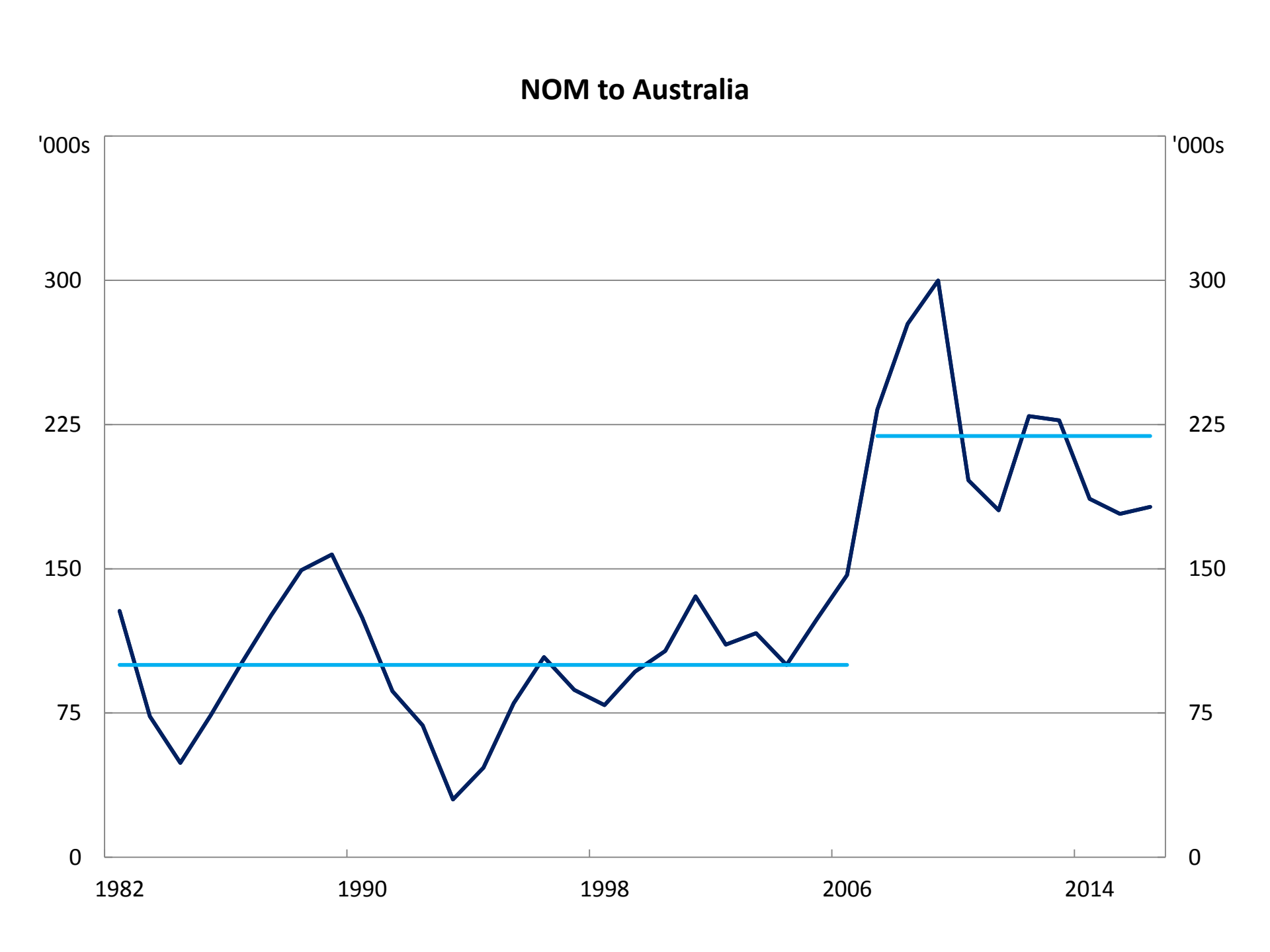

NOM to Australia
'000s
300
225
150
75
0
1982
1990
1998
2006
2014

Chart 3.13: Impact of a Temporary Decrease in NOM to Australia

Response to an average NOM decrease of 64,000 p.a. for five years

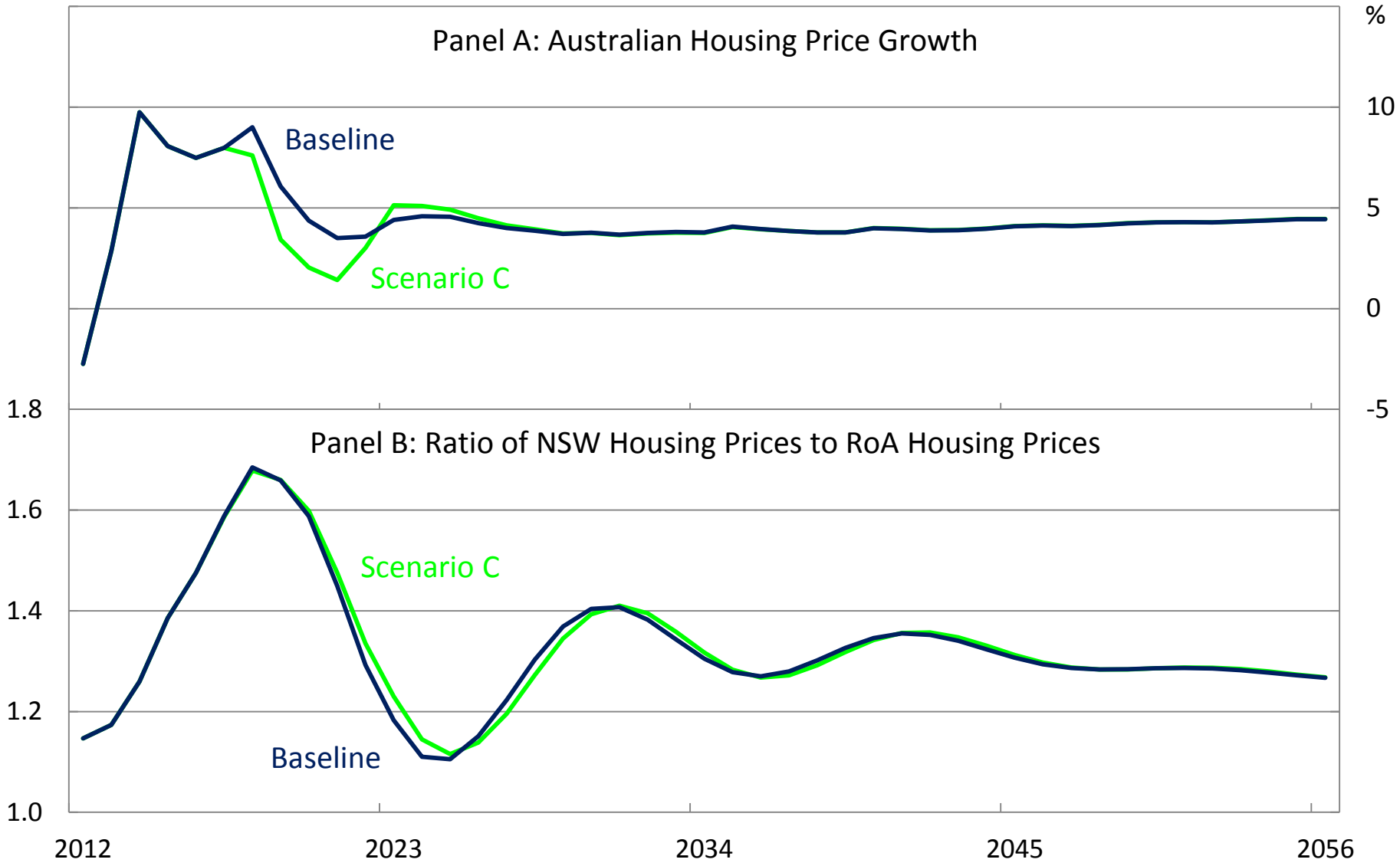


Chart 3.14: Australian Housing Prices under Different Scenarios

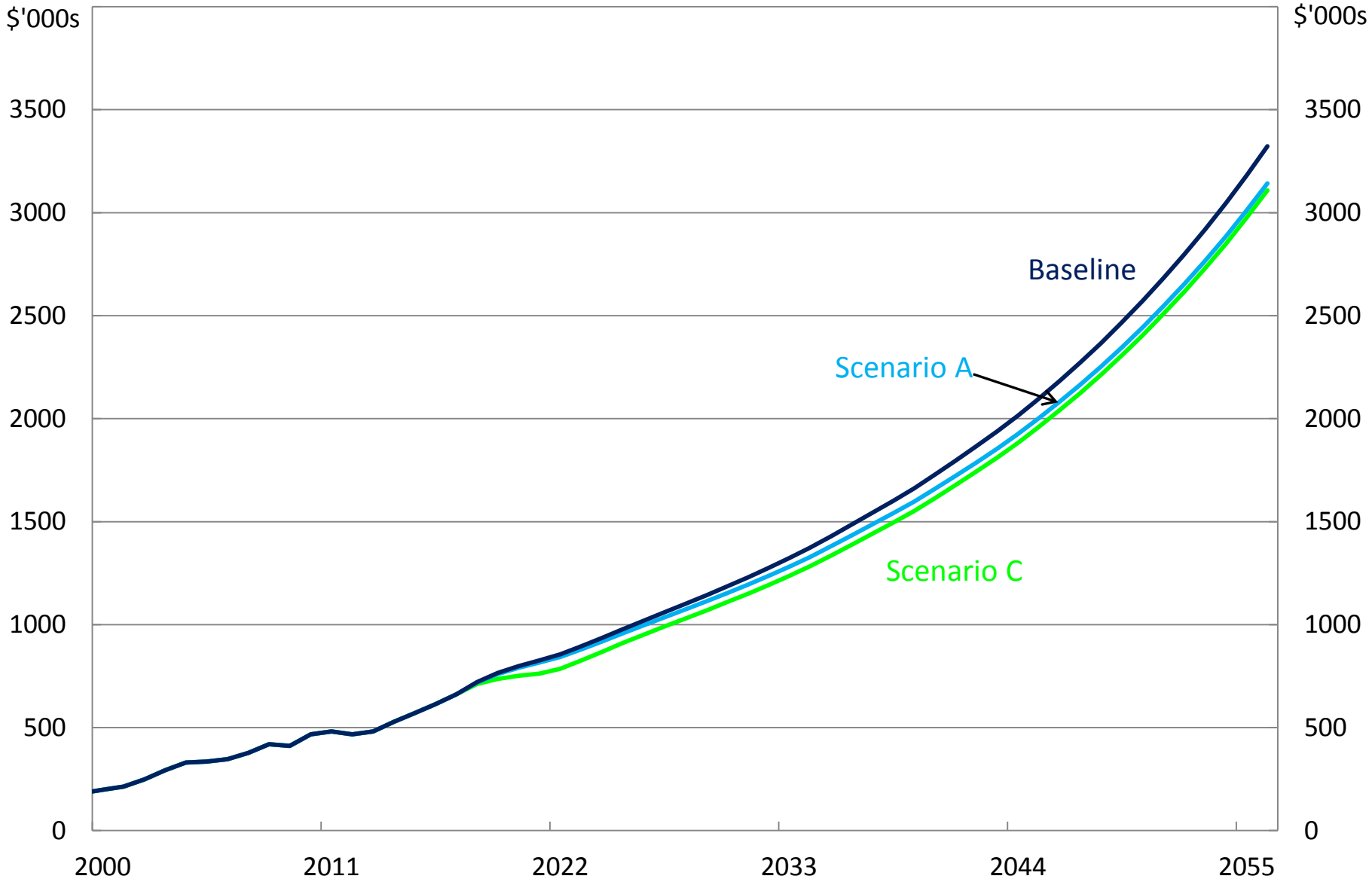


Table 3.2 – Impact of a Temporary Reduction in National NOM

Deviations of Key Indicators from Baseline (Average Reduction of 64,000 p.a. for Five Years)

Indicator	Impact at Given Forecast Horizon Percentage change relative to baseline, unless otherwise stated			
	2-year	5-year	10-year	40-year
Relative Housing Prices				
(NSW versus the RoA)	-0.4	1.8	-1.1	0.1
Housing Price Growth (a)				
Australia	-1.4	-2.1	0.2	0.0
NSW	-1.6	-1.3	-1.2	0.0
RoA	-1.3	-2.6	0.9	0.0
Housing Price Level				
Australia	-1.3	-7.8	-6.7	-6.5
NSW	-1.5	-6.8	-7.3	-6.4
RoA	-1.1	-8.5	-6.3	-6.5
Annual Net In-Migration (b)				
Australia	-80.0	-40.0	0.0	0.0
NSW	-24.1	-11.2	-0.5	0.1
RoA	-55.9	-28.8	0.5	-0.1
Housing Under-/Over-Supply (c)				
Australia	51.6	144.7	164.8	251.7
NSW	16.6	39.3	53.3	70.9
RoA	35.0	105.4	111.5	180.8
Population				
Australia	-0.5	-1.3	-1.4	-1.4
NSW	-0.5	-1.2	-1.5	-1.4
RoA	-0.5	-1.4	-1.3	-1.4

(a) Change relative to baseline measured in percentage points.
(b) Change relative to baseline measured in thousands of persons.
(c) Change relative to baseline measured in thousands of houses, rather than in percentage terms. A positive number indicates a reduction in under-supply (or increase in over-supply).

Conclusions

Demand Side

- Even a temporary NOM reduction could significantly alleviate price pressures
  - Average NOM cut of 64,000 for 5 years might generate a slightly larger price impact than a permanent 5,000 p.a. supply increase
  - Easy to engineer
  - Would also generate *earlier* price relief

Conclusions

Supply Side

- Improving supply also very important
- Challenging to achieve on a sustained basis
  - Co-ordination problems (land release, planning, infrastructure, etc)
  - Managing local concerns
  - Conflicting incentives for States re housing
- Migration flows create an additional “free rider” challenge – in terms of “leakage” of price benefits to other States

Conclusions

<u>Supply Side</u>

- Re this “free rider” problem:
  - States may get other compensating *benefits* from increased migration flows (negating “free rider” concerns)
  - Either way, if trying to control housing price growth, actions by States to boost supply will be more successful if co-ordinated than if done in isolation

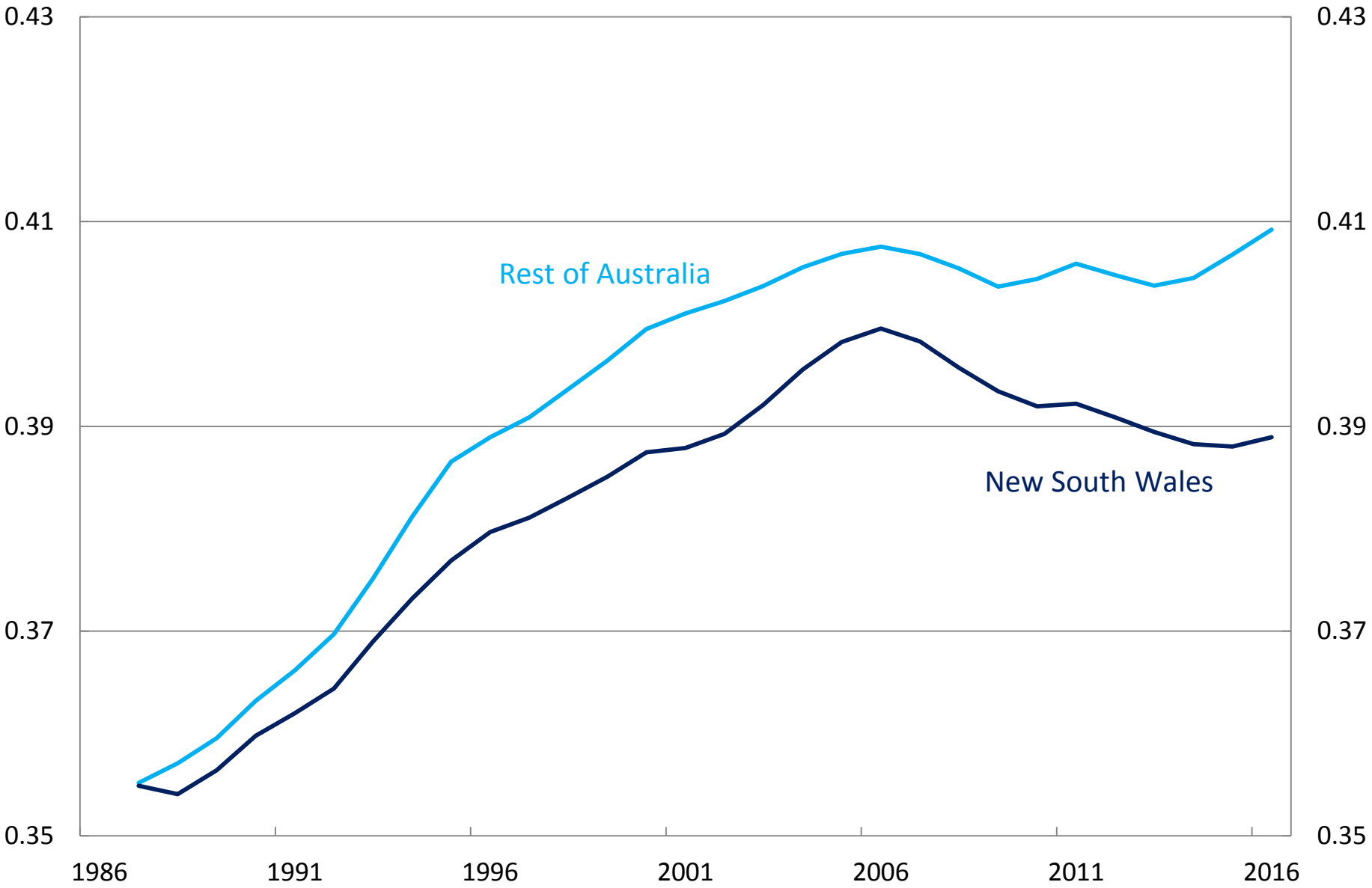
Housing Prices and Migration Flows

Spare Slides

Measuring Housing Under-/Over-Supply

- Simple approach based on examining housing stock per capita data

Chart 2.2: Housing Stock Per Capita



Measuring Housing Under-/Over-Supply

- Simple approach based on examining housing stock per capita data
- For NSW and RoA, fit simple logarithmic curves to actual housing stock per capita data – as indicators of “underlying” housing demand
- Form resulting “housing stock per capita disequilibrium” measures , for use as explanators in behavioural equations
- Measures align well with more sophisticated methods

Chart 2.1: Disequilibrium in Housing Stock Per Capita

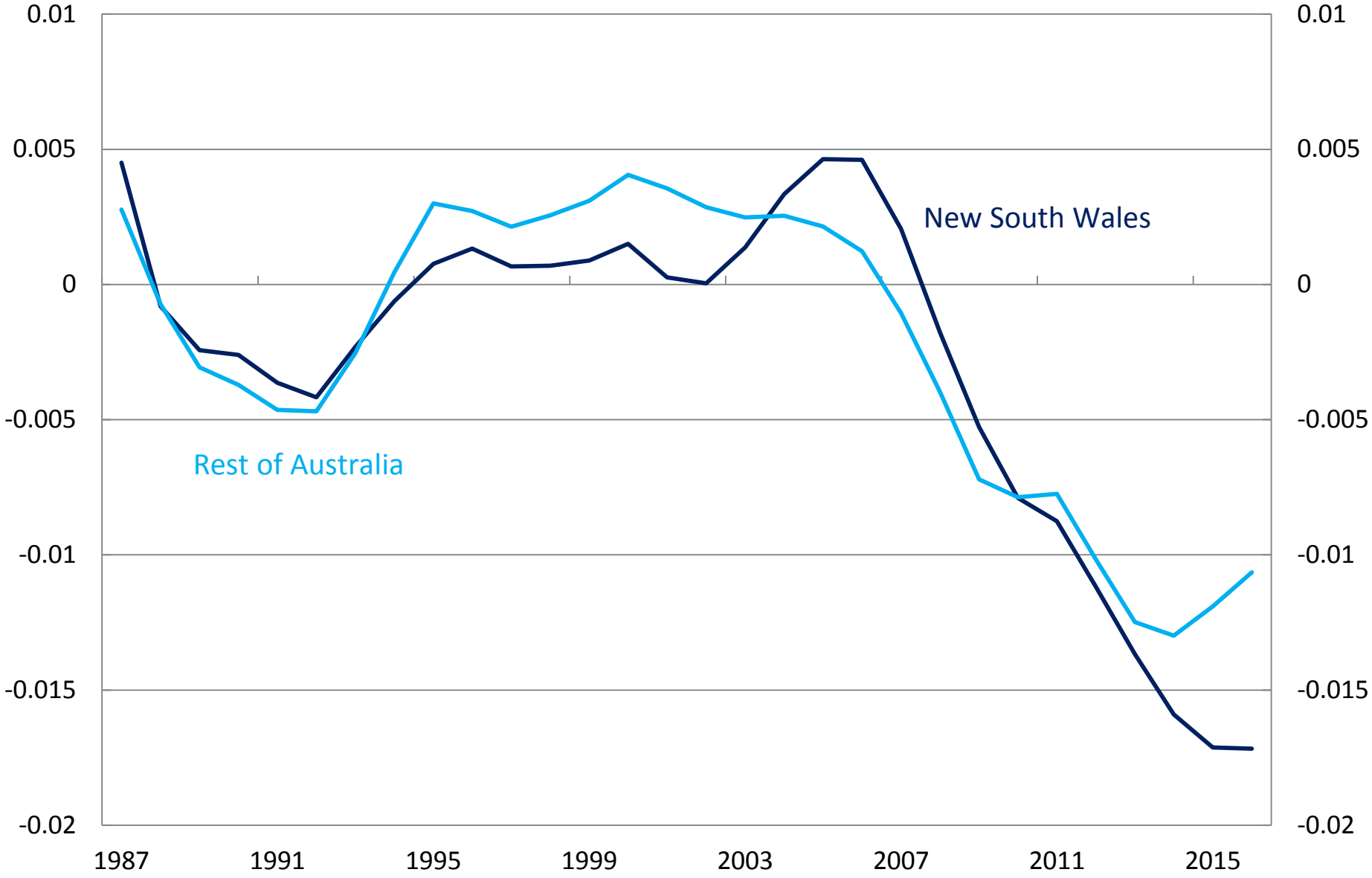
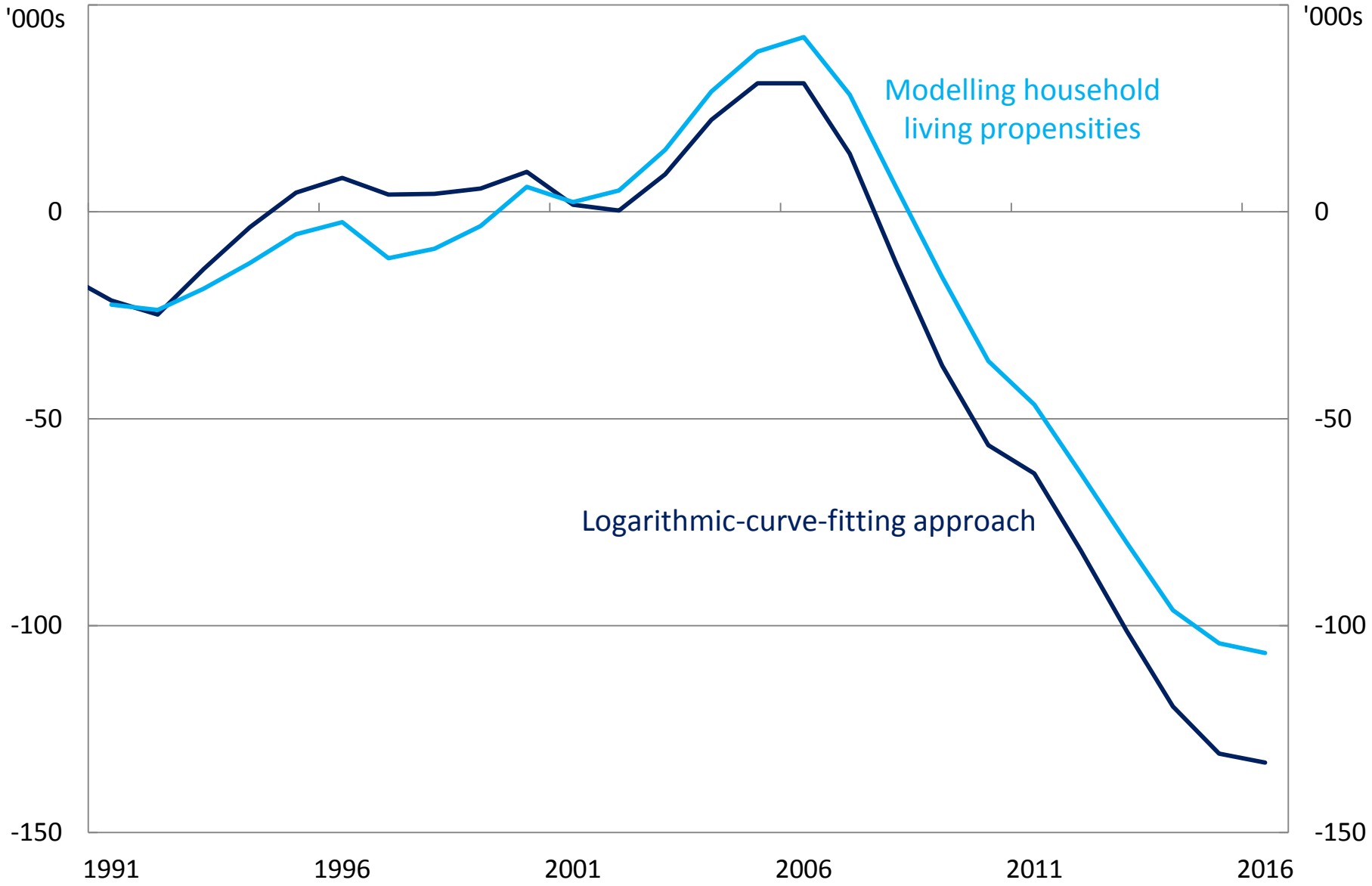
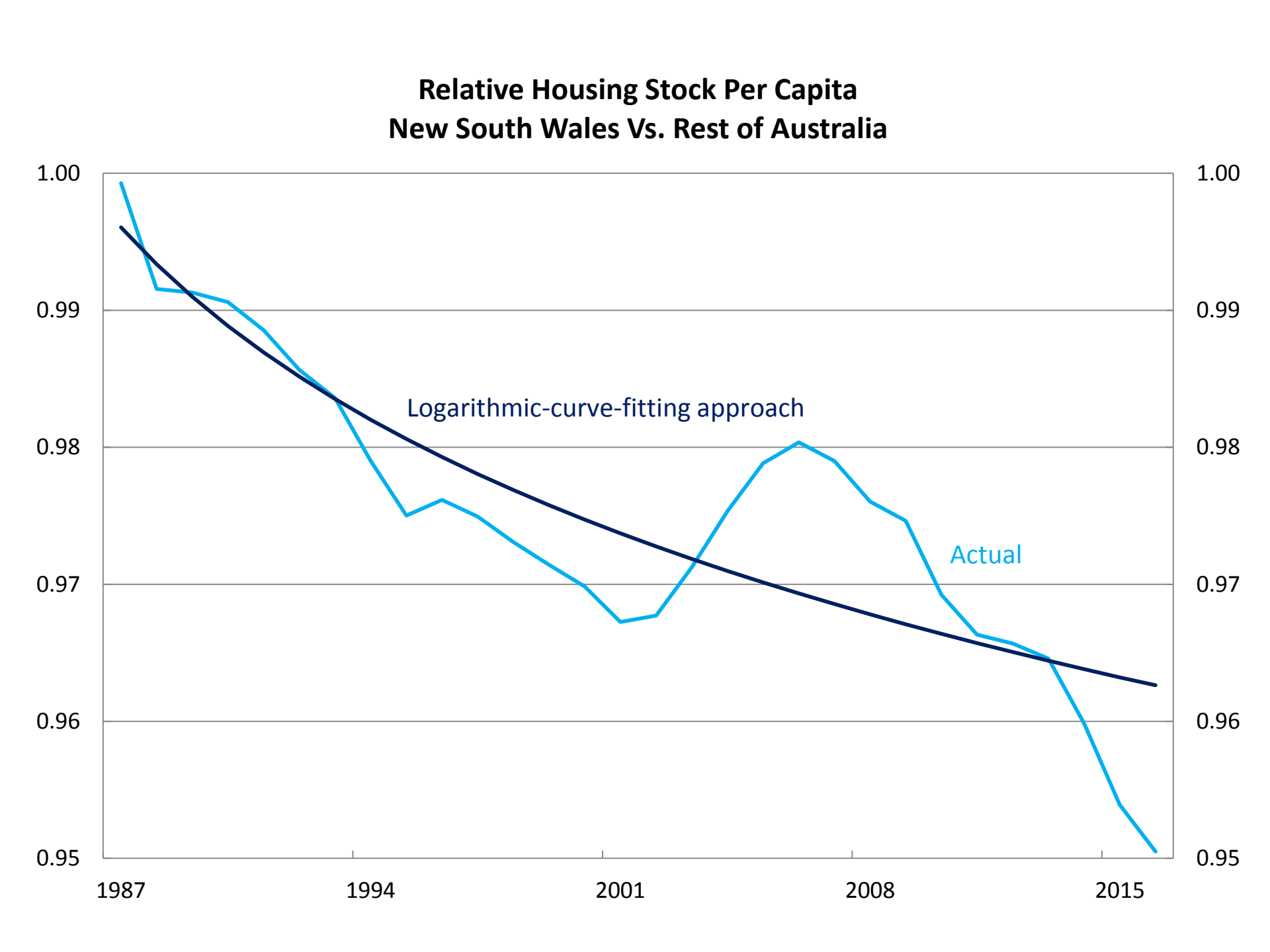
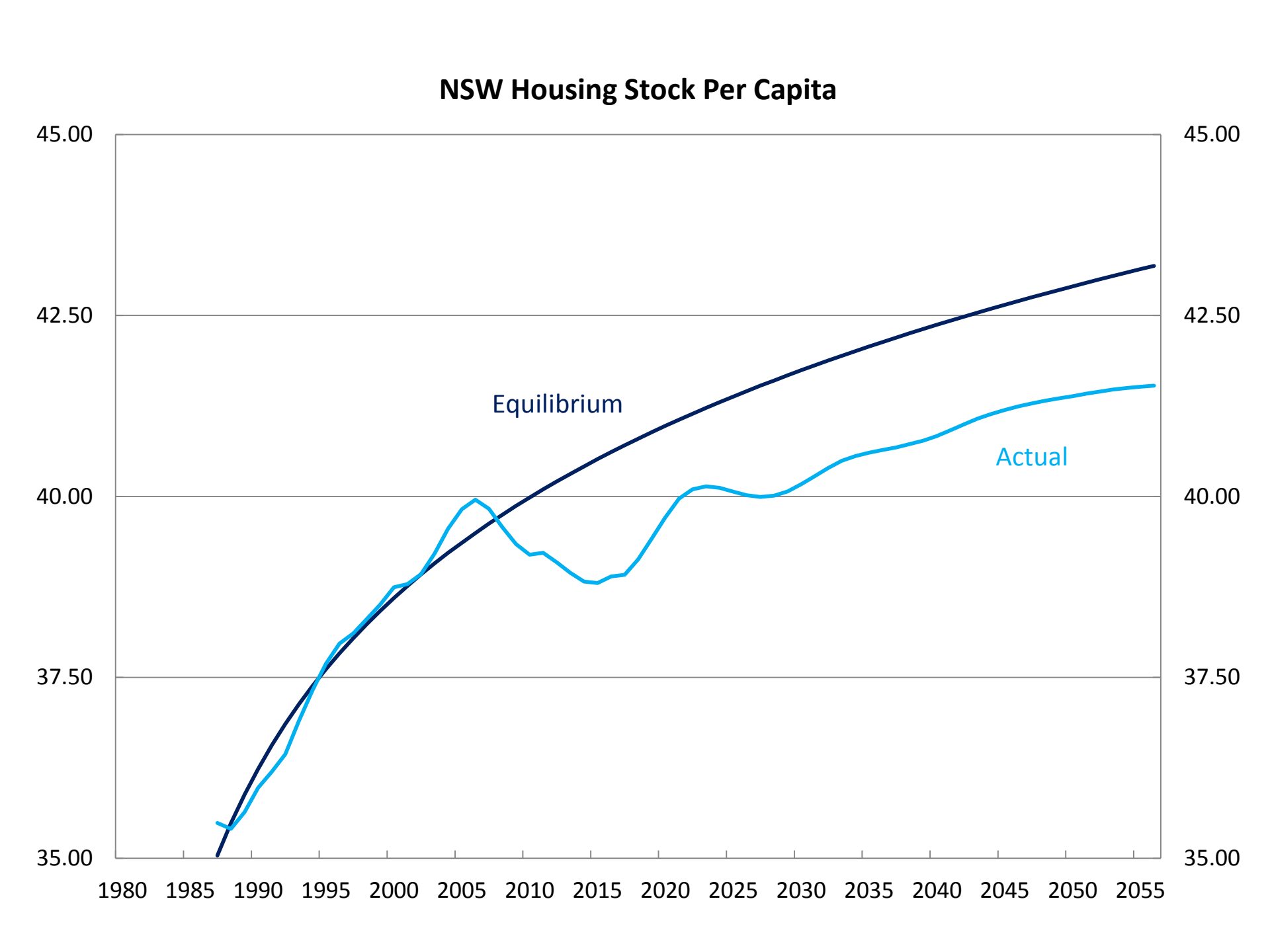


Chart A.1: NSW Housing Under-/Over-Supply




Relative Housing Stock Per Capita
New South Wales Vs. Rest of Australia
1.00
0.99
0.98
0.97
0.96
0.95
1987
1994
2001
2008
2015
Logarithmic-curve-fitting approach
Actual


NSW Housing Stock Per Capita
45.00
42.50
40.00
37.50
35.00
Equilibrium
Actual
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055

Behavioural Equations

Fitted vs Actual Values and Equation Residuals

Chart 2.3: Relative Housing Price Equation

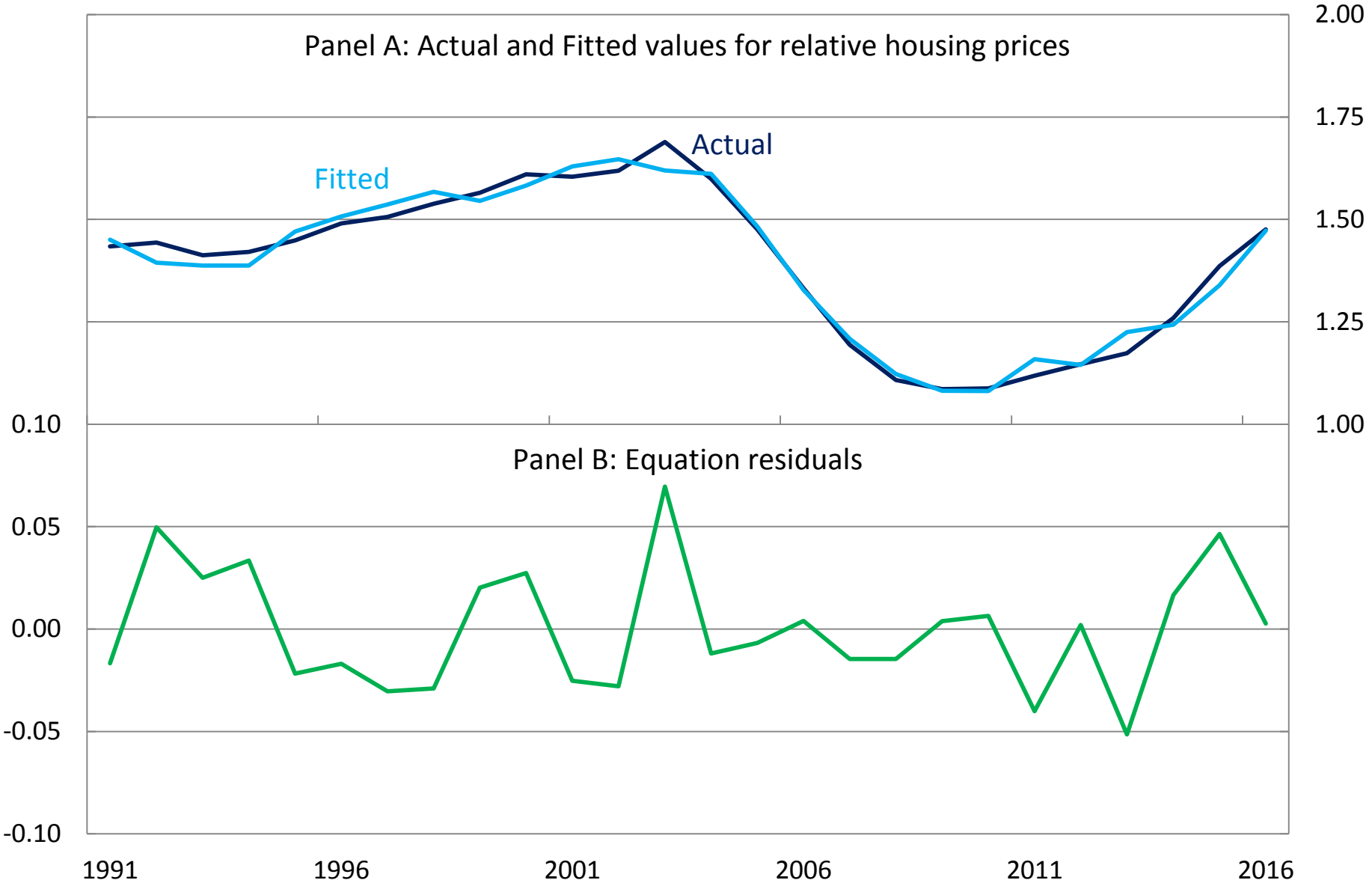


Chart 2.5: NOM Share Equation

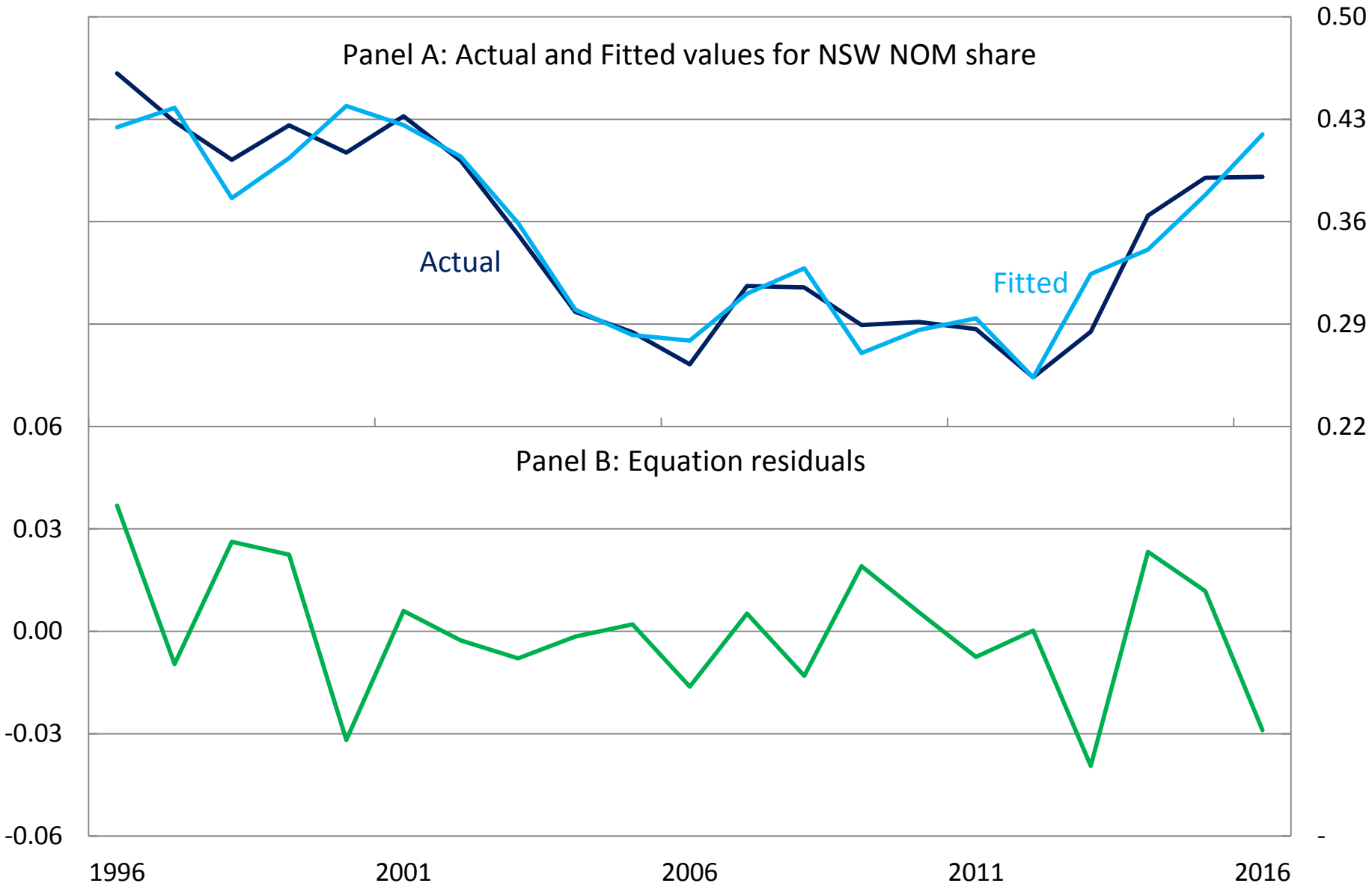
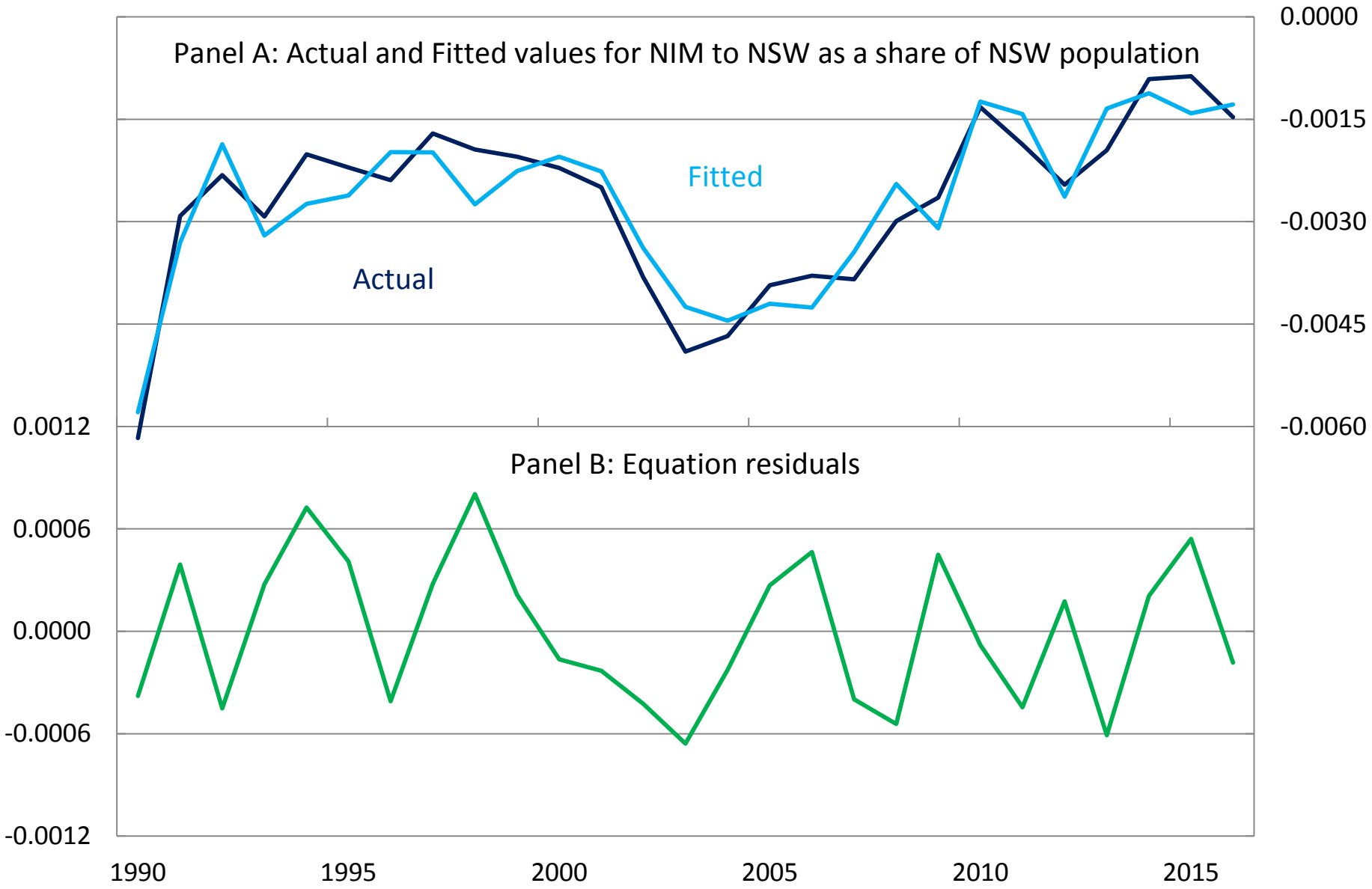


Chart 2.6: NIM Share Equation



Repayments on New Housing Loans

Per cent of household disposable income

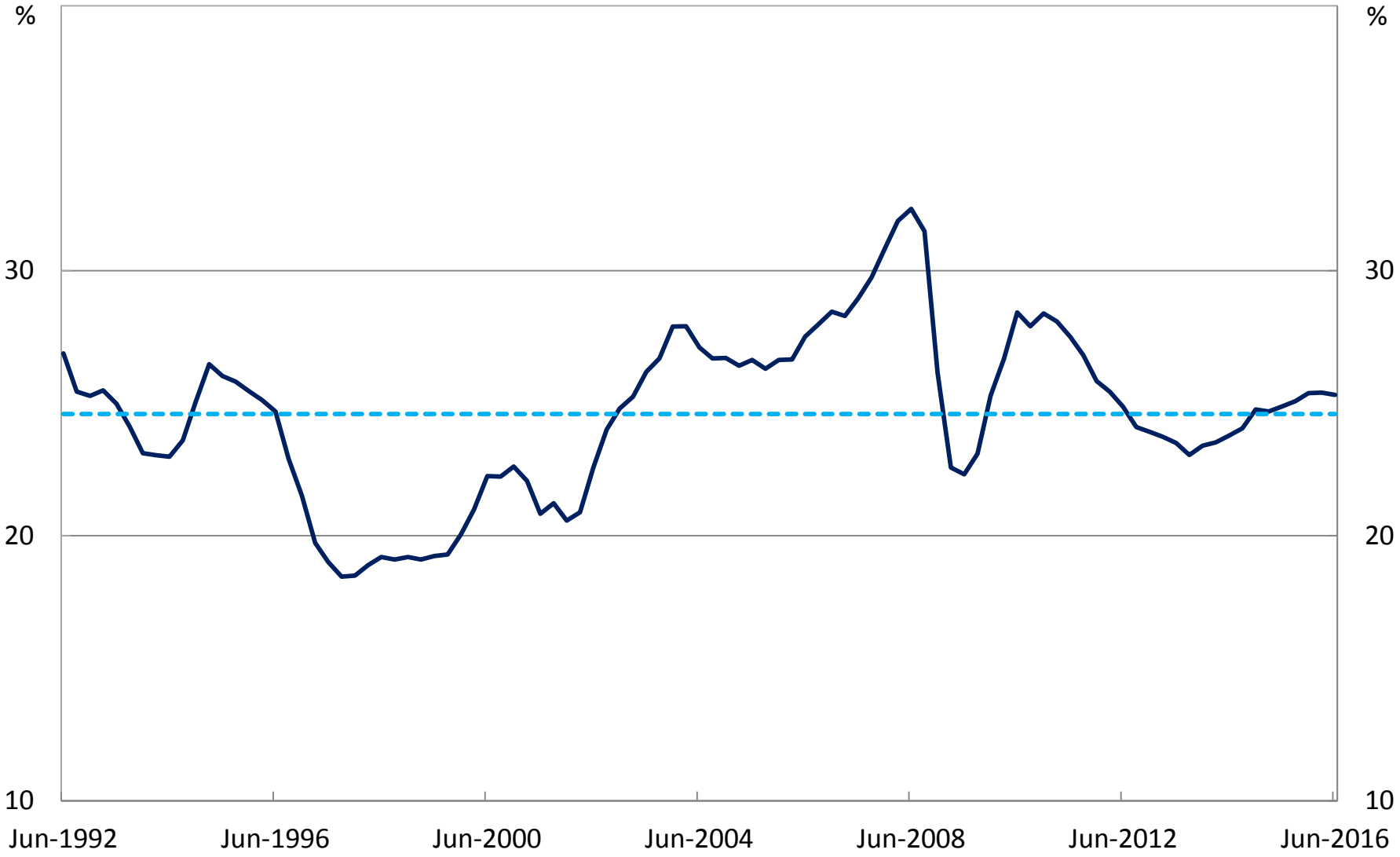
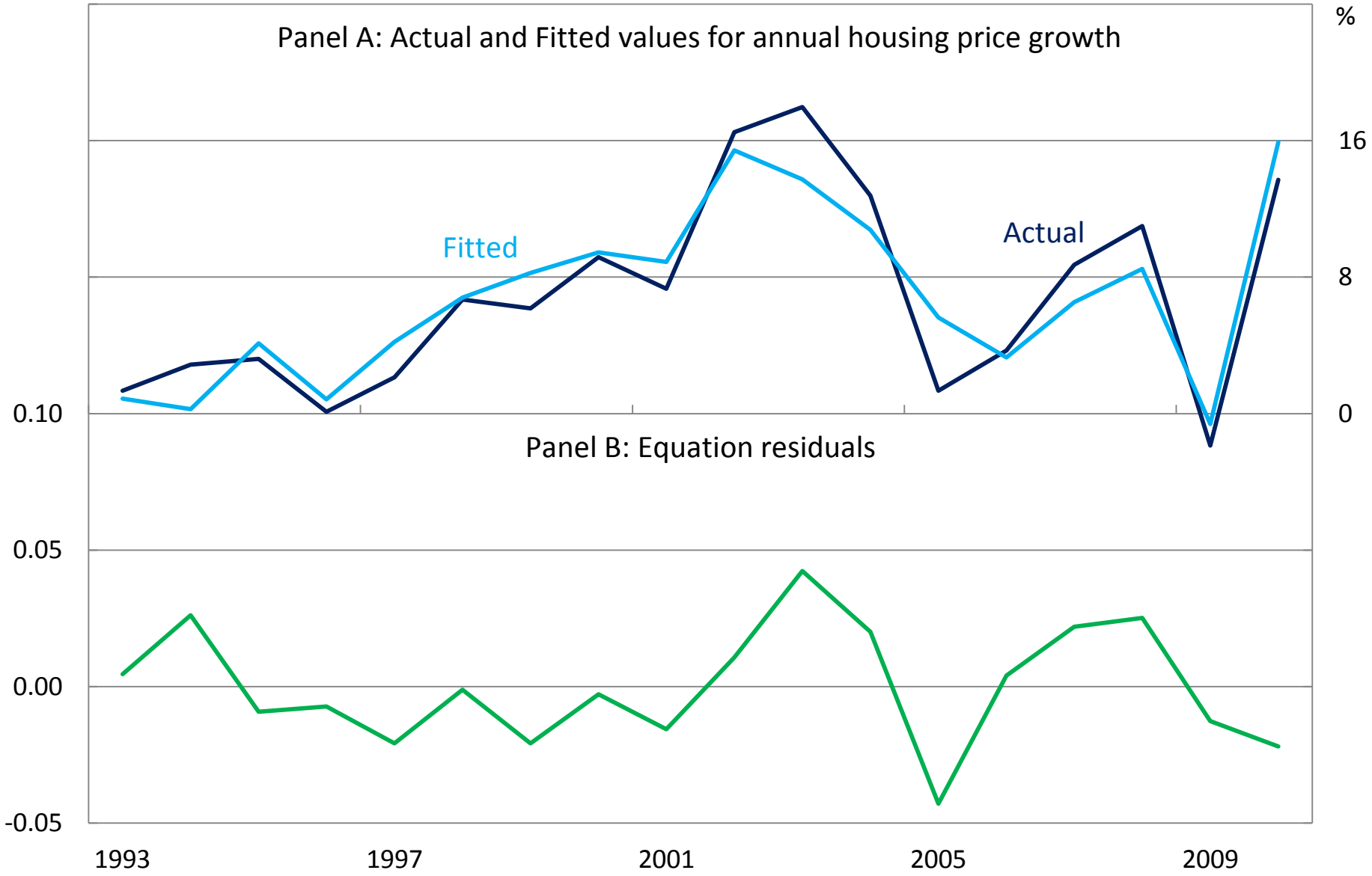


Chart 2.7: Australian Housing Price Growth Equation



Behavioural Equations

Coefficient Estimates and Diagnostic Statistics

Table B.1 – Relative Housing Price Equation

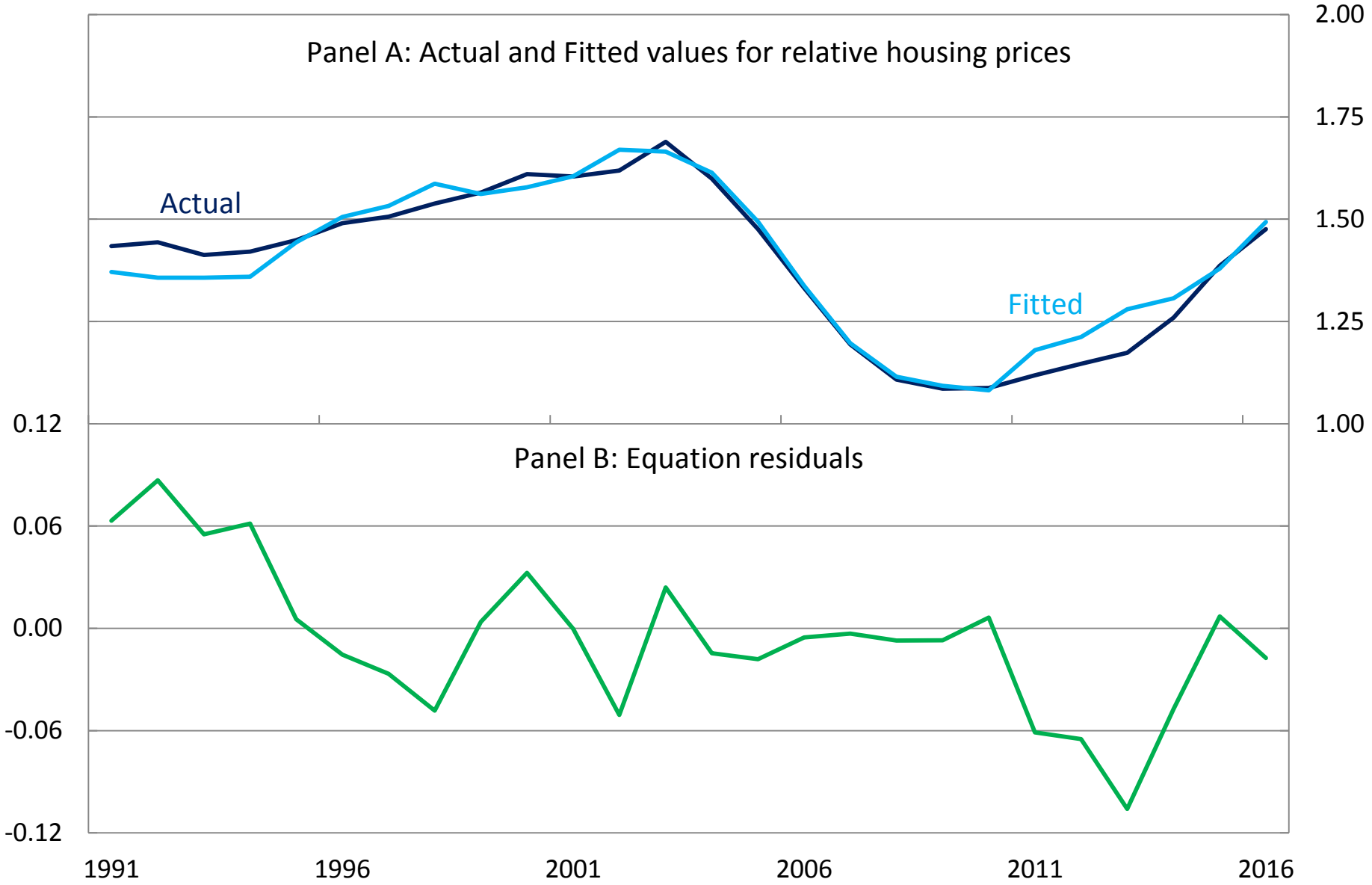
$$HPrel_t = \beta_0 + \beta_1(HspcRelDiseq_{t-1} + HspcRelDiseq_{t-3}) + \beta_2 PopRelTTY_t + \beta_3(AWErel_t + AWErel_{t-1} + AWErel_{t-2} + AWErel_{t-3}) + \varepsilon_t$$

$$\varepsilon_t = \beta_4 \varepsilon_{t-1}$$

Coefficient	Value	t-statistic
β_0	−1.477	−2.701
β_1	−15.586	−12.200
β_2	8.493	1.264
β_3	0.686	5.239
β_4	0.528	4.536
Summary Statistics	**Value**	
R^2	0.975	
Adjusted R^2	0.971	
Standard error of the regression	0.032	
Durbin-Watson statistic	2.055	

Note: The estimation sample is 1991 to 2016 (n = 26)

Chart 2.4: Relative Housing Price Equation without AR(1) Error Process



Statistical Output for the Quarterly Relative Housing Price Equation

Dependent Variable: HP_REL
Method: Least Squares
Date: 06/06/17 Time: 09:50
Sample: 12/01/1989 6/01/2016
Included observations: 107
Convergence achieved after 14 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.003626	0.564317	-1.778480	0.0783
HSPC_REL_DISEQ(-4)+HSPC_REL_DIS...	-10.91962	1.963645	-5.560893	0.0000
POP_REL_TTY+POP_REL_TTY(-4)+POP...	0.047554	0.016534	2.876196	0.0049
AWE_REL_HP+AWE_REL_HP(-4)+AWE_...	0.587720	0.134647	4.364894	0.0000
DUMMY_GST	0.043716	0.010780	4.055185	0.0001
AR(1)	0.840273	0.042802	19.63166	0.0000

R-squared	0.983413	Mean dependent var	1.394388
Adjusted R-squared	0.982592	S.D. dependent var	0.184328
S.E. of regression	0.024320	Akaike info criterion	-4.540569
Sum squared resid	0.059739	Schwarz criterion	-4.390691
Log likelihood	248.9205	Hannan-Quinn criter.	-4.479811
F-statistic	1197.607	Durbin-Watson stat	1.945164
Prob(F-statistic)	0.000000		

Inverted AR Roots	.84

Table B.2 – NSW NOM Share Equation

$$NOMshare_{NSW,t} = \delta_0 + \delta_1\, UED_t + \delta_2\, MiningTTY_t + \delta_3\, HPrel_{t-1} + \delta_4\, AWErel_t + \delta_5(\Delta AWErel_{t-1} + \Delta AWErel_{t-2} + \Delta AWErel_{t-3}) + \delta_6 DumGFC_{t-1}$$

Coefficient	Value	t-statistic
δ_0	−0.770	−2.247
δ_1	−7.370	−6.138
δ_2	−3.408	−4.327
δ_3	−0.316	−4.169
δ_4	1.463	3.598
δ_5	0.706	1.909
δ_6	−0.049	−1.791

Summary Statistics	Value
R^2	0.909
Adjusted R^2	0.869
Standard error of the regression	0.024
Durbin-Watson statistic	2.304

Note: The estimation sample is 1996 to 2016 (n = 21)

Table B.3 – NSW NIM Share Equation

$$NIMshare_{NSW,t} = \theta_0 + \theta_1\, MiningTTY_t + \theta_2\, UED_t + \theta_3\big((HPrel_t + HPrel_{t-1})/2\big) + \theta_4(DumHP_{NSW})\big((HPrel_t + HPrel_{t-1})/2\big)$$

Coefficient	Value	t-statistic
θ_0	0.0069	7.446
θ_1	−0.0614	−4.024
θ_2	−0.1725	−8.597
θ_3	−0.0072	−10.401
θ_4	−0.0014	−5.757

Summary Statistics	Value
R^2	0.88
Adjusted R^2	0.859
Standard error of the regression	0.0005
Durbin-Watson statistic	1.864

Note: The estimation sample is 1990 to 2016 (n = 27)

Table B.4 – Australian Housing Price Growth Equation

$$HPgr_{Aus,t} = \varphi_0 + \varphi_1 MtgeToHHDIratio_{Aus,t-1} + \varphi_2 HspcDiseq_{Aus,t-1} + \varphi_3 DumGFC2_t + \varphi_4\left(HspcDiseq_{Aus,t-1} - HspcDiseq_{Aus,t-2}\right) + \varphi_5 MtgeRateReal_{t-1} + \varepsilon_t$$

$$\varepsilon_t = \varphi_5 \varepsilon_{t-1}$$

Coefficient	Value	t-statistic
ϕ_0	0.434	3.460
ϕ_1	−1.088	−2.211
ϕ_2	−3.752	−0.585
ϕ_3	−0.091	−3.084
ϕ_4	−17.011	−1.361
ϕ_5	−1.904	−2.500
ϕ_6	0.573	1.553

Summary Statistics	Value
R^2	0.862
Adjusted R^2	0.786
Standard error of the regression	0.027
Durbin-Watson statistic	1.696

Note: The estimation sample is 1993 to 2010 (n = 18)

Model Results

Baseline Case

Chart 3.2: Ratio of NSW Housing Prices to RoA Housing Prices

Baseline model results

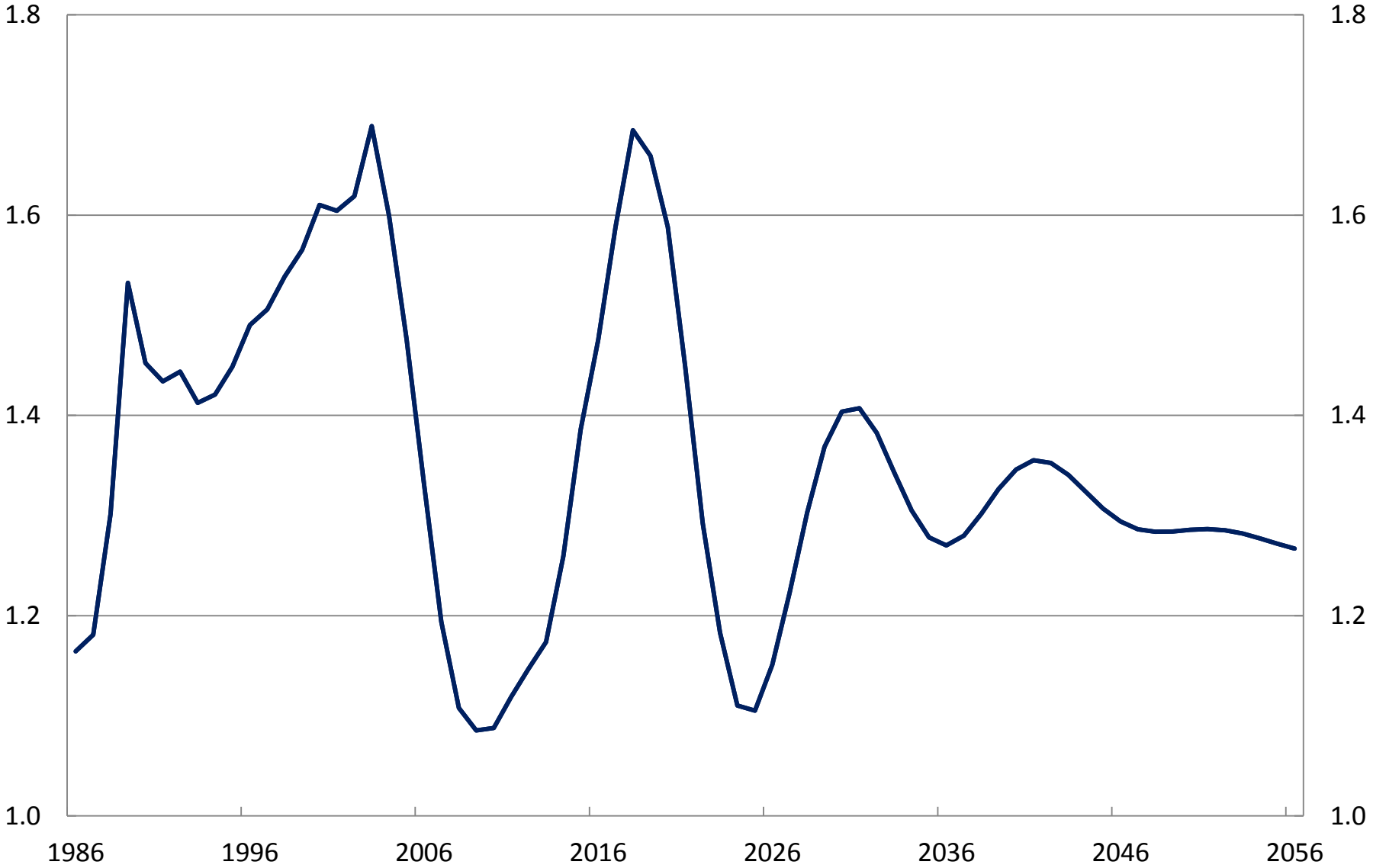


Chart 3.3: NOM and NIM to NSW

Baseline model results

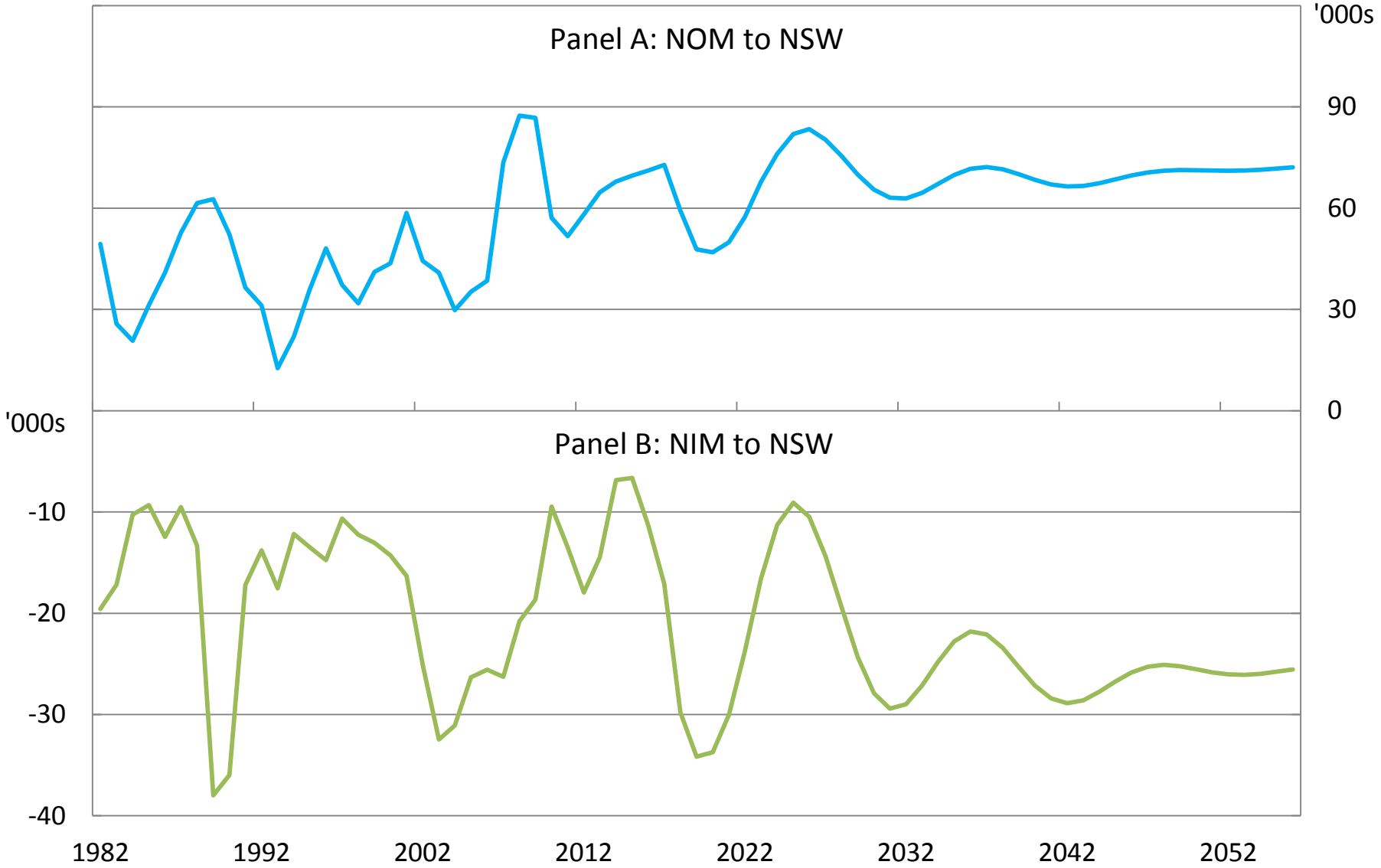
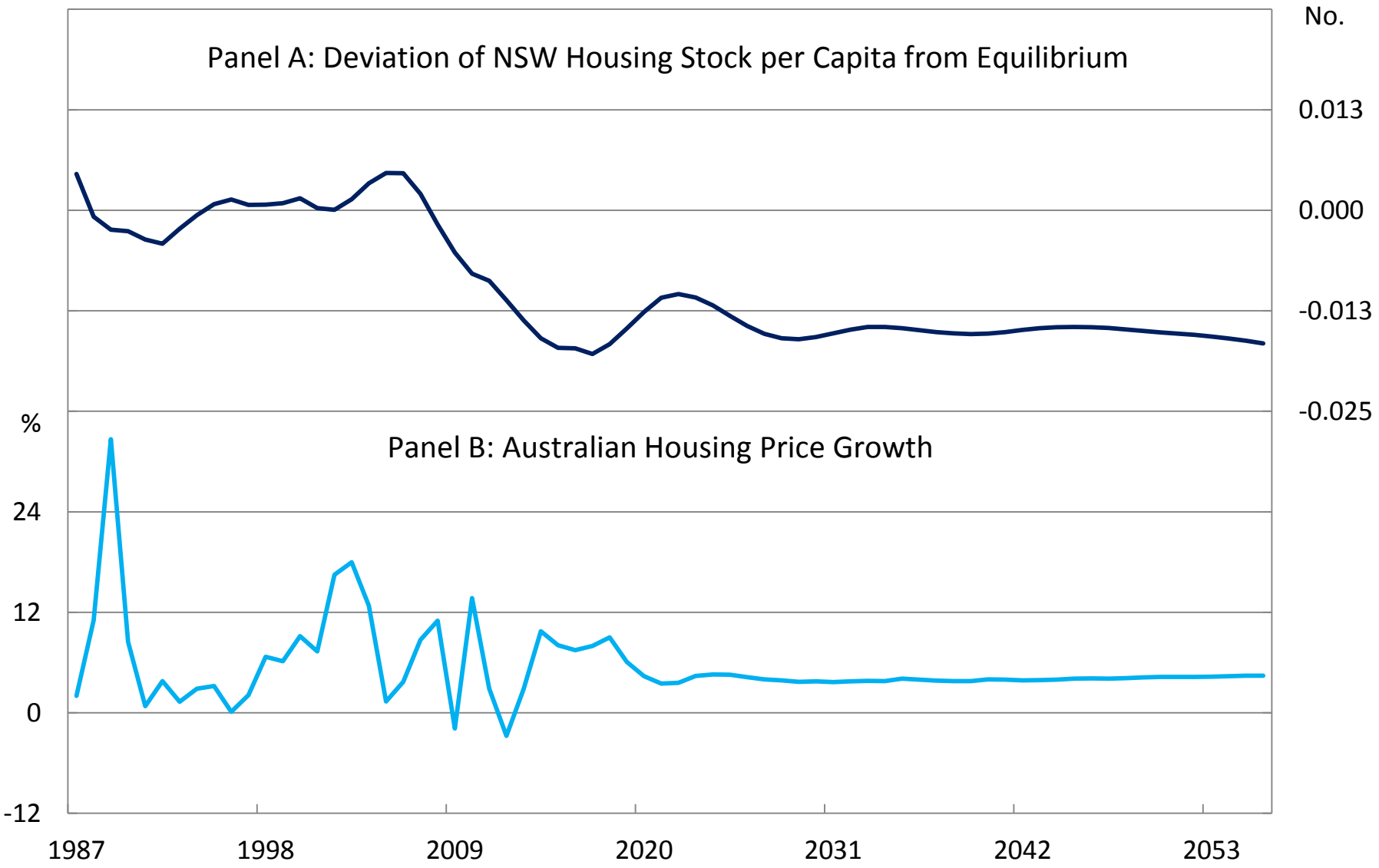


Chart 3.4: Other Key Indicators

Baseline model results



Appendix C

Permanent 80,000 Reduction in Annual Net Overseas Migration to Australia

Chart C.2: Net Overseas Migration to NSW

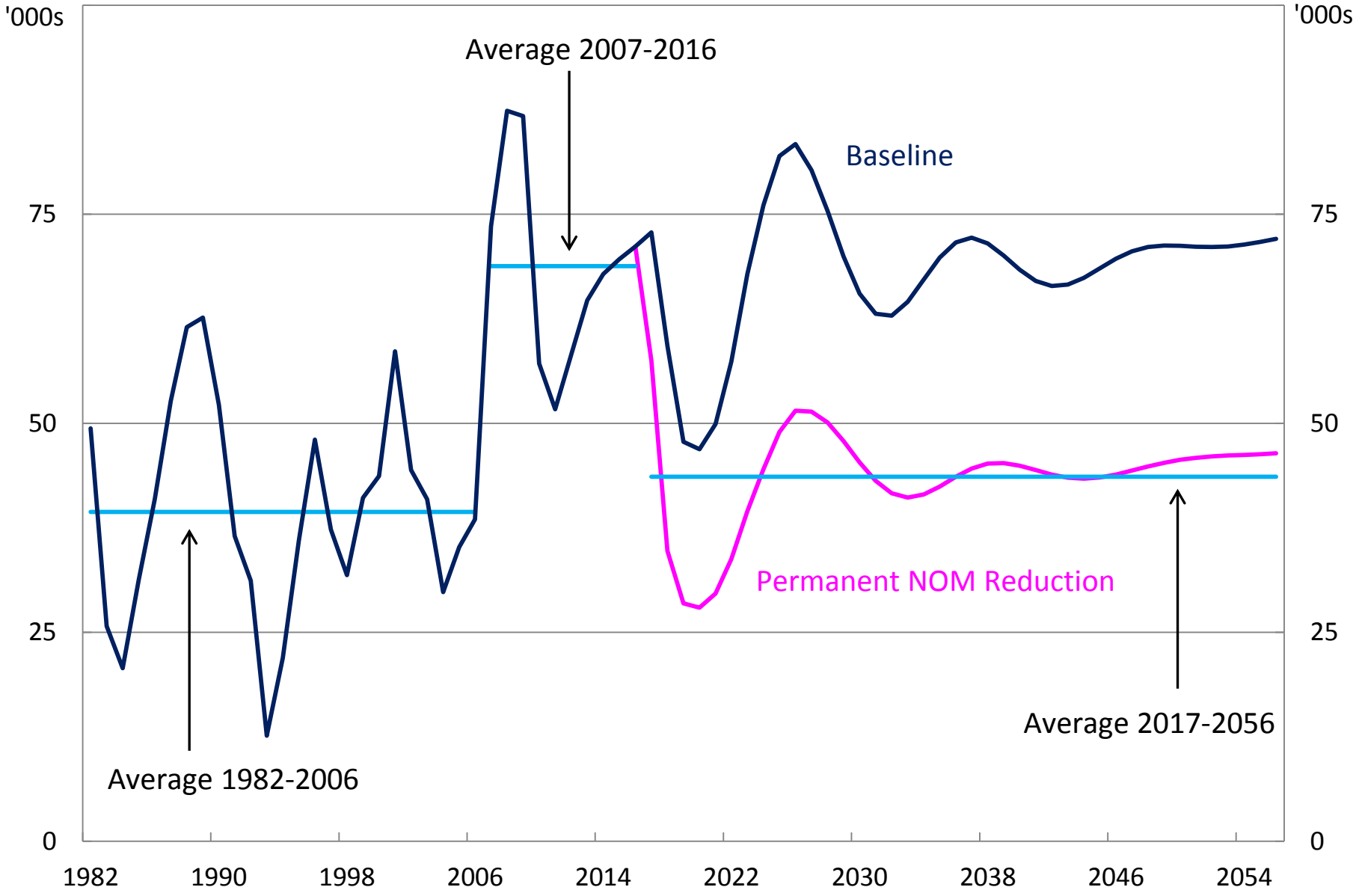


Chart C.1: Annual Australian Housing Price Growth

Impact of a sustained decrease in net overseas migration to Australia

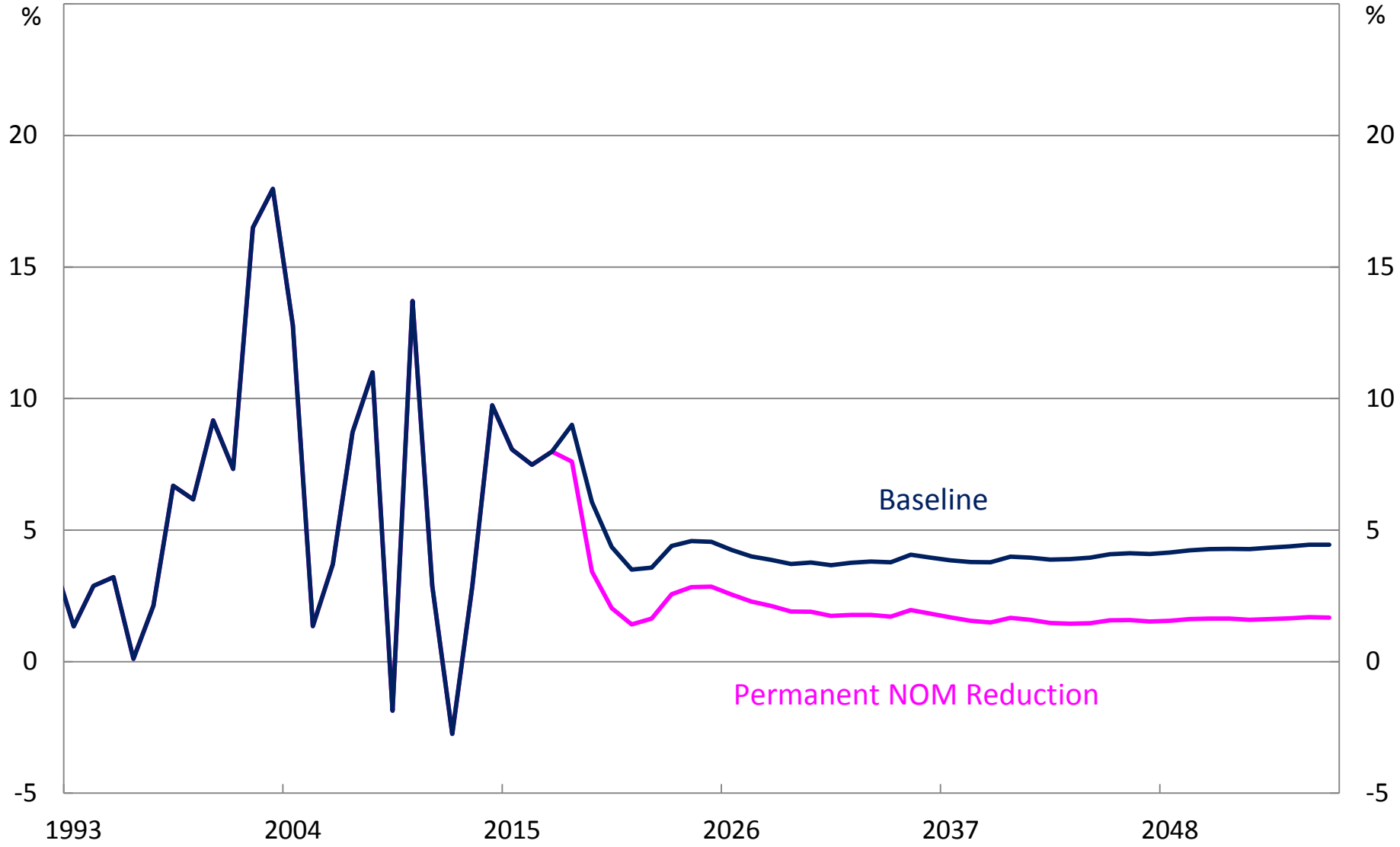


Chart C.3: Ratio of NSW Housing Prices to RoA Housing Prices

Impact of a sustained decrease in net overseas migration to Australia