Australian Demographic and Social Research Institute

Projections of Housing Demand in Australia, 2011 - 2041

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Canberra: June 2013

SUMMARY REPORT

Report Disclaimer

This report presents results of a series of household projections calculated for the National Housing Supply Council only as a guide to assist the NHSC in planning for future population change. The authors do not guarantee, and accept no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any material and accept no responsibility for any decisions that users may make as a result of using the data herein. The authors recommend that users exercise their own skill and care with respect to their use of these data and that users carefully evaluate the accuracy, currency, completeness and relevance of the resource for their purposes.

Limitations

• The 2011 preliminary Estimated Resident Population (ERP) data were used for these projections. The 2006 Estimated Resident Population data were used for calculations of transition probabilities. Following the 2011 Census, the Australian Bureau of Statistics (ABS) has made major changes to the measurement of ERP including a new approach to measuring census coverage. As a result of these changes, the 2011 ERP estimated prior to the release of the corrected 2011 census population was found to be 294,000 persons higher than the 2011 ERP incorporating the census results. As this error, historically, is very large, the ABS is in the process of recalculating and reissuing ERP for 20 years prior to 2011. These data were not available when the projections were modelled and will be released later in 2013 (see ABS, 2013 for further information). When these adjusted ERP data are issued, they may alter the survival ratios, base populations and transition probabilities used in these projections.

• All geographic boundaries were concorded to 2011 boundaries by the Australian Bureau of Statistics. There is likely to be some error in the concordance process, particularly when the concordance is applied across time as is the case with the ERP, Census and deaths data.

• Randomisation of small cell data may also influence the quality of the input tables used in these projections. Moreover, reclassification of missing cells in census tables may also distort propensities applied.

• The usual caveat with demographic projections applies: results present a possible future based upon a restricted set of assumptions. There are exogenous policy shocks that may affect the utility of belonging to different living arrangements in the later life course. For example, American studies have shown that increases in income and social security payments as well as reforms to nursing home subsidies have given rise to a higher demand for independent living (McGarry and Schoeni, 2000; Hoerger, Picone and Sloan, 1996).

• Transition probabilities for independent living may be affected by the availability and public support for carers. Another factor that may affect the transition probabilities, particularly in the earlier life cycle, is housing prices (McDonald and Temple, 2004). However, in old age there is little evidence to suggest that living arrangement decisions are made on the basis of house prices, with the major determinants being demographic (Börsch-Supan, 1989).

• Earlier household projections published in 2004 by the ABS use a standard propensity model to project households – where households are calculated from a set of propensities for each person to belong to alternative living arrangement types. With the release of updated household projections in 2010, the ABS shifted its methodology to include 'reconciled' propensities. Of particular importance, counts of total households and lone person households are replaced within the model to meet an externally benchmarked estimate. A recent report by the council notes that the ABS may publish a household number in 2014 (NHSC, 2013). The methodology the ABS will use to generate the household numbers is unknown and may differ to those presented here.

BACKGROUND

This report provides a narrative description of results of the projection of future housing demand in the capital cities and balances of state for the eight States and Territories of Australia for the period, 2011-41. The baseline housing data for the projections is obtained from the 2011 Census of Population and Housing. The Estimated Resident Population data for 30 June 2011 form the baseline population data. Appendix 1 to this report provides an assessment of the 2006 projections against the results of the 2011 Census.

These updated projections are based on the new Greater Capital City Statistical Areas (GCCSA) geography, rather than the Capital City / Balance of State geography used before the implementation of the new Australian Statistical Geography Standard (ASGC). As noted by the ABS, the purpose of the new geography is to:

> "represent a socio-economic definition of each of the eight State and Territory capital cities, this means the greater capital city boundary includes people who regularly socialise, shop or work within the city, but live in the small towns and rural areas surrounding the city. It does not define the built up edge of the city". ABS, 2010.

PROJECTION METHODOLOGY

The projections employ an innovative approach to projection of housing demand at the sub-national level. The methodology is detailed in McDonald, Kippen and Temple (2006). A short overview of the approach was provided in a previous report (McDonald and Temple 2008). That previous report also contains an analysis of changes in the household situation of Australians between the 1991, 1996, 2001 and 2006 Censuses of Australia. These trends are updated in this report using the results of the 2011 Census.

Migration is dealt with differently in this report than in previous reports. In previous reports, the migration input has been net migration for each geographic unit where international and internal movements were combined. In this report, the migration inputs to the model have been based upon NOM Arrivals and NOM Departures data for international migration and also upon arrivals and departures data for internal migration. The new approach is preferable because, while the age distributions of arrivals and of departures tend to be relatively stable across time in both international and internal movements, the age distributions of net migration can be unstable if the balance between arrivals and departures changes. See Appendix 3 for further detail.

HOUSING SUPPLY AND DEMAND

The projections provide the housing demand for occupied dwellings (by structure and tenure type) that would result from changing demographic and social trends (population size, births, deaths, international migration, internal migration, age structure changes and family and household formation and dissolution). These are all demand-side factors. The projections are not constrained by any supply-side factors such as availability of land, the number of vacant dwellings, construction of new dwellings and affordability. Our approach is to project housing demand on the basis of current and recent trends in demand inputs. These demand projections should then be assessed in supply terms, that is, the results from the projections of demand for housing can be compared with existing and planned supply of housing and assessments made of what corrections for demand-supply discrepancies need to be made. Where meeting demand would create supply difficulties, consideration would need to be given to how this demand is re-directed. Do the projected households maintain their dwelling preference but change their location or do they change their dwelling preference within the location. The fact that supply cannot meet housing preferences could also conceivably lead to the household not being formed at all.

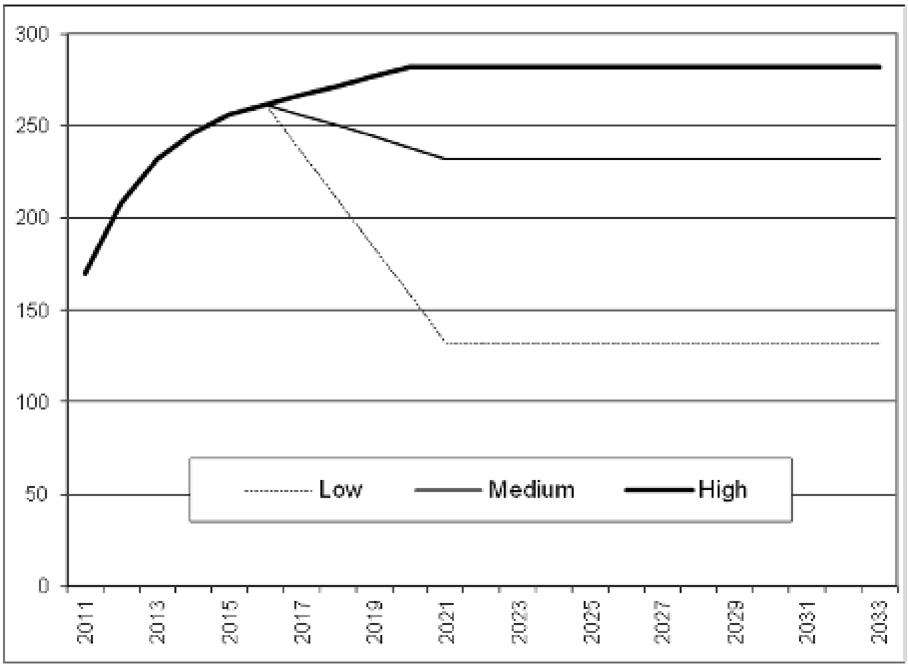
THE 2009-2039 PROJECTIONS: ASSUMPTIONS

The projections cover three possible future scenarios that reflect different assumptions about future international migration. The three assumed levels of annual net overseas migration are labeled as Low (132,000), Medium (232,000) and High (282,000). The three target scenarios for net overseas migration apply from 2021 onwards. Prior to 2021, the projections take into account information on migration to and from Australia that is already known as described in the next section. Aside from migration, all other assumptions are invariant across these future scenarios.

International Migration Assumptions

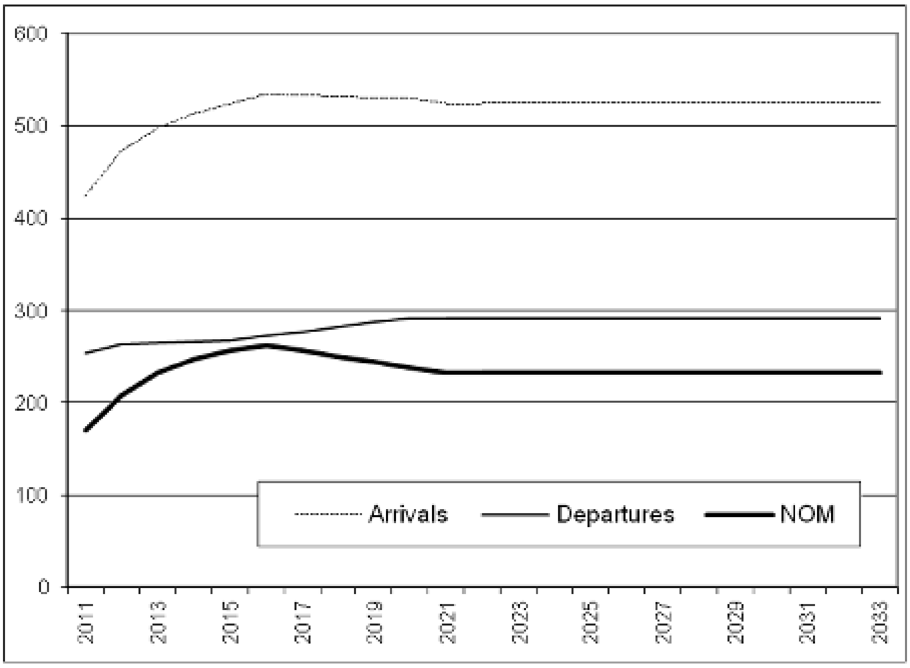
For the year, 2011-12, the published data for NOM Arrivals and Departures are used (ABS. 2013). From 2012-13 to 2015-16, international migration is assumed to follow the projections made by the Department of Immigration and Citizenship (DIAC 2013) for both NOM Arrivals and NOM Departures. From 2016-17 to 2019-20, NOM Departures and NOM Arrivals change linearly to reach the three target scenario levels by 2020-21. The assumptions are displayed in Figures 1 and 2.

Figure 1: Low (132), Medium (232) and High (282) NOM Assumptions



Source: ABS (2013); DIAC (2013); Author calculations.

Figure 2: Medium (NOM = 232) Scenario, Arrivals Departures and NOM



Source: ABS (2013); DIAC (2013); Author calculations.

Table 1: Assumed State Splits, NOM Arrivals

	2011-12	2012-13	2013-14	2015-16	2016-17+
NSW	31.3	30.9	30.6	30.3	30.0
Vic	23.9	23.7	23.5	23.3	23.2
Qld	19.6	19.6	19.6	19.6	19.6
SA	4.8	4.7	4.7	4.6	4.6
WA	16.7	17.4	18.0	18.6	19.0
Tas	0.8	0.8	0.8	0.8	0.8
NT	1.2	1.2	1.2	1.2	1.2
ACT	1.8	1.7	1.6	1.6	1.6
Australia	100	100	100	100	100

Source: ABS (2012a) & Author calculations.

Having established total NOM Arrivals and NOM Departures for Australia, it is then necessary to split these across States and Territories. The 2011-12 splits are based on ABS preliminary estimates for that year. In the five years to 2011-12, Western Australia's share of NOM Arrivals rose from 12.3 per cent to 16.7 per cent. By historical standards, this is a very substantial shift in shares. We assume that labour demand will remain strong in Western Australia through to 2016-17 because of the continuation of the construction phase in the mining industry but also because of the increase in wealth in the state and the ensuing increased demand for services. Migration also tends to create its own networks (chain migration) so that friends and relatives follow those that have already moved. Thus, once a movement is established, it tends to continue. Accordingly, we assume that Western Australia's share of NOM Arrivals will increase between 2011-12 and 2016-17 as shown in Table 1 after which the shares remain constant. Levels for other States and Territories are scaled downwards to reflect this increase for Western Australia. The State and Territory splits for NOM Departures are kept constant across the years of the projections at the 2011-12 published level as shown in Table 2.

Table 2: Assumed State Splits, NOM Departures

	2011-12+
NSW	35.6
Vic	23.9
Qld	19.7
SA	4.3
WA	12.0
Tas	0.9
NT	1.4
ACT	2.1
Australia	100

Source: ABS (2012a) & Author calculations.

Finally, it is necessary to split State and Territory NOM Arrivals and Departures across the two sub-state levels, capital city and rest of state. The assumptions used are based on ABS splits and are held constant across time (Table 3).

Table 3: Assumed Sub-State Proportion Splits, NOM Departures, NOM Arrivals and NOM

		Departures	Arrivals	NOM
NSW	Sydney	0.804	0.869	0.959
	Rest	0.196	0.131	0.041
VIC	Melbourne	0.865	0.906	0.946
	Rest	0.135	0.094	0.054
QLD	Brisbane	0.546	0.568	0.595
	Rest	0.454	0.432	0.405
SA	Adelaide	0.864	0.891	0.914
	Rest	0.136	0.109	0.086
WA	Perth	0.845	0.874	0.899
	Rest	0.155	0.126	0.101
TAS	Hobart	0.559	0.569	0.583
	Rest	0.441	0.431	0.417

Source: Derived from ABS Population Projections.
Notes: Sub state projections for NT and ACT not included.

A technical note on this changed migration methodology is included as Appendix 3 of this report. Appendix 3 (Table A3.1) also shows the age distributions of NOM Arrivals and NOM Departures for Australia.

Interstate Migration Assumptions

Interstate arrivals and departures data are based on the most recently published ABS data (ABS 2013) for states and territories and upon the ABS Experimental Net Internal Regional Migration Estimates for divisions of state. The experimental estimates are realigned to agree with the most recent state and territory level data. The table shows large gains for Perth and the balances of Victoria and Queensland. A large net loss is experienced by Sydney and smaller losses by Melbourne and Adelaide. The age distributions of net interstate migration are shown in Appendix 4 for each geographic unit.

Table 4. Net Internal Migration – Adjusted for Projections and Experimental 2010-11 ABS

	Adjusted 2011-12	Experimental 2010-11
Sydney	-22606	-20249
Bal	4228	7031
Melbourne	-7198	-5540
Bal	8401	9299
Brisbane	1037	-825
Bal	10759	7975
Adelaide	-2722	-2909
Bal	365	296
Perth	8375	4977
Bal	2710	1186
Hobart	-937	82
Bal	-1615	-129
NT	-1492	-2549
ACT	695	1355
Total	0	0

Source: Author calculations and ABS, 2012.

Fertility Assumptions

For Australia as a whole, the Total Fertility Rate is assumed to fall linearly from 1.90 births per woman in 2011 to 1.80 in 2021. From 2021 onwards, fertility is held constant. The change in fertility is scaled across the regions used in the projection according to the relative levels of fertility in 2011 (Table 5). Age patterns of fertility for each geographic unit were calculated from registered births provided by the ABS and were held constant across the projection period.

Table 5. Assumed Levels of the Total Fertility Rate.

	2011	2021_
1. Greater Sydney	1.85	1.75
2. Rest of NSW	2.18	2.06
3. Greater Melbourne	1.70	1.61
4. Rest of Vic.	2.07	1.96
5. Greater Brisbane	1.90	1.80
6. Rest of Qld	2.11	2.00
7. Greater Adelaide	1.77	1.68
8. Rest of SA	2.22	2.10
9. Greater Perth	1.83	1.73
10. Rest of WA	2.24	2.13
11. Greater Hobart	2.12	2.01
12. Rest of Tas.	2.16	2.04
13. NT	2.13	2.02
14. SEQ	1.89	1.79
15. ACT	1.72	1.63
16. Australia	1.90	1.80

Source: Authors calculations based on ABS supplied data.

Mortality Assumptions

Thirty years of Australian Life Tables were used to calculate sex-age specific survival ratios for Australia. From these annualised, sex-age specific rates of change were calculated. These rates of change were then projected to increase at 95% of the previous year's rate of change. These projection intensities were then applied to all regions in the projections. At the regional level, for the baseline input, age-sex specific abridged life tables were calculated using death registration data obtained from the ABS. For males under age 45 and females under age 50, survival ratio projections are assumed to follow the national level because regional level mortality tends to fluctuate at these ages where mortality rates are low. At higher ages, regional survival ratios are projected from their baseline in alignment with the projected changes in the Australian rates. Northern Territory survival ratios were calculated separately using published NT life tables. The results expressed in terms of expectation of life are shown in Table 6.

Table 6: Estimated and Projected Life Expectancy at Birth, Males and Females, 2011, 2026 and 2040

	Males			Females		
	2011	2026	2040	2011	2026	2040
1. Greater Sydney	80.2	83.9	85.8	84.4	86.7	87.8
2. Rest of NSW	78.9	82.4	84.1	83.4	85.6	86.7
3. Greater Melbourne	80.5	84.3	86.2	84.5	86.9	88.0
4. Rest of Vic.	79.1	82.6	84.4	83.6	85.8	86.8
5. Greater Brisbane	79.7	83.3	85.1	84.2	86.5	87.6
6. Rest of Qld	79.5	83.0	84.9	84.2	86.5	87.6
7. Greater Adelaide	79.9	83.6	85.5	84.2	86.5	87.6
8. Rest of SA	79.4	83.0	84.8	83.8	86.0	87.1
9. Greater Perth	80.4	84.2	86.1	84.8	87.2	88.3
10. Rest of WA	79.3	82.8	84.6	84.2	86.6	87.7
11. Greater Hobart	79.4	82.9	84.7	83.4	85.6	86.6
12. Rest of Tas.	78.9	82.3	84.0	82.9	85.0	86.0
13. NT	74.9	77.8	79.3	80.4	82.4	83.4
14. SEQ	79.9	83.6	85.4	84.5	86.8	87.9
15. ACT	81.0	84.9	86.9	84.4	86.8	87.9
Australia	79.8	83.4	85.3	84.1	86.4	87.5

Source: Authors calculations based on ABS supplied data.

Households, Dwelling Types and Tenure Types: Assumptions

The 2006-2011 HCT net transition probabilities by region, age and sex are assumed to remain constant throughout the projection period.[1]

The 2011 Census distributions of dwelling type by region, type of household and age of the reference person are assumed to remain constant throughout the projection period.

The 2011 Census distributions of tenure type by region, dwelling type, type of household and age of the reference person are assumed to remain constant across the projection period.

The probabilities and distributions referred to above do not change very much from census to census. The small changes that occur between censuses are both upwards and downwards in unpredictable ways as we observe these distributions from 1991 through to 2011. In this circumstance, in our assessment, it is better to assume that the distributions remain as they were at the most recent census. This also aids interpretation of the results as the projections are then the housing needs that would be required if patterns of behavior remain the same as they were at the time of the most recent census. Movements

[1] In applying HCT propensities, we do not make adjustments for multiple family households, which account for about 1% of households.

across intercensal periods of the main HCT net transition probabilities are discussed in Appendix 2 to this report.

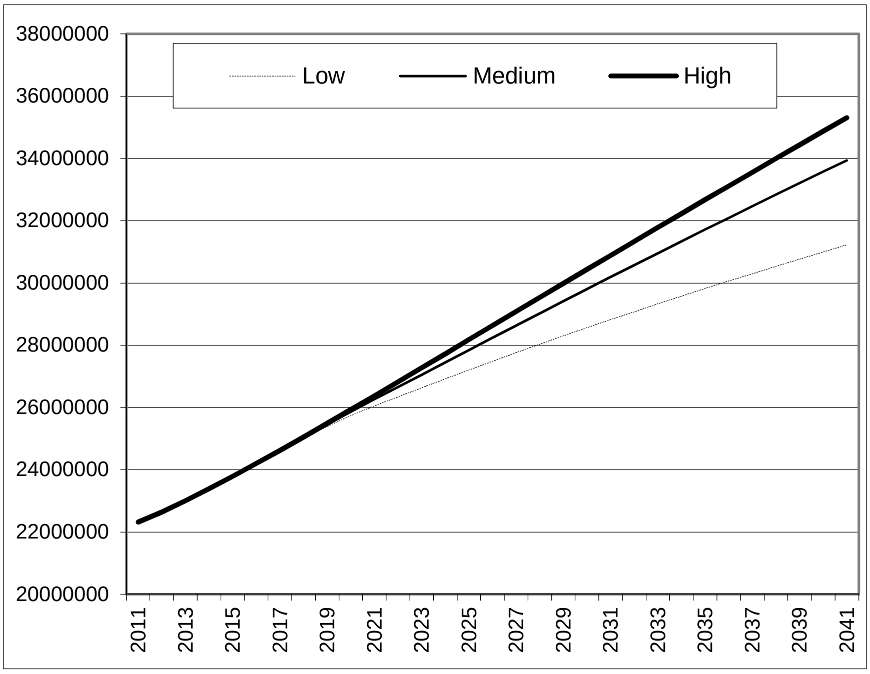
PROJECTION RESULTS

Population and Households: Australia

In this projection, the results for Australia have been obtained by summing the 14 separate projections for the geographic units of Australia. The results from this summation were checked against direct Australia-level projections and the differences for both total population and total households differed by less than 0.2 per cent by 2041. This confirms the reliability of using the summation approach.

The projected population of Australia is shown for the three scenarios in Figure 3. As the assumptions are the same in the three scenarios to 2017, the projected populations are also the same. The end point populations in 2041 are 31.2 million for the Low scenario, 33.9 million for the Medium scenario and 35.3 million for the High scenario.

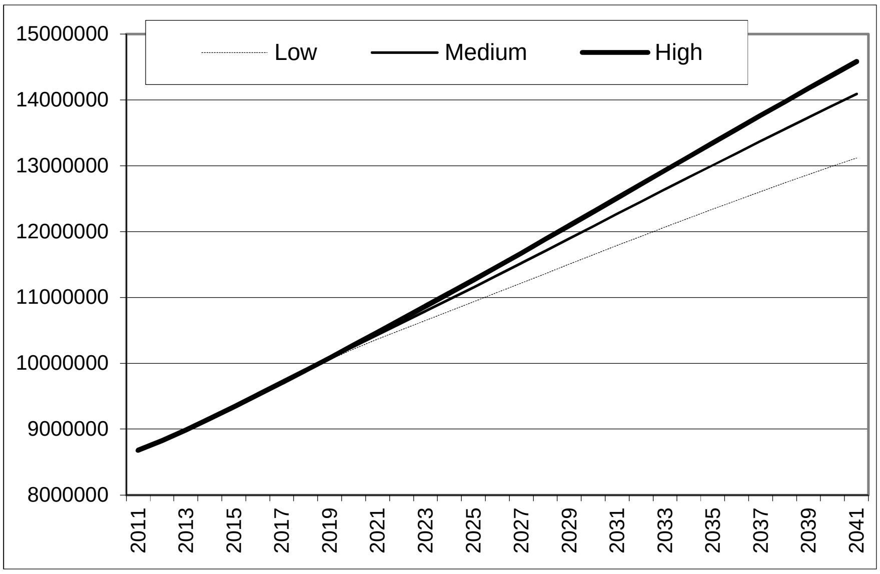
Figure 3: Projected Population, Australia, Low, Medium and High



Source: Authors calculations

The projection results for Australian households are shown in Figure 4. Total households increase from 8.7 million in 2001 to 13.1 million according to the Low scenario, to 14.1 million for the Medium scenario and to 14.6 million for the High scenario. Average household size changes from 2.57 persons per household in 2011 to 2.38 in the Low scenario, 2.41 in the Medium scenario and 2.42 in the High scenario. Thus, migration has a small positive impact on average household size because of the younger age distribution of migrants.

Figure 4. Projected Households, Australia, Low Medium and High



Source: Authors calculations

Projected households by type

In the results section of the text, results will be shown for the three scenarios at the Australian level and then regional results will be shown only for the medium level projection.

Table 7 shows the growth in households by type across the three scenarios and two projection periods. For total households, the projected growth varies across the three scenarios from 28 to 32 per cent between 2011 and 2026 and between 18 to 27 per cent between 2026 and 2041. The difference in the growth rates between the Medium and High scenarios is relatively small in both projection periods. The lack of variation across the scenarios in the first period reflects the fact that the migration assumptions do not vary in the first half of this period. However, the growth of households is larger in the first period than in the second even for the High projection which has a higher level of migration in the second period than in the first. This probably reflects the impact of the increasing numbers of deaths of older persons in the latter period as suggested by the lower rate of growth of lone person households in the 2026-41 period.

Growth is considerably greater for lone person households than for other household types in both periods but it is also high for persons in non-private dwellings. These trends primarily reflect the ageing of the population.

Table 7. Ratio of households by type, 2026 to 2011 and 2041 to 2026, Australia, three scenarios

	Ratio of Households by Type, Australia						
	Two Parent Families	One Parent Families	Couples No Children	Lone Persons	Group Households	Total Households	Persons in NPDs
Scenario: Low							
2011-26*	1.16	1.21	1.26	1.49	1.20	1.28	1.37
2026-41**	1.08	1.16	1.14	1.34	1.15	1.18	1.35
Scenario: Mid							
2011-26*	1.20	1.25	1.28	1.51	1.26	1.31	1.39
2026-41**	1.16	1.23	1.19	1.39	1.21	1.24	1.38
Scenario: High							
2011-26*	1.22	1.27	1.30	1.52	1.28	1.32	1.40
2026-41**	1.20	1.27	1.21	1.41	1.24	1.27	1.40

Source: Authors calculations
Notes: * Ratio of 2026 household count to 2011 household count; ** Ratio of 2041 household count to 2026 household count.

Across States and Territories and metropolitan and non-metropolitan areas, the overarching conclusion, not unexpectedly, is that household growth rates are strongly associated with population growth rates for each geographic unit (Table 8).

In general, the projected growth rates for households consisting of families with children were low or even negative in the non-metropolitan regions with the exception of nonmetropolitan Queensland. Growth rates for families with children remain very strong in Brisbane (and SEQ) and in Perth and moderately strong in Sydney and Melbourne. The growth rates for this household type are more muted in Darwin and Canberra and low in Hobart and Adelaide.

The national pattern of high but falling growth of lone person households is evident across all geographic units. However, in several geographic areas, the number of persons in non-private dwellings grows faster between 2026 and 2041 than in the earlier period, but the projected growth is strong in all regions.

Table 8. Relative increase in numbers of households by type, Medium scenario

Region	Period	Relative increase over the period						
		2 parent families	1 parent families	Couples without children	Lone person	Group households	Total households	Persons in NPDS
NSW capital city	2011-26*	1.17	1.22	1.26	1.43	1.22	1.26	1.29
	2026-41**	1.13	1.20	1.18	1.36	1.19	1.21	1.38
NSW balance of state	2011-26*	0.95	1.06	1.11	1.36	1.10	1.13	1.28
	2026-41**	1.01	1.07	0.98	1.24	1.05	1.08	1.23
VIC capital city	2011-26*	1.16	1.27	1.26	1.53	1.25	1.30	1.41
	2026-41**	1.12	1.26	1.17	1.40	1.25	1.23	1.44
VIC balance of state	2011-26*	1.01	1.07	1.22	1.49	1.12	1.22	1.34
	2026-41**	1.00	1.10	1.02	1.32	1.06	1.13	1.41
QLD capital city	2011-26*	1.29	1.31	1.38	1.52	1.25	1.37	1.40
	2026-41**	1.21	1.30	1.26	1.40	1.29	1.29	1.37
QLD balance of state	2011-26*	1.28	1.24	1.47	1.65	1.25	1.42	1.43
	2026-41**	1.19	1.21	1.25	1.46	1.20	1.29	1.49
SA capital city	2011-26*	1.06	1.05	1.18	1.29	1.07	1.16	1.22
	2026-41**	1.04	1.10	1.06	1.22	1.08	1.12	1.37
SA balance of state	2011-26*	0.98	1.05	1.20	1.48	1.19	1.20	1.52
	2026-41**	1.00	1.08	1.01	1.30	1.09	1.12	1.46
WA capital city	2011-26*	1.28	1.32	1.41	1.60	1.24	1.40	1.55
	2026-41**	1.17	1.29	1.26	1.45	1.30	1.29	1.56
WA balance of state	2011-26*	1.11	1.15	1.41	1.69	1.19	1.36	1.38
	2026-41**	1.04	1.12	1.14	1.44	1.14	1.21	1.42
TAS capital city	2011-26*	1.03	1.05	1.23	1.39	1.05	1.19	1.08
	2026-41**	1.03	1.09	1.08	1.27	1.06	1.13	1.30
TAS balance of state	2011-26*	0.92	0.98	1.17	1.42	1.10	1.15	1.46
	2026-41**	0.93	1.01	0.95	1.24	1.00	1.05	1.47
NT	2011-26*	1.14	1.19	1.32	1.64	1.28	1.31	1.23
	2026-41**	1.11	1.28	1.16	1.35	1.15	1.22	1.23
ACT	2011-26*	1.14	1.14	1.25	1.45	1.10	1.25	1.18
	2026-41**	1.05	1.17	1.14	1.31	1.14	1.17	1.37
SE QLD	2011-26*	1.35	1.34	1.45	1.58	1.27	1.43	1.46
	2026-41**	1.24	1.31	1.30	1.44	1.29	1.32	1.53

Source: Authors calculations Notes: * Ratio of 2026 household count to 2011 household count; ** Ratio of 2041 household count to 2026 household count.

Demand for additional dwellings by type

Table 9 shows that the demand for additional dwellings is contingent upon the assumed level of net international migration. For the 2011-26 period, the additional immigrants increase the demand for dwellings in Australia as a whole from 2.40 million in the Low scenario to 2.66 million in the Medium scenario and then to 2.80 million in the High scenario. The increment to total dwellings is lower in the second period because of the lower level of migration assumed in this scenario in the second period. The reverse is true for the high migration scenario, because of higher migration in the second period than in the first.

The growth rate of each dwelling type does not vary within any one projection scenario because the distribution of dwelling types for each cell defined by age-sex of the household reference person and household type (preferences) remains constant. Thus, the dwelling type distribution will only change because of changes in the composition of the population by age or household type. These changes are relatively small.

Table 9. Total increment to dwellings and ratio of dwellings by type, 2026 to 2011 and 2041 to 2026, Australia, three scenarios

	Increment To Dwellings	Total*	Separate* Houses	Semi* Detached	Flats*
Scenario: Low					
2011-26	2,399,463	1.28	1.28	1.28	1.27
2026-41	2,047,401	1.18	1.18	1.20	1.20
Scenario: Mid					
2011-26	2,663,192	1.31	1.30	1.31	1.31
2026-41	2,768,396	1.24	1.24	1.25	1.26
Scenario: High					
2011-26	2,799,272	1.32	1.32	1.33	1.33
2026-41	3,130,107	1.27	1.27	1.28	1.28

Source: Authors calculations Notes: * Ratio of relevant (2026 or 2041) years dwelling count to base year (2011 or 2026) dwelling count.

In both periods, the required increment for dwellings is larger in Perth than in the other cities reflecting the high population growth projected for Perth (Table 10). According to the Medium scenario, Perth would require an annual increment to dwellings of 34,000 between 2011 and 2026 rising to over 40,00 per annum in the second period. In contrast, the projected growth in dwellings is relatively modest in non-metropolitan Western Australia. While this result is likely to be sustained in the first period of projection, all the results of projections in the second period, 2026-2041, must be considered to be highly speculative. The required increment to dwellings is higher in Melbourne than in Sydney which in turn is higher than in SEQ. In contrast, the projected increment to dwellings is very low in Hobart and is negative between 2026 and 2041 in non-metropolitan Tasmania. The required growth is very similar for each dwelling type although, in some regions, the required growth is higher for flats than for other dwelling types.

Table 10. Increments to numbers of dwellings and relative increase in numbers of dwellings by type, Medium scenario

		Increment to Dwellings	Total	Separate Houses	Semi Detached	Flats
Greater Sydney	2011-26	451,723	1.26	1.27	1.26	1.24
	2026-41	462,152	1.21	1.21	1.22	1.22
Rest of NSW	2011-26	137,368	1.13	1.12	1.16	1.16
	2026-41	99,488	1.08	1.08	1.10	1.11
Greater Melbourne	2011-26	505,895	1.32	1.32	1.31	1.31
	2026-41	523,583	1.25	1.25	1.26	1.26
Rest of VIC	2011-26	121,795	1.22	1.21	1.27	1.29
	2026-41	119,616	1.17	1.17	1.21	1.23
Greater Brisbane	2011-26	312,958	1.39	1.39	1.38	1.37
	2026-41	330,235	1.29	1.29	1.31	1.32
Rest of QLD	2011-26	309,092	1.34	1.33	1.36	1.36
	2026-41	324,320	1.26	1.26	1.28	1.29
Greater Adelaide	2011-26	107,676	1.21	1.20	1.23	1.24
	2026-41	102,263	1.16	1.16	1.19	1.20
Rest of SA	2011-26	25,035	1.16	1.15	1.21	1.30
	2026-41	17,710	1.10	1.09	1.12	1.17
Greater Perth	2011-26	511,040	1.72	1.72	1.71	1.71
	2026-41	610,991	1.50	1.50	1.50	1.50
Rest of WA	2011-26	86,722	1.45	1.44	1.51	1.51
	2026-41	96,103	1.34	1.33	1.40	1.42
Greater Hobart	2011-26	10,151	1.11	1.11	1.10	1.12
	2026-41	8,291	1.08	1.08	1.11	1.13
Rest of TAS	2011-26	6,182	1.05	1.04	1.14	1.13
	2026-41	-2,867	0.98	0.97	1.04	1.04
NT	2011-26	24,788	1.31	1.32	1.28	1.24
	2026-41	18,305	1.17	1.18	1.16	1.15
ACT	2011-26	45,165	1.32	1.33	1.30	1.26
	2026-41	45,996	1.25	1.24	1.27	1.27
SEQ	2011-26	426,659	1.36	1.35	1.37	1.39
	2026-41	456,447	1.28	1.27	1.30	1.31

Source: Authors calculations Notes: * Ratio of relevant (2026 or 2041) years dwelling count to base year (2011 or 2026) dwelling count.

Demand by tenure category

Table 11 shows the ratio of dwellings required in 2026 to the number of dwellings in 2011 according to tenure type. It also shows the same ratio for the second period. The purpose of this table is to show whether the demand for any type of tenure increases more than for other types. Owner/purchasers grow at the same rate as all tenures in each scenario in each period. However, in all scenarios, the growth for public rental tenure is higher than for all dwellings while the growth for private rental tenure is lower than for all dwellings, and this is especially the case in the first projection period. These conclusions apply also to all geographic regions (Table 12).

Table 11. Ratio of dwellings by tenure, 2026 to 2011 and 2041 to 2026 Australia, three scenarios

	Total	Owner/ Purchasers	Public Renters	Private Renters
Scenario: Low				
2011-26	1.28	1.29	1.35	1.22
2026-41	1.18	1.19	1.25	1.17
Scenario: Mid				
2011-26	1.31	1.32	1.38	1.26
2026-41	1.24	1.24	1.31	1.23
Scenario: High				
2011-26	1.32	1.33	1.39	1.29
2026-41	1.27	1.27	1.33	1.26

Source: Authors calculations
Notes: * Ratio of 2026 dwellings count to 2011 dwellings count; ** Ratio of 2041 dwellings count to 2026 dwellings count.

Table 12. Relative increase in numbers of dwellings by tenure, Medium scenario

		Ratio of Dwellings in 2026 to 2011			
		Total	Owner/ Purchasers	Public Renters	Private Renters
Greater Sydney	2011-26	1.26	1.28	1.35	1.21
	2026-41	1.21	1.21	1.28	1.20
Rest of NSW	2011-26	1.13	1.14	1.18	1.09
	2026-41	1.08	1.08	1.13	1.08
Greater Melbourne	2011-26	1.32	1.34	1.40	1.26
	2026-41	1.25	1.25	1.33	1.23
Rest of VIC	2011-26	1.22	1.22	1.28	1.19
	2026-41	1.17	1.17	1.24	1.18
Greater Brisbane	2011-26	1.39	1.41	1.48	1.32
	2026-41	1.29	1.30	1.37	1.28
Rest of QLD	2011-26	1.34	1.35	1.41	1.30
	2026-41	1.26	1.26	1.33	1.26
Greater Adelaide	2011-26	1.21	1.22	1.29	1.16
	2026-41	1.16	1.16	1.23	1.15
Rest of SA	2011-26	1.16	1.16	1.25	1.13
	2026-41	1.10	1.09	1.17	1.09
Greater Perth	2011-26	1.72	1.73	1.76	1.68
	2026-41	1.50	1.51	1.56	1.46
Rest of WA	2011-26	1.45	1.48	1.54	1.37
	2026-41	1.34	1.33	1.45	1.34
Greater Hobart	2011-26	1.11	1.13	1.16	1.04
	2026-41	1.08	1.08	1.14	1.09
Rest of TAS	2011-26	1.05	1.06	1.09	1.01
	2026-41	0.98	0.98	1.03	0.97
NT	2011-26	1.31	1.40	1.34	1.18
	2026-41	1.17	1.21	1.20	1.12
ACT	2011-26	1.32	1.35	1.37	1.21
	2026-41	1.25	1.25	1.30	1.22
SEQ	2011-26	1.36	1.38	1.41	1.31
	2026-41	1.28	1.29	1.35	1.26

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Appendix 1.

Comparisons of NHSC Projections Based on 2006 ERP and 2011 Outcomes

This appendix provides an assessment of the projections made for the National Housing Supply Council based on the 2006 Estimated Resident Population. This comparison is made at the state and national level due to significant changes in the geography used since the last set of projections. These new projections are based on the new Greater Capital City Statistical Areas (GCCSA) geography, rather than the Capital City / Balance of State geography used before the implementation of the new Australian Statistical Geography Standard (ASGC). As noted by the ABS, the purpose of the new geography is to:

> "represent a socio-economic definition of each of the eight State and Territory capital cities, this means the greater capital city boundary includes people who regularly socialise, shop or work within the city, but live in the small towns and rural areas surrounding the city. It does not define the built up edge of the city". ABS, 2010.

The assessment compares the projections with 2011 outcomes, using both the unrevised ERP estimates for 2011 and the revised estimates. The most important issue here is that, following the 2011 Census of Population and its Post Enumeration Survey, the ABS revised the ERP for 30 June 2011 downwards by 294,000. This is a very substantial correction compared with corrections made at previous censuses.

The ABS has not identified the source of this large error. In our view, for the country as a whole, little of the error can be attributed to errors in the recorded intercensal births and deaths because of the relatively high degree of accuracy associated with these statistics. There is a possibility that some people who arrived in Australia or departed from Australia in the intercensal period, in relation to their usual residence status in Australia, were reported or counted differently in the migration statistics than in the census. However, in relation to arrivals in Australia, this explanation implies that a large number of people in Australia at the time of the census were recorded by the census as visitors but they had been recorded by the migration statistics as usual residents. This argument is not supported by the relatively small number of persons classified as visitors in the 2011 Census.

The most likely explanation of the large error, therefore, is that most of the error is due to the 2006 ERP being too high, probably because international migration was not measured well by the ABS in the 2001-06 intercensal period. However, in publishing revised estimates of ERP to this point, the ABS has maintained the 2006 ERP population estimate as originally estimated. This means that, effectively, the recorded level of net intercensal population change based on births, deaths and migration has been reduced by the ABS by 294,000, the estimated overcount of population at 30 June 2011. If intercensal births and deaths are considered to be accurate, this implies a reduction of the recorded intercensal net migration by 294,000, a result that has to be considered very unlikely indeed.

The 2006 Census-based projections made for the NHSC take off from the 2009 ERP. This means that they incorporate both the high 2006 ERP and the actual net migration, births and deaths between 1 July 2006 and 30 June 2009. For the two years to 30 June 2011, the NHSC Medium projection assumptions had a slightly lower level of net population increase than actually occurred. Thus, the NHSC Medium projected population of Australia at 2011 of 22,586,600 was a little below the ABS unrevised ERP for 2011 of 22,618,200. Thus, the NHSC population projections are aligned to the unrevised ERP.

The revisions to ERP after the 2011 Census differed substantially across States and Territories (National Housing Supply Council 2013: 118). It is these revisions that are the major explanation of the differences at the State and Territory level between the NHSC projections and the 'actual' 2011 populations as shown in Appendix Table A1.1. For Australia, the Medium NHSC projection of population was 1.2 per cent higher than the revised ERP. For Western Australia, Tasmania and ACT, however, the revised 2011 ERP was higher than the NHSC projected populations. This again reflects the effects of the ABS post-census revision of ERP.

Table A1.1. Comparison of NHSC projections with the Revised ERP, 2011

Variant	**Population 2011**				
	NSW	**Vic**	**Qld**	**SA**	**WA**
Actual ERP (post-census revision)	7211468	5534526	4474098	1638232	2352215
NHSC Projections					
Low	7238518	5549422	4580935	1639865	2315171
Medium	7288113	5592030	4613335	1648762	2339760
High	7331508	5629311	4641684	1656548	2361276
Differences (NHSC and revised ERP), %					
Low	0.4	0.3	2.4	0.1	-1.6
Medium	1.1	1.0	3.1	0.6	-0.5
High	1.7	1.7	3.7	1.1	0.4
Variant	**Population 2011**				
	Tas	**NT**	**ACT**	**Australia**	
Actual ERP (post-census revision)	511195	231333	367752	22320819	
NHSC Projections					
Low	508813	232753	359576	22425054	
Medium	509910	233637	361018	22586565	
High	510869	234412	362280	22727888	
Differences (NHSC and revised ERP), %					
Low	-0.5	0.6	-2.2	0.5	
Medium	-0.3	1.0	-1.8	1.2	
High	-0.1	1.3	-1.5	1.8	

Source: Authors calculations

For households, the relative differences between the NHSC projections and the numbers of households estimated for the current NHSC projections based on the revised 2011 ERP are somewhat larger than the population comparisons. This is due to the fact that average household size was a little higher in the 2011 ERP-based estimates than in the NHSC projections in all States and Territories except Tasmania. However, small changes in average household size can have a relatively large impact on the numbers of households. The largest increases in household size were in Western Australia and in the two Territories. This and the downward result for Tasmania suggest that the driving force may have been housing affordability; where housing was less affordable, average household size increased. This indicates the sensitivity of housing projections to supply-side factors.

Table A1.2. Comparison of NHSC Projections with the NHSC Estimates Based on the Revised ERP, 2011, Households

Variant	**Households 2011**				
	NSW	**Vic**	**Qld**	**SA**	**WA**
Actual ERP (post-census revision)	2778765	2152064	1729929	675235	905935
NHSC Projections					
Low	2826207	2182420	1790133	684868	924592
Medium	2844912	2198854	1802647	688561	934343
High	2861278	2213233	1813596	691792	942875
Differences (NHSC and revised ERP), %					
Low	1.7	1.4	3.5	1.4	2.1
Medium	2.4	2.2	4.2	2.0	3.1
High	3.0	2.8	4.8	2.5	4.1
Variant	**Households 2011**				
	Tas	**NT**	**ACT**	**Australia**	
Actual ERP (post-census revision), %	215092	79937	142015	8678973	
NHSC Projections					
Low	212831	83071	142657	8846779	
Medium	213286	83385	143226	8909214	
High	213684	83659	143724	8963840	
Differences (NHSC and revised ERP)					
Low	-1.1	3.9	0.5	1.9	
Medium	-0.8	4.3	0.9	2.7	
High	-0.7	4.7	1.2	3.3	

Source: Authors calculations

Table A1.3. Average Household Size in 2011, 2006 Census-based NHSC Projections and 2011 Census-based NHSC Estimates

State and Territory	Average Household Size, 2011	
	2006 Census-based NHSC Projections	2011 Census-based NHSC Estimates
New South Wales	2.562	2.595
Victoria	2.543	2.572
Queensland	2.559	2.586
South Australia	2.395	2.426
Western Australia	2.504	2.596
Tasmania	2.391	2.377
Northern Territory	2.802	2.894
Australian Capital Territory	2.521	2.590
AUSTRALIA	2.535	2.572

Source: Authors calculations

Examining the (Projected- Actual) differences by household type (Table A1.4), it is evident that families with children were more prevalent than projected while lone person households were less prevalent. Again, this would be more likely to occur is there was an affordability problem, especially for young people who might otherwise have left their parents' home.

Table A1.4: Distribution of Households by Type, Actual (NHSC 2011 Estimates Based on Revised 2011 ERP) and Difference, 2011

	Projected (Medium Scenario)				
	2 Parent Families	1 Parent Families	Couples No Children	Lone Persons	Group Households
NSW	0.322	0.116	0.267	0.257	0.038
VIC	0.319	0.110	0.263	0.266	0.043
QLD	0.305	0.116	0.292	0.243	0.045
SA	0.276	0.111	0.281	0.300	0.032
WA	0.305	0.106	0.279	0.274	0.035
TAS	0.270	0.114	0.294	0.291	0.031
NT	0.326	0.142	0.241	0.246	0.046
ACT	0.318	0.107	0.265	0.254	0.056
AUS	0.311	0.113	0.274	0.262	0.040
	Actual				
	2 Parent Families	1 Parent Families	Couples No Children	Lone Persons	Group Households
NSW	0.326	0.121	0.265	0.247	0.041
VIC	0.325	0.112	0.265	0.251	0.047
QLD	0.310	0.120	0.288	0.232	0.050
SA	0.283	0.114	0.282	0.284	0.037
WA	0.325	0.108	0.286	0.240	0.042
TAS	0.266	0.119	0.286	0.294	0.034
NT	0.340	0.136	0.247	0.220	0.057
ACT	0.325	0.105	0.270	0.238	0.062
AUS	0.318	0.116	0.274	0.248	0.044
	Difference				
	2 Parent Families	1 Parent Families	Couples No Children	Lone Persons	Group Households
NSW	-0.004	-0.005	0.002	0.010	-0.003
VIC	-0.007	-0.003	-0.002	0.015	-0.004
QLD	-0.005	-0.004	0.003	0.011	-0.005
SA	-0.007	-0.003	-0.001	0.016	-0.005
WA	-0.019	-0.002	-0.006	0.034	-0.007
TAS	0.004	-0.005	0.008	-0.003	-0.003
NT	-0.014	0.005	-0.006	0.026	-0.011
ACT	-0.008	0.002	-0.005	0.016	-0.005
AUS	-0.007	-0.003	0.000	0.014	-0.004

Source: Authors calculations

In relation to tenure, private rental was more common in reality than had been projected and the owner/purchasers were less prevalent than projected. This again is not an unexpected trend given the affordability of owner/purchasing in the 2006-11 period NHSC 2013). However, another factor may have been the very large increase in temporary overseas migration in this period (Khoo, S-E. et al. 2012).

Table A1.5: Distribution of Households by Tenure, Actual (NHSC 2011 Estimates Based on Revised 2011 ERP) and Difference, 2011

	Projected (Medium Scenario)				
	Owner Purchaser	Public Renter	Other Renter	Other	Total
NSW	0.711	0.045	0.221	0.023	1.000
VIC	0.738	0.029	0.219	0.014	1.000
QLD	0.670	0.034	0.279	0.017	1.000
SA	0.728	0.066	0.191	0.015	1.000
WA	0.709	0.038	0.235	0.018	1.000
TAS	0.747	0.055	0.183	0.015	1.000
NT	0.494	0.085	0.378	0.042	1.000
ACT	0.693	0.077	0.222	0.008	1.000
AUS	0.709	0.041	0.232	0.018	1.000
	Actual				
	Owner Purchaser	Public Renter	Other Renter	Other	Total
NSW	0.681	0.041	0.263	0.014	1.000
VIC	0.718	0.027	0.242	0.014	1.000
QLD	0.646	0.034	0.305	0.015	1.000
SA	0.708	0.057	0.221	0.014	1.000
WA	0.692	0.037	0.253	0.018	1.000
TAS	0.726	0.053	0.206	0.015	1.000
NT	0.475	0.128	0.348	0.050	1.000
ACT	0.677	0.073	0.241	0.008	1.000
AUS	0.686	0.039	0.261	0.015	1.000
	Difference				
	Owner Purchaser	Public Renter	Other Renter	Other	Total
NSW	0.030	0.004	-0.042	0.009	0.000
VIC	0.020	0.003	-0.023	0.000	0.000
QLD	0.024	0.000	-0.025	0.001	0.000
SA	0.020	0.009	-0.030	0.001	0.000
WA	0.017	0.001	-0.019	0.000	0.000
TAS	0.022	0.002	-0.023	0.000	0.000
NT	0.020	-0.043	0.030	-0.007	0.000
ACT	0.016	0.005	-0.020	0.000	0.000
AUS	0.023	0.002	-0.029	0.003	0.000

Source: Authors calculations

Appendix 2

Movements in HCT net transition probabilities for three intercensal periods, Australia
(Source: Author calculations based on Census and ERP Data)

The net transition probability measures the rate at which people of a given age move between one HCT category and another as they move to the next age. For example, Figure A2.1 shows for males, the net probability of moving from the HCT category, living with parents, to the HCT category, living as a couple. This probability rises from zero at 15 to around 0.12 by age 24. The net probability of 0.12 means that as males living at home with parents age from 24 to 25, there is a 12 per cent chance that they will leave their parents' home to live in a couple relationship having discounted those who move in the opposite direction (from being coupled to living with parents).[2]

Transitions at Ages 15-24

Figure A2.1 indicates that across the three intercensal periods, 1996-2001, 2001-06 and 2006-11, males aged 15-24 became increasingly less likely to leave their parents' home to live in a couple relationship. However, between 2006 and 2011, they were more likely to leave their parents' home to live in some other situation: alone, in a group household or in a non-private dwelling (Figure A2.2). In relation to living with parents, the two transitions tend to balance each other in the 2006-11 period.

For females, the broad pattern of behaviour between 2006 and 2011 is much the same as for males but the drop in the probability of leaving the parents' home to live as a couple is much larger than the rise in the probability of leaving the parents' home to live in another arrangement (Figures A2.3 and A2.4). This means that the overall probability of staying at home with parents rose.

Overall, young people of this age tended to live in larger households as might be expected given the fact that housing affordability was generally low in the 2006-11 period.

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[2] Note that the net transition probability also includes the differential effects on the HCT category of migration and mortality. For example, in the example given in the text, if there was a net migration into a region of men who were predominantly in a couple relationship, this would tend to reduce the net transition probability of moving from living with parents to being coupled. In almost all instances because the level of migration is very low at any one age and because the HCT distribution for migrants usually does not differ greatly from the distribution existing in the population at that age, the differential effects of migration are likely to be negligible. This is more likely to be the case at high levels of geographic aggregation such as those used in this report. Also, as the differential effects of migration and mortality are not taken into account directly, it is a desirable feature of the method that these effects are 'rolled into' the net transition probabilities that we use. A major exception to the above is that in relation to transitions into non-private dwellings at old ages (nursing homes), the differential effect of mortality is non-negligible because the mortality rates of persons in nursing homes are considerably higher than the mortality rates of persons of the same age who are not in a nursing home.

Figure A2.1 Net transition probabilities: Living with Parents to Coupled, Males aged 15-24

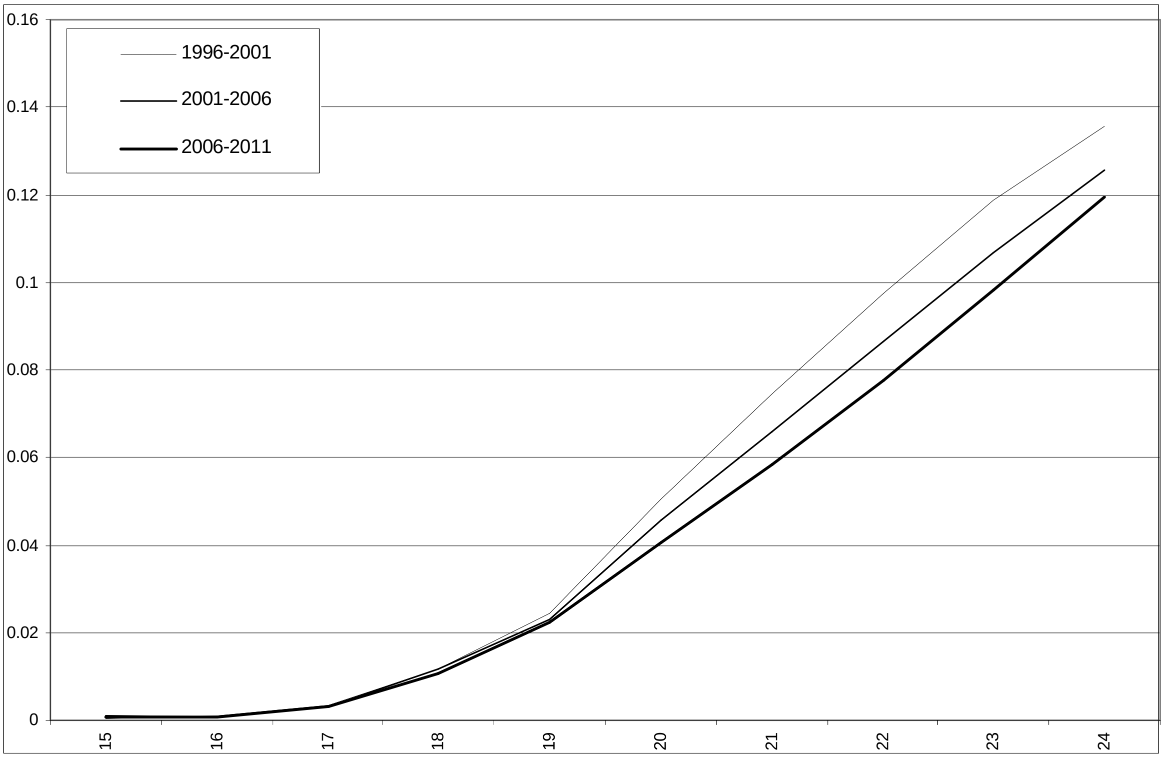


Figure A2.2 Net transition probabilities: Living with Parents to Other (not coupled), Males aged 15-24

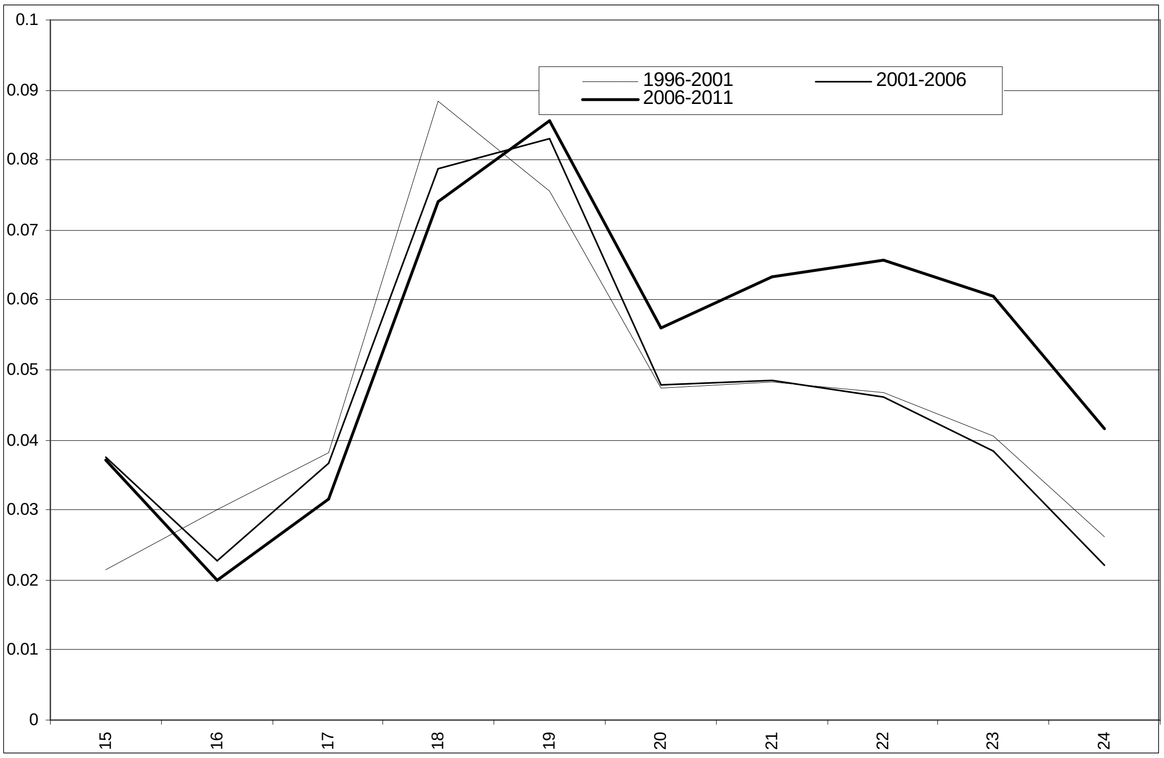


Figure A2.3 Net transition probabilities: Living with Parents to Coupled, Females aged 15-24

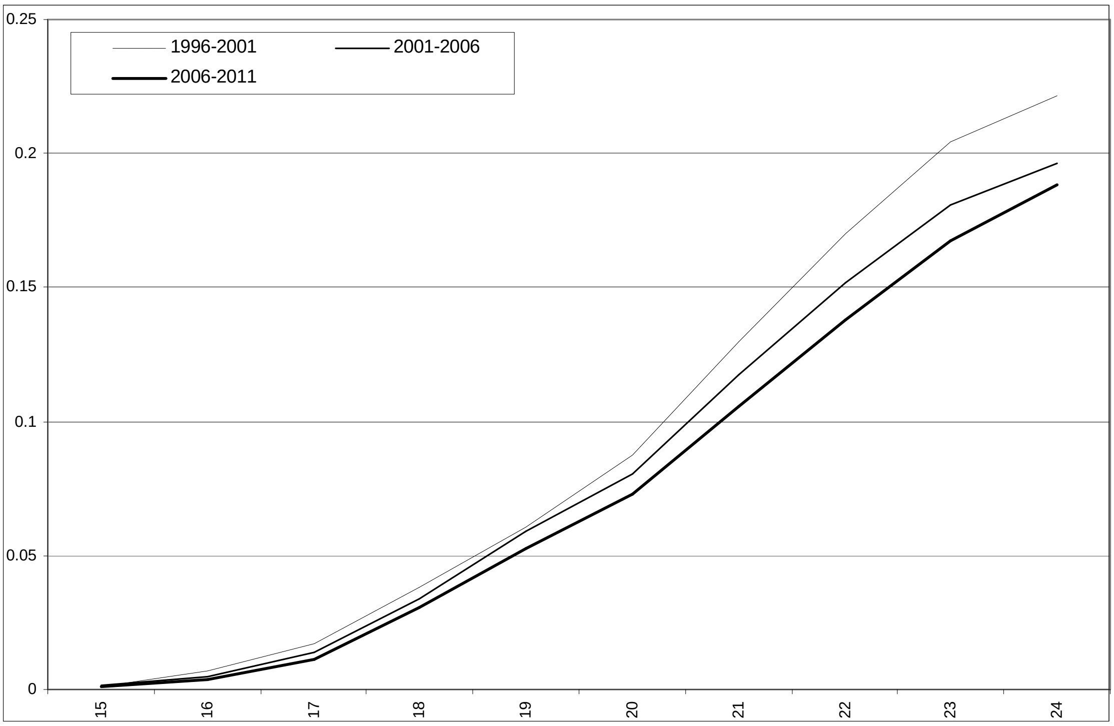
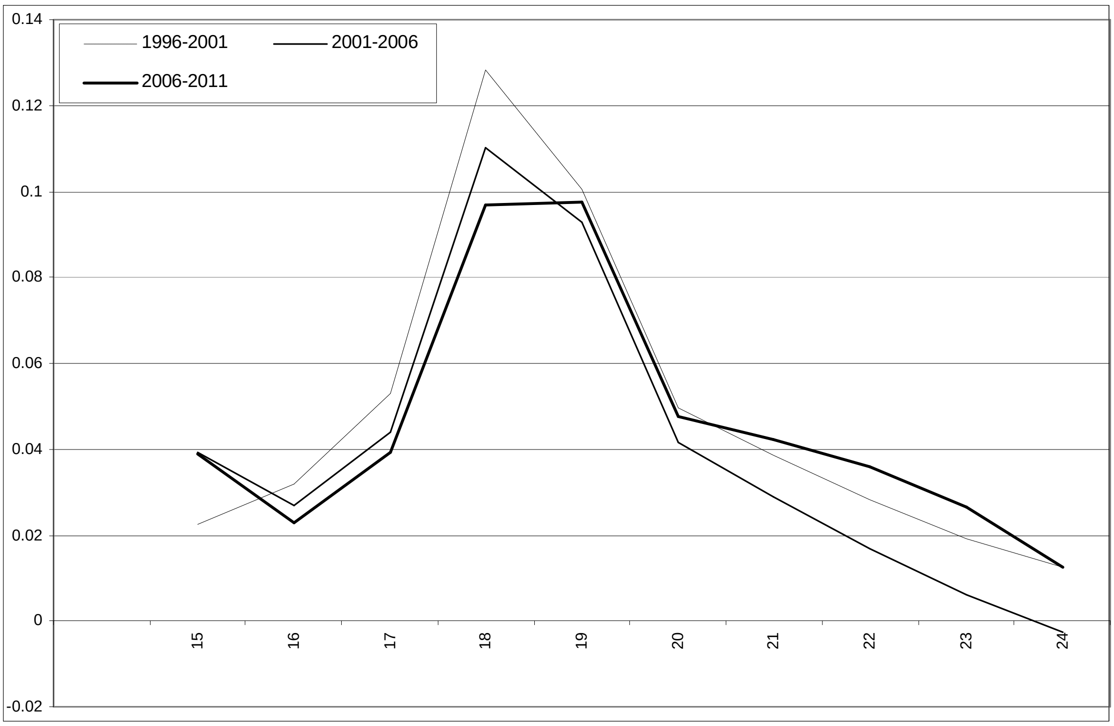


Figure A2.4 Net transition probabilities: Living with Parents to Other (not coupled), Females aged 15-24



Transitions at Ages 25-34

The main transitions at these ages are from living with parents to living in a couple relationship and from other living arrangements (living alone, in a group household) to living as a couple (Figures A2.5 and A2.6). For men at these ages, the probability of moving out of the parents' house to living as a couple has been rising across the last three intercensal periods with the highest probabilities applying between 2006 and 2011. Moving from another household type to coupled, however, has fluctuated across the three periods, being highest in the 2001-06 period but the level of the probabilities of this movement are much lower than those for moving out of the parents' home into a couple relationship. Thus, the overall movement tended to favour the formation of couple relationships in this age group of males between 2006 and 2011.

For females, there is very little change in the transition probabilities from living with parents to being coupled across the three intercensal periods and no change at all across the two most recent periods (Figures A2.7 and A2.8). However, in sharp contrast, the probabilities of women in these ages moving out of other living arrangements (living alone or in a group household) to being coupled have risen very substantially across the three periods and being highest in the 2006-11 period. Like males, the transitions together point a higher level of couple formation at these ages in the 2006-11 period.

Transitions at Ages 35-59

At these ages, there is only one major net transition, from being coupled to being not coupled, or vice versa (Figure A2.9). At the younger end of this age range (from 35 to the early 40s) for males, the transitions are negative meaning more people are coupling than uncoupling. Beyond this early age range, the reverse is true with more people uncoupling than coupling. It seems that the rates of uncoupling for men at these ages fell fairly considerably between the 1996-2001 period and the 2001-2006 period but there has been a rise in uncoupling in the 2006-2011 period. From age 46 onwards, the rates of uncoupling were slightly higher in the 2006-11 period than they had been in the 1996-2001 period. While falling rates of remarriage have an equivalent effect on this measure as rising rates of relationship breakdown, the latter is the more likely factor involved.

Similar conclusions apply to the transitions between being coupled and not being coupled for women in the 35-59 age group (Figure A2.10) with rates of uncoupling falling sharply between 1996-2001 and 2001-2006 but then rising again in the 2006-11 period.

For both males and females, the transition probabilities in this age range are very small so the movements up and down as just described have very little impact upon the projections.

Figure A2.5. Net transition probabilities: Living with Parents to Coupled, Males, 25-34

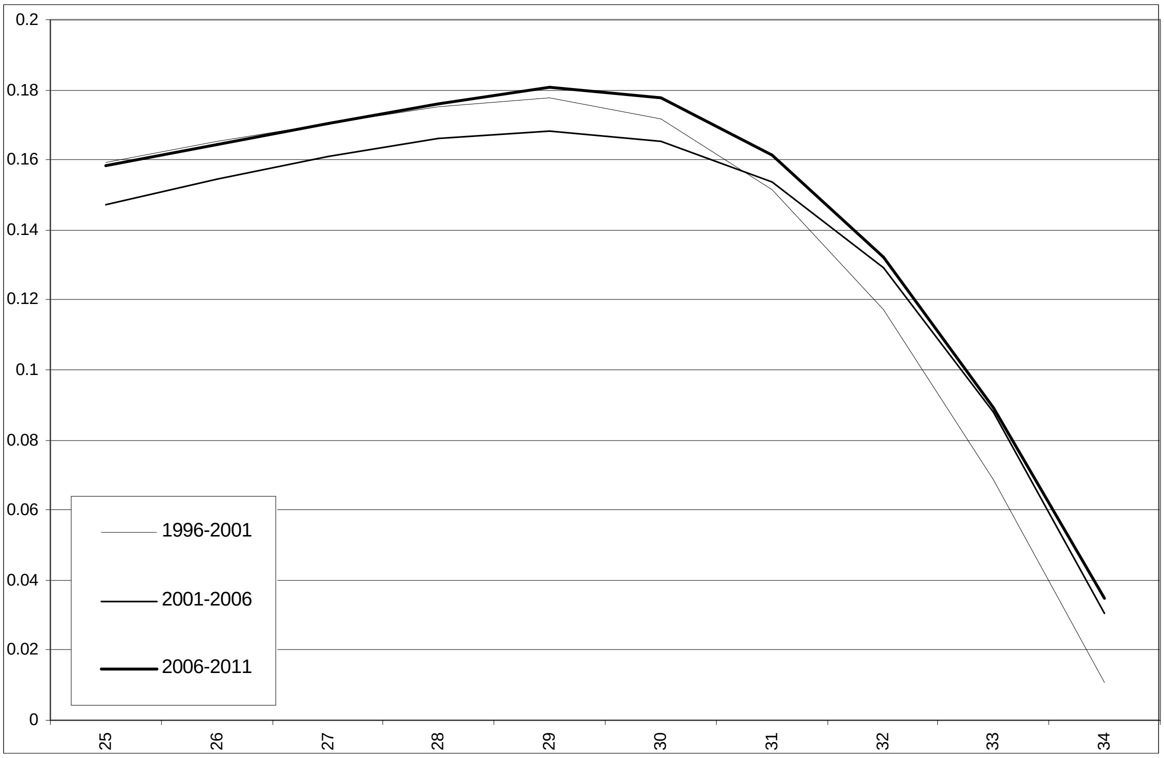


Figure A2.6. Living in Other HCT (not coupled, not with parents) to Coupled, Males, 25-34

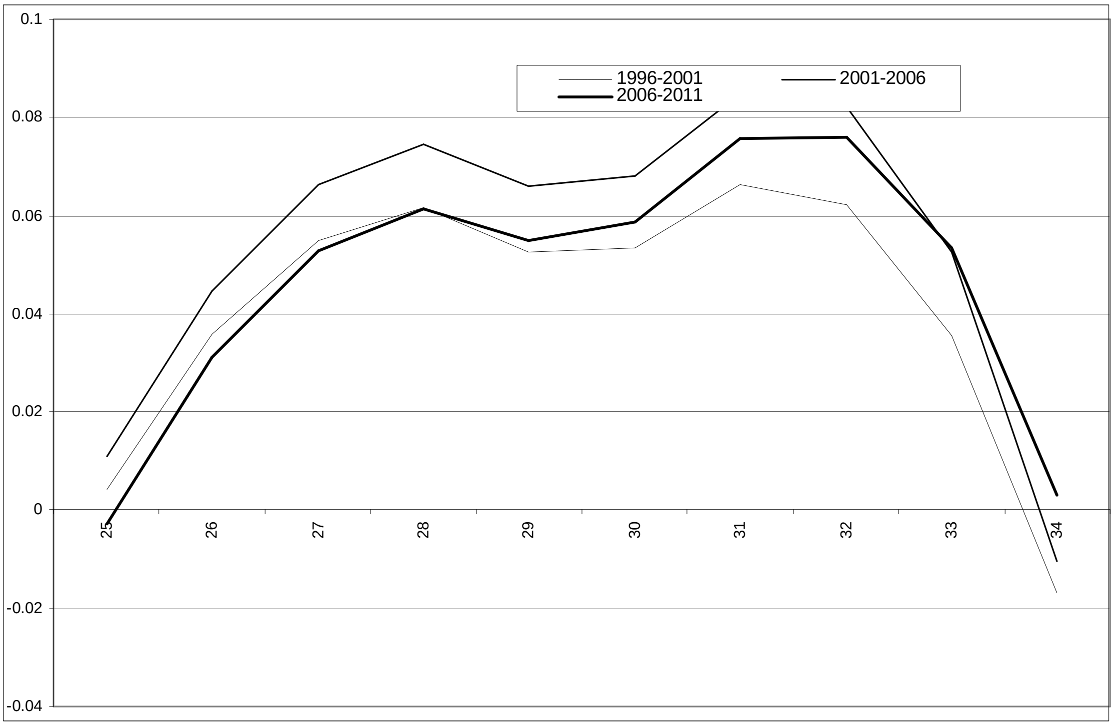


Figure A2.7. Net Transition Probabilities: Living with Parents to Coupled, Females, 25-34

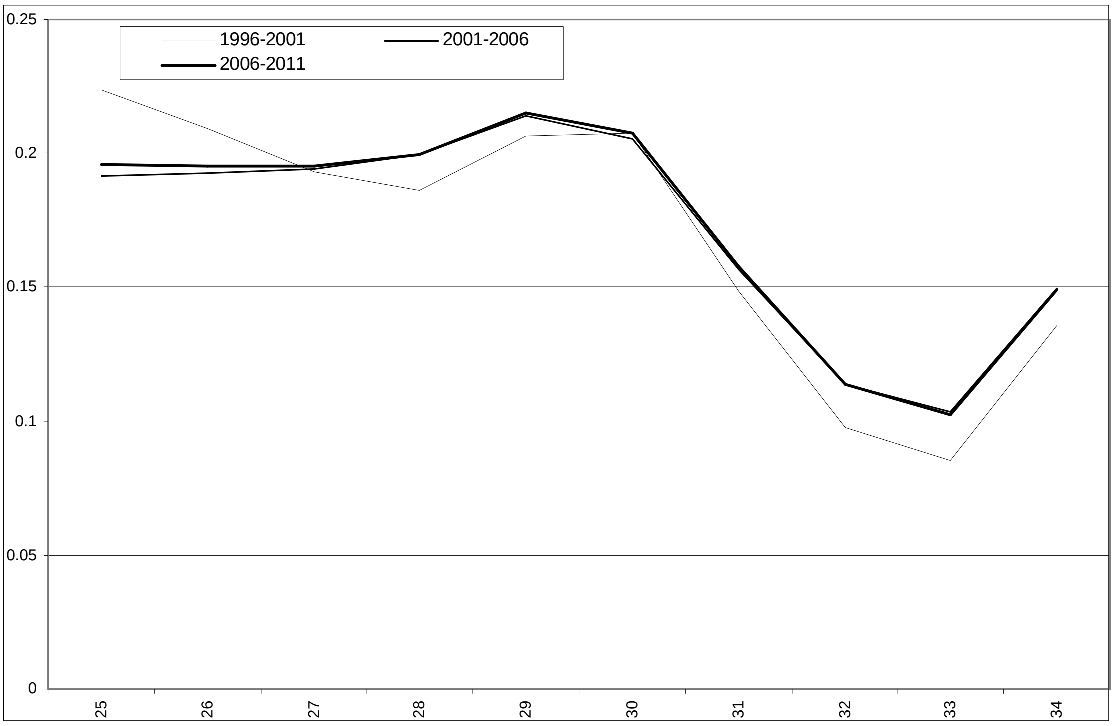


Figure A2.8 Net Transition Probabilities: Living with Parents to Other (not coupled), Females, 25-34

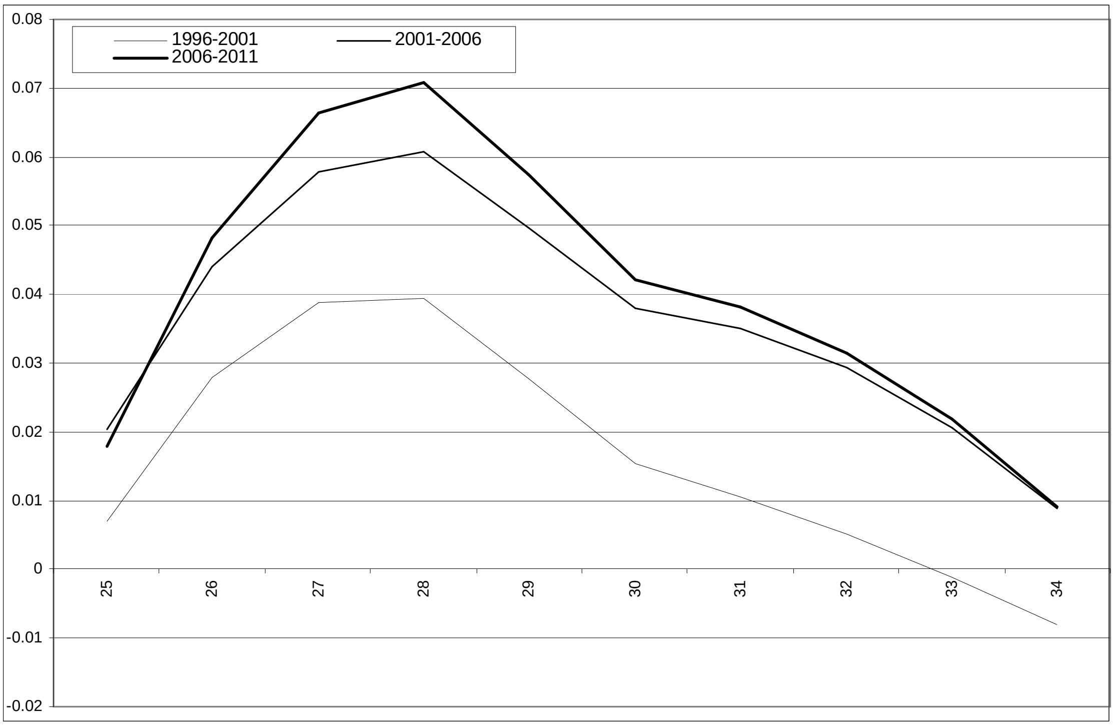


Figure A2.9. Net Transition Probabilities: Coupled to Not Coupled, Males, Ages 35-59

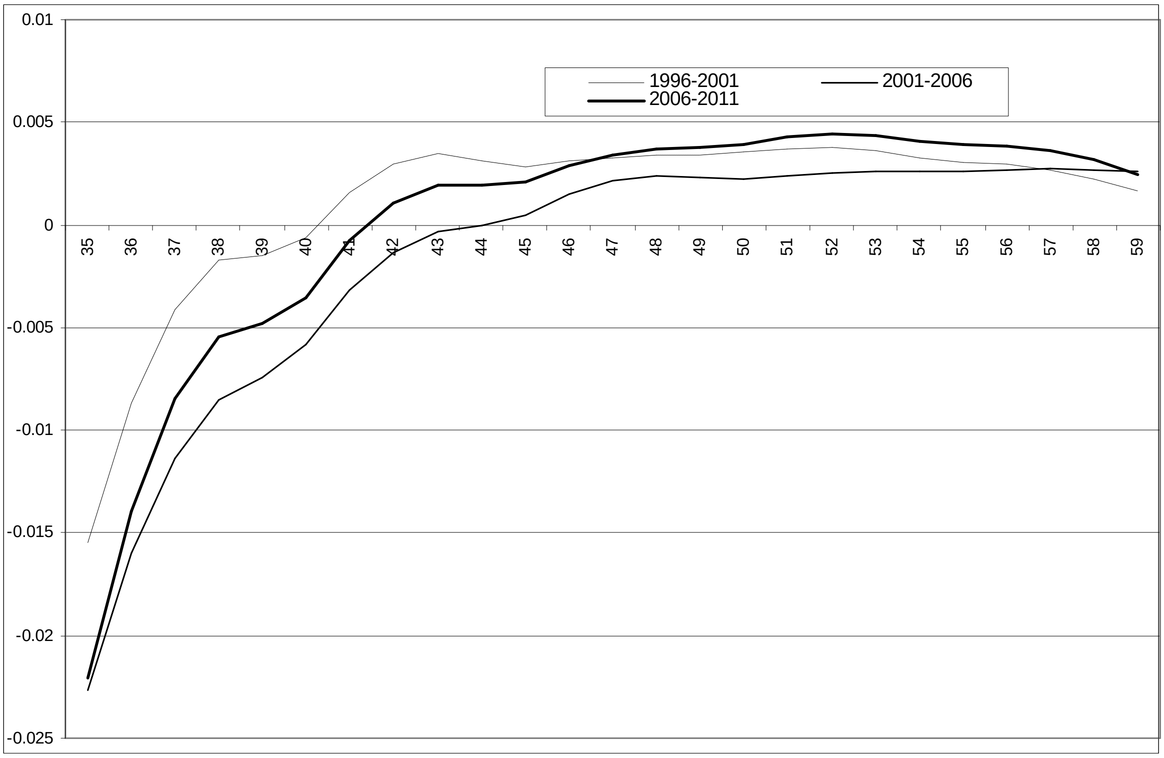
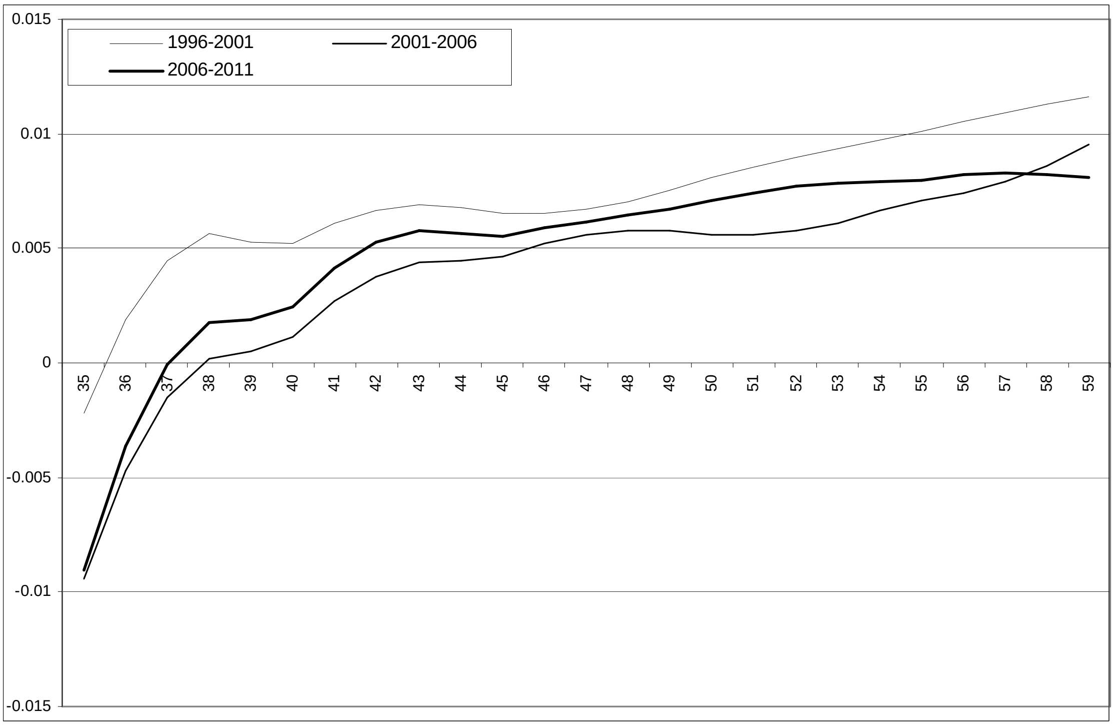


Figure A2.10. Net Transition Probabilities: Coupled to Not Coupled, Females, Ages 35-59



Transitions at Ages 60-84 (males) and 60-79 (females)

At these ages, there are two main (net) transitions from being coupled to living in other household types (primarily living alone but also some who are living with their children) and from being coupled to moving into a non-private dwelling (nursing home).

For both transitions, the probabilities are very low for males until they reach the mid-seventies (Tables A2.11 and A2.12). Both transitions then rise sharply. The transition from being coupled to living in another household type has fallen across the three time periods reflecting improvement in survival of the wives of older men. By the 2006-11 period, the probabilities of this transition had become very small being under 0.01 (a one in a hundred chance) up to the early eighties.

The probabilities of men in this age range moving into a nursing home from a couple relationship are also relatively low across most of the age range (until the mid-seventies). The rates then rise to about 0.015 by age 84. The changes over time in this transition probability are negligible for males.

For women, the transition probabilities from being coupled to living in another household type are much higher in these ages than for males because of higher male mortality (Figure A2.13). However, as male mortality has been falling across time, these transition probabilities have also fallen across time especially between the 1996-2001 period and the 2001-06 period.

The probability of women moving from a couple relationship into a nursing home is very low until they reach their mid-seventies (Figure A2.14). The probability then increases. In the late seventies, the probability of women moving into a nursing home from a couple relationship fell significantly between the 2001-06 period and the 2006-11 period.

As the baby-boom generation moves into this age range, the two household types that are associated with this age range, couples with no co-resident children (empty-nesters) and people living alone will rise. The changing trend in this age range is for couples to survive together longer before one dies or moves into a nursing home. This is an important factor in the growth of households consisting of couple families without children.

Figure A2.11. Net Transition Probabilities: Coupled to Other Household Types, Males, Ages 60-84

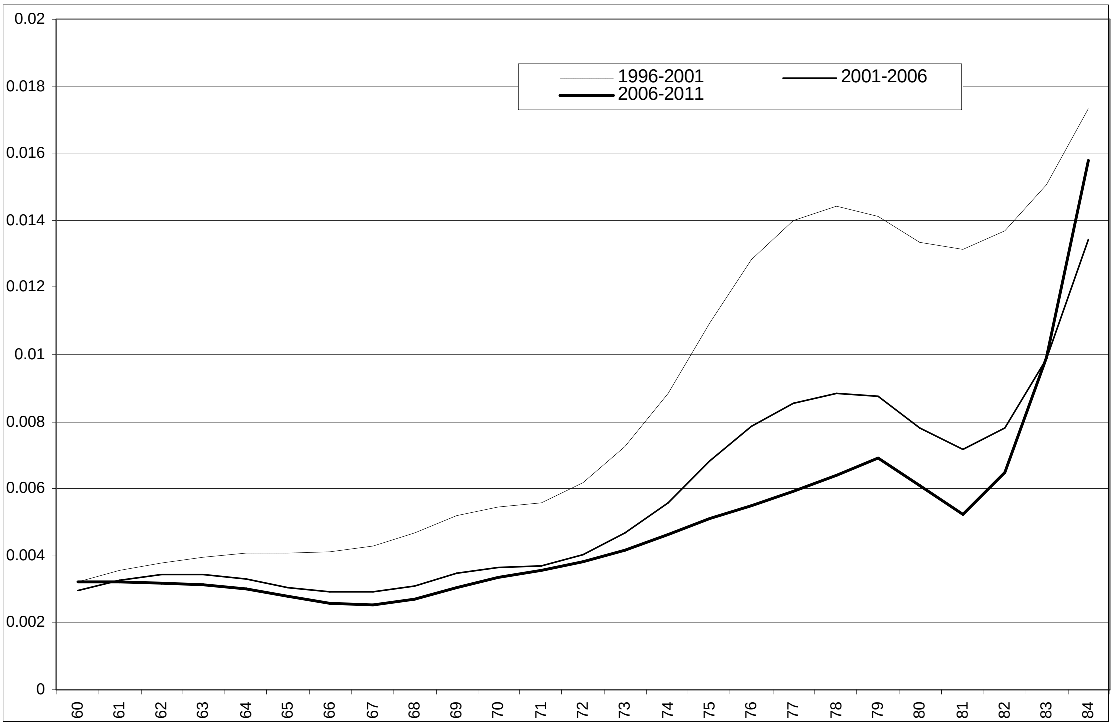


Figure A2.12. Net Transition Probabilities: Coupled to Non-Private Dwelling, Males, Ages 60-84

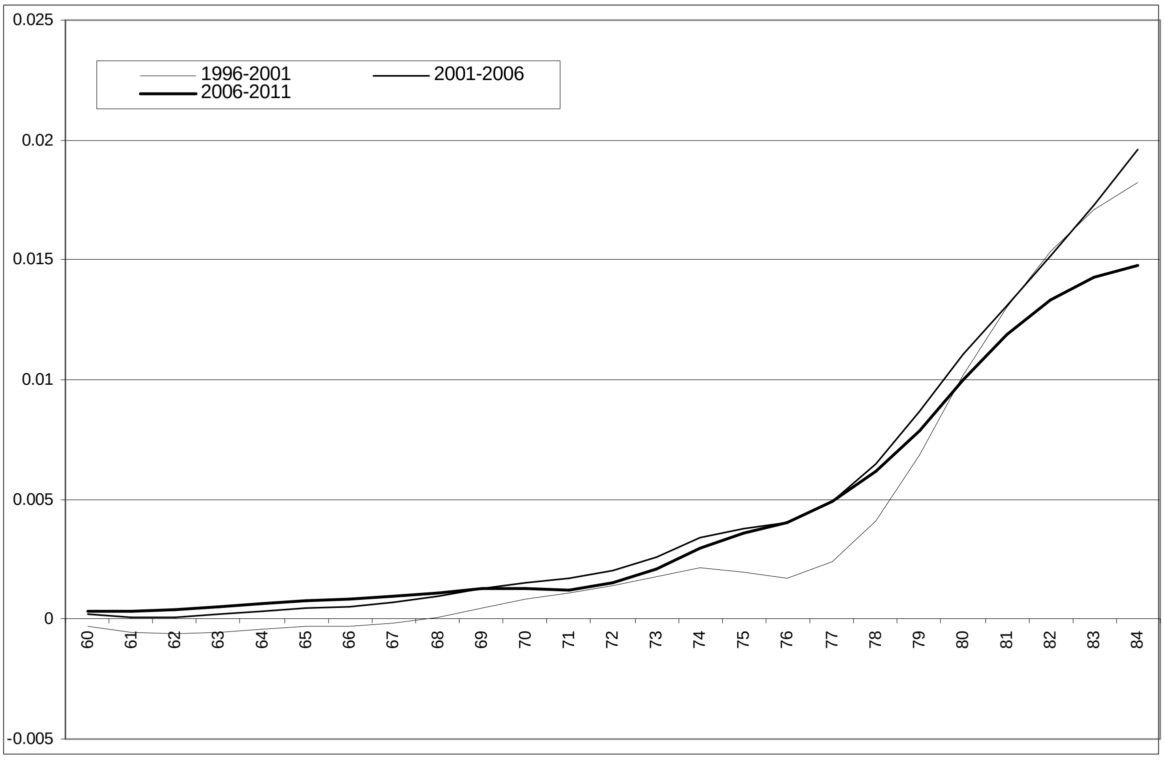


Figure A2.13. Net Transition Probabilities: Coupled to Other Household Types, Females, Ages 60-79

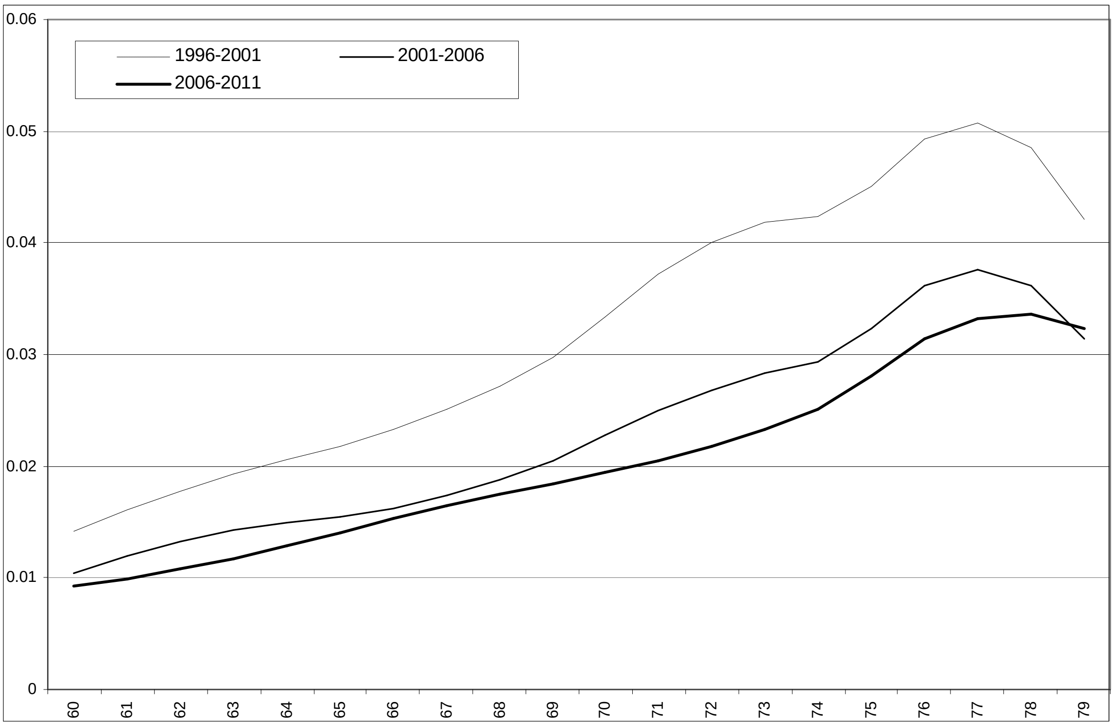
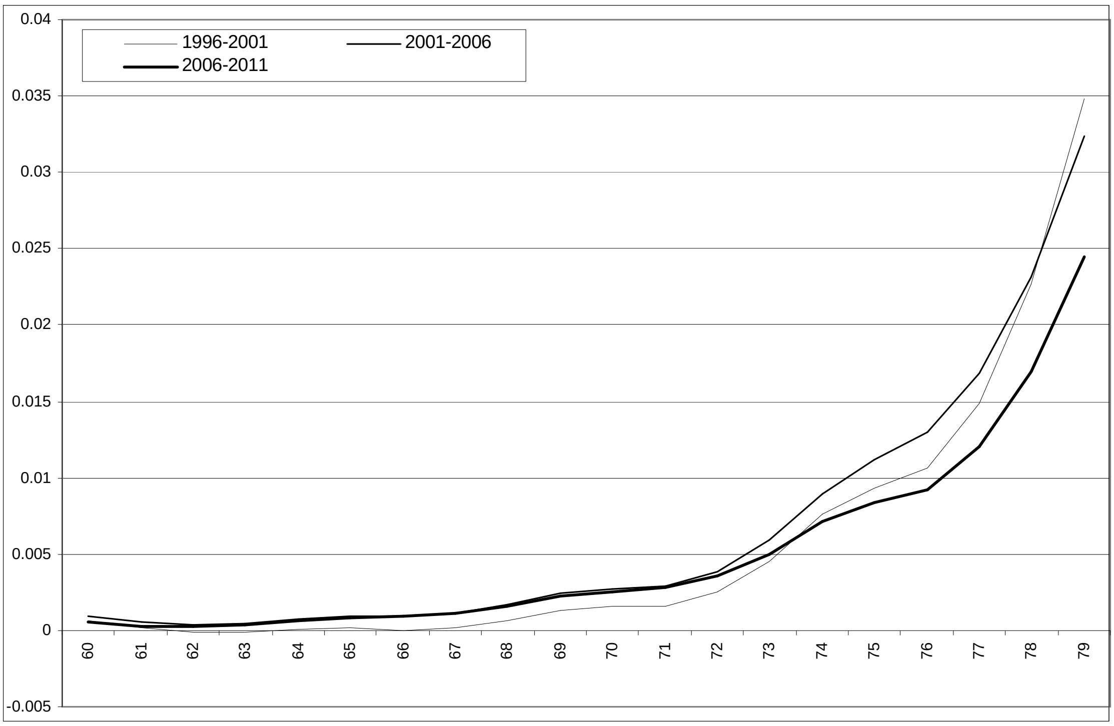


Figure A2.14. Net Transition Probabilities: Coupled to Non-Private Dwelling, Females, Ages 60-79



Transitions at Old Ages, Males 85+ and Females 80+

For these age ranges, beyond the mid 90s, additional smoothing is undertaken to ensure that the projections do not generate negative numbers. For many subnational regions, the national level transitions are applied for several transitions due to high variability in the measures parameters.

From age 85 onwards, the probability of moving from a coupled relationship into a nursing home is high for males, rising from about four per cent at age 85 to close to 15 per cent by age 99 (Figure A2.15). Ignoring the odd results obtained for the 1996-01 period, this probability tended to increase above age 90 between the 2001-06 period and the 2006-11 period.

The transition probabilities for men aged 85 and over moving from an Other Household Type (mainly living alone or with children) were mainly negative (Figure A2.16). This is not caused by men moving out of nursing homes into Other Household Types but by the much higher mortality of those living in a nursing home (see Footnote 1). Across time, the age patterns of probabilities for this transition are quite unstable. This is the only example of instability of the age pattern among all of the transitions discussed here. The reasons for this instability are also unclear.

The transition probabilities of moving from a coupled relationship into a nursing home are also high for women aged 80 and over, rising from about seven per cent at age 80 to 17 per cent at age 94 (Figure A2.17). Beyond age 94, the probabilities for this transition fall, the explanation being the higher mortality of those in nursing homes (see Footnote 1). As was the case for men, the probabilities of this transition were higher above age 90 in the 2006-2011 period than was the case in the 2001-06 period. Again, the explanation could be higher survival rates in nursing homes.

For women shifting from Other Household Types into nursing homes, the age pattern is quite different for the same transition for males (Figure A2.18). The probabilities are generally not negative and rise continually with age. There is very little difference between the probabilities in the 2001-06 and 2006-11 periods.

Table A2.15. Net Transition Probabilities, Coupled to Non-Private Dwelling, Males Aged 85+

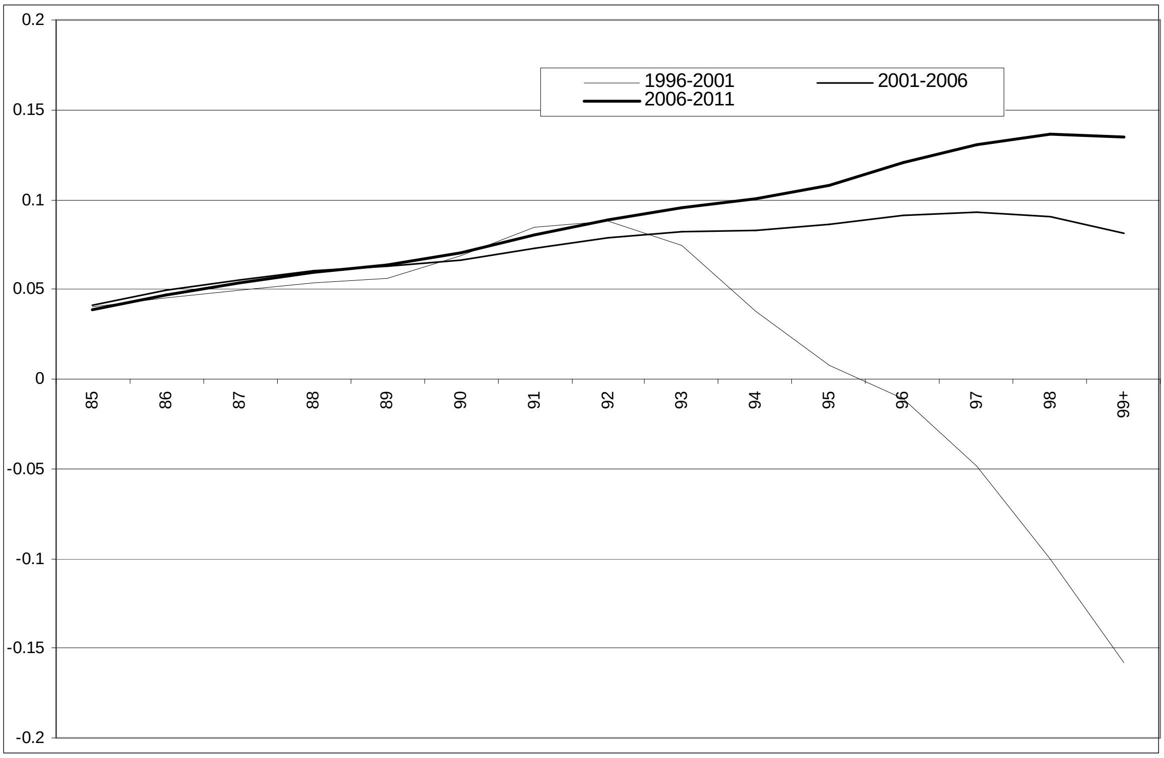


Figure A2.16. Net Transition Probabilities, Other Household Type (not coupled) to Non-Private Dwelling, Males Aged 85+

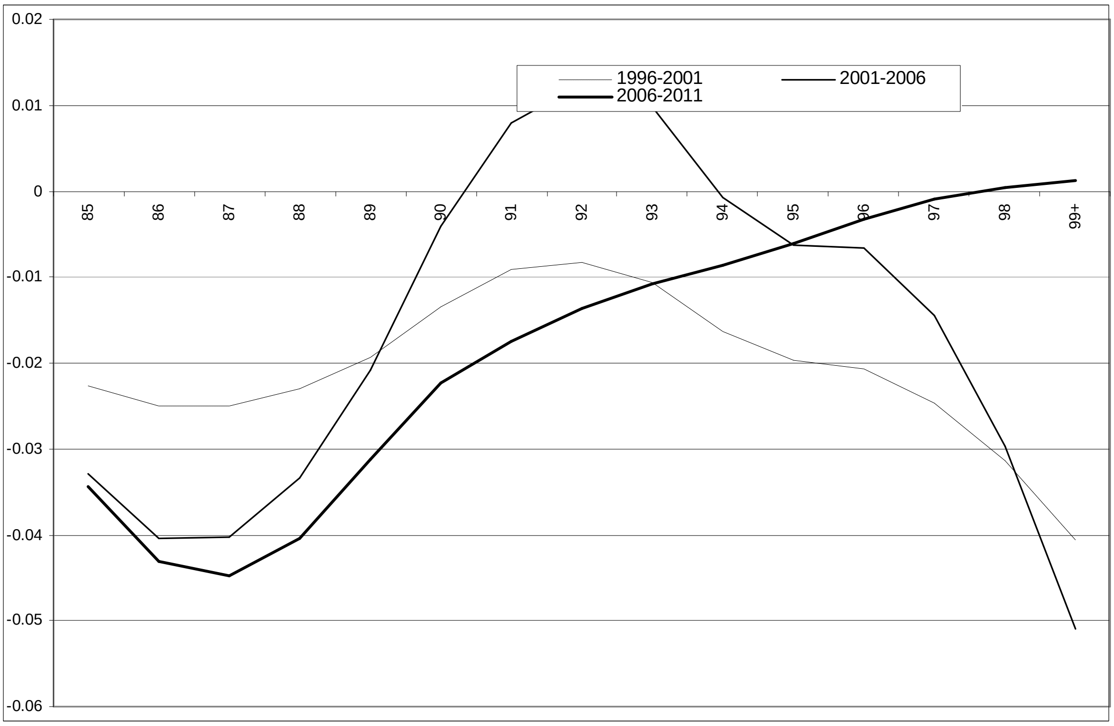


Figure A2.17. Net Transition Probabilities, Coupled to Non-Private Dwelling, Females Aged 80+

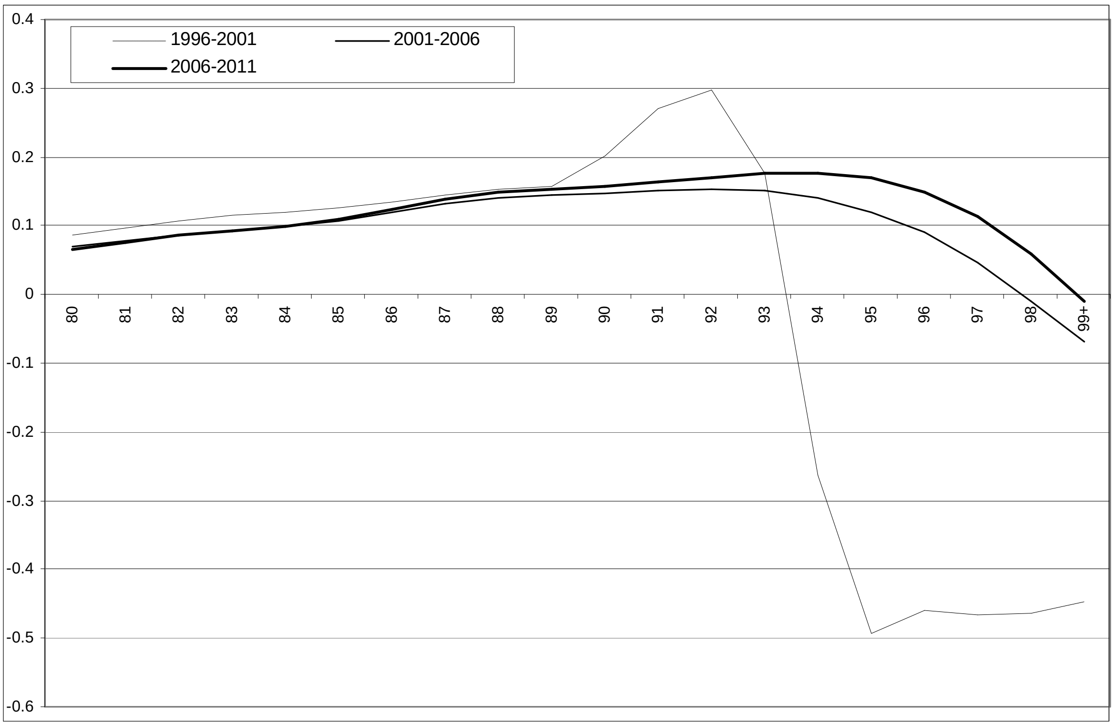
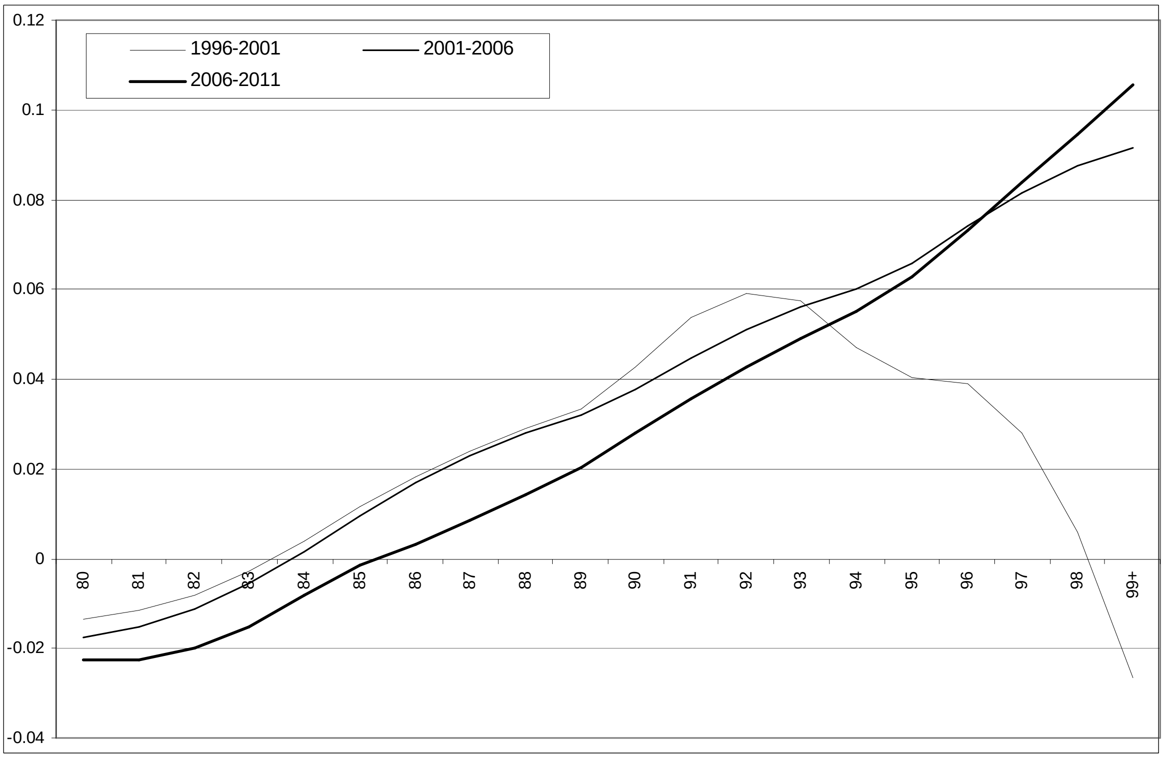


Figure A2.18. Net Transition Probabilities, Other Household Type (not coupled) to Non-Private Dwelling, Females Aged 80+



Appendix 3.

Updated Migration Estimates for the NHSC Projections: Technical Note

Previous projections for the NHSC have used forward survival techniques to estimate net migration ratios which are scaled to produce alternative population and housing futures based on 21 NOM assumptions. These standard methods require two estimated resident populations in addition to survival probabilities for the intervening period. Using these estimates, it is possible to measure the level of net migration over a historical period.

Due to recent changed to the measurement of ERP, we have adjusted our methodology to incorporate projected migration ratios based only on the jump of year ERP combined with assumptions about future Net Internal Migration (NIM) arrivals and departures, as well as assumptions about future Net Overseas Migration (NOM) arrivals and departures.

This has been necessary as following the 2011 Census, the ABS has made major changes to the measurement of ERP. As a result of this change, an intercensal error for the period of 294,000 persons was identified. As this error, historically, is very large, the ABS is in the process of recalculating and reissuing 20 prior years of ERP to be consistent with the new method of calculating ERP. These data were not available at the time of producing the projections and will be released later in 2013 (see ABS, 2013 for further information). The adopted methodology only uses the 2011 ERP as a means to calculating an adjusted migration ratio to meet an externally defined ANM target – built from detailed assumptions regarding single year of age and sex NIM and NOM arrivals and departures across the different regions in the projection.

NIM Departures at each age:

$$NIMi = NIMPi \times \sum_{i=0}^{100} NIM$$

Where NIM (NIMi) and age-sex profiles (NIMi) are imputed weighted updated estimates from the ABS Experimental Interregional Migration Series (ABS, 2012)

NOM Departures at each age:

$$NOMDi = NOMDPi \times \sum_{i=0}^{100} NOMD$$

Where NOM Departures for each regions are based on a projected split of NOM departures and arrivals estimated from recent data.

NOM Arrivals at each age:

$$NOMAi = NOMDAi \times \sum_{i=0}^{100} NOMA$$

ANM at each age:

$$ANMi = (NIMi) + (NOMAi - NOMDi)$$

With projections of ANM by single year of age and sex for the full period, unadjusted migration ratios readily be calculated as follows:
Unadjusted Migration Ratio:

$$MR_{i,i+1}^{u} = \frac{(Pop_i^t \times SR_i) + ANMi}{(Pop_i^t \times SR_i)}$$

To adjust for rounding, randomisation and lifetable errors, we calculate age-sex specific adjusted migration ratios as follows:

$$MR_{i,i+1}^{A} = MR_{i,i+1}^{u} \times Wi$$

Where Wi is a weighting parameter estimated estimated within the model (by numerical linear search methods), to force the constraint:

$$\left(MR_{i,i+1}^{A} - 1\right) \times Popi = ANMi$$

This ensures that when aggregated across the population, the projected ANM is consistent by sex and year. That is a specific weight is estimated for each sex, year and region cell in the projection.

Reference

ABS (2012) 'Experimental Regional Internal Migration Estimates' Cat No. 34120, Australian Bureau of Statistics: Canberra.

ABS (2013) ‘Upcoming Revisions to Population Estimates’ in Regional Population Growth, 2011-12. Cat No. 3218.0. Available from: http://www.abs.gov.au/ausstats/abs@.nsf/Products/3218.0~2011-12~Main+Features~Upcoming+revisions+to+population+estimates?OpenDocument

Table A3.1. Percentage Age Distributions of NOM Arrivals, NOM Departures and Net NOM, Australia, 2011-12.

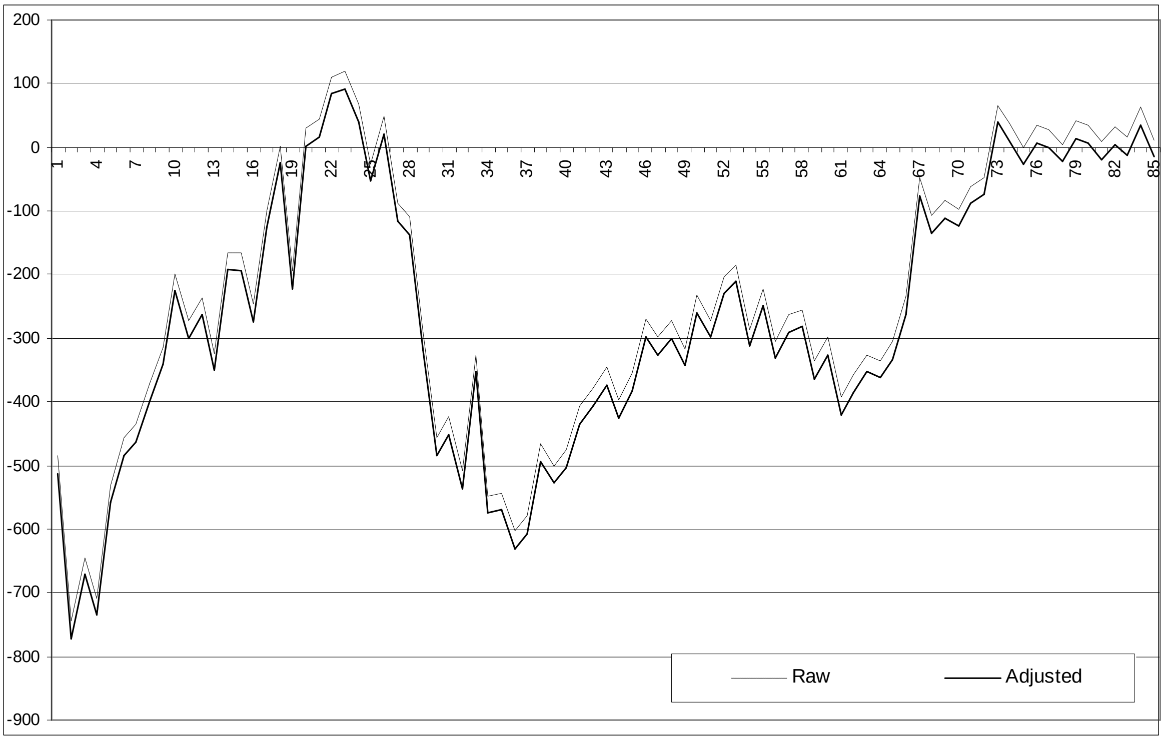
Age Group	Males		
	NOM Arrivals	NOM Departures	Net NOM
0-4	6.6	6.2	7.2
5 to 9	5.1	3.3	7.3
10 to 14	4.2	2.8	6
15-19	7.4	3.7	12.2
20-24	17.2	17.3	17.1
25-29	18.1	22.6	12.3
30-34	12.9	14	11.4
35-39	8	7.4	8.9
40-44	6.7	5.8	7.9
45-49	3.9	4.3	3.5
50-54	3.2	3.5	2.7
55-59	2.2	2.8	1.4
60-64	1.9	2.4	1.2
65+	2.6	3.8	0.9
TOTAL	100	100	100

Age Group	Females		
	NOM Arrivals	NOM Departures	Net NOM
0-4	6.5	6.2	6.9
5 to 9	4.9	3.4	6.7
10 to 14	4.2	2.9	5.7
15-19	7.9	4.1	12.4
20-24	19	18.8	19.4
25-29	19.9	22.2	17.1
30-34	12.5	13.6	11.1
35-39	7	6.7	7.4
40-44	5.5	5.2	5.7
45-49	3.2	3.9	2.4
50-54	3	3.5	2.4
55-59	2.2	3	1.4
60-64	1.8	2.5	0.9
65+	2.4	3.9	0.6
TOTAL	100	100	100

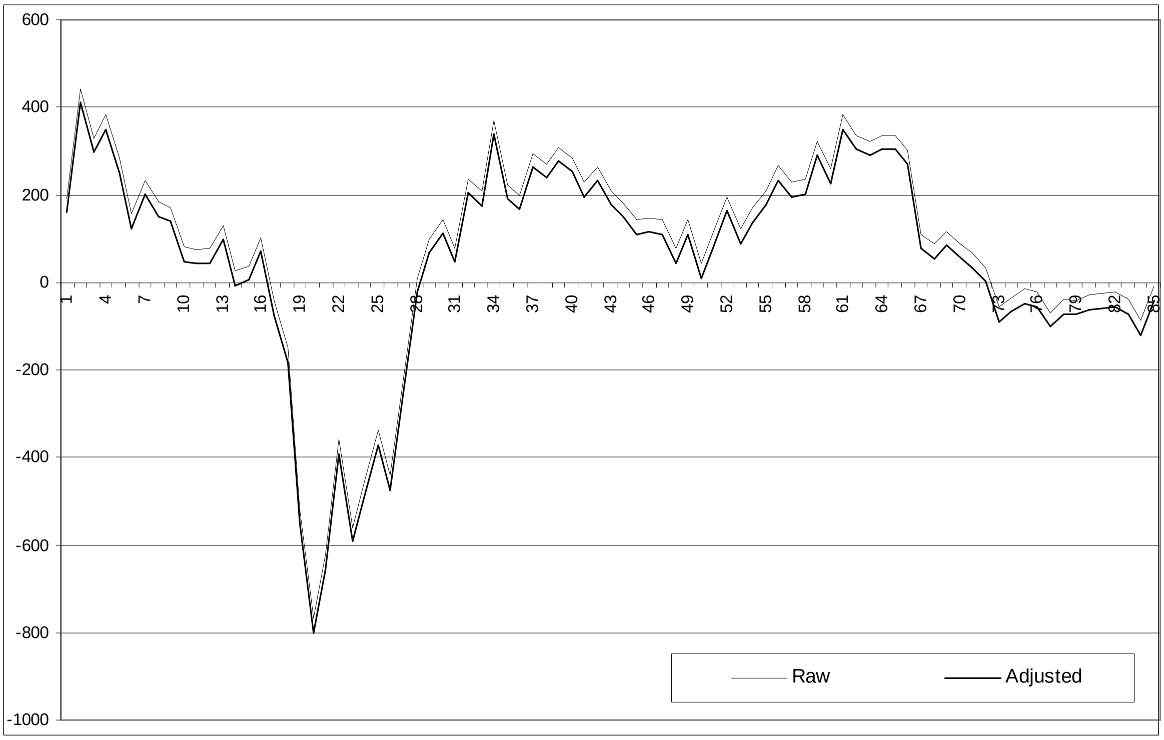
Source: ABS Migration SuperStar Table: ageXsexXstateandterritoryNOM.scs

Appendix 4.
Age distributions of net internal migration used in the projections
(Source: Author Calculation and ABS, 2012)

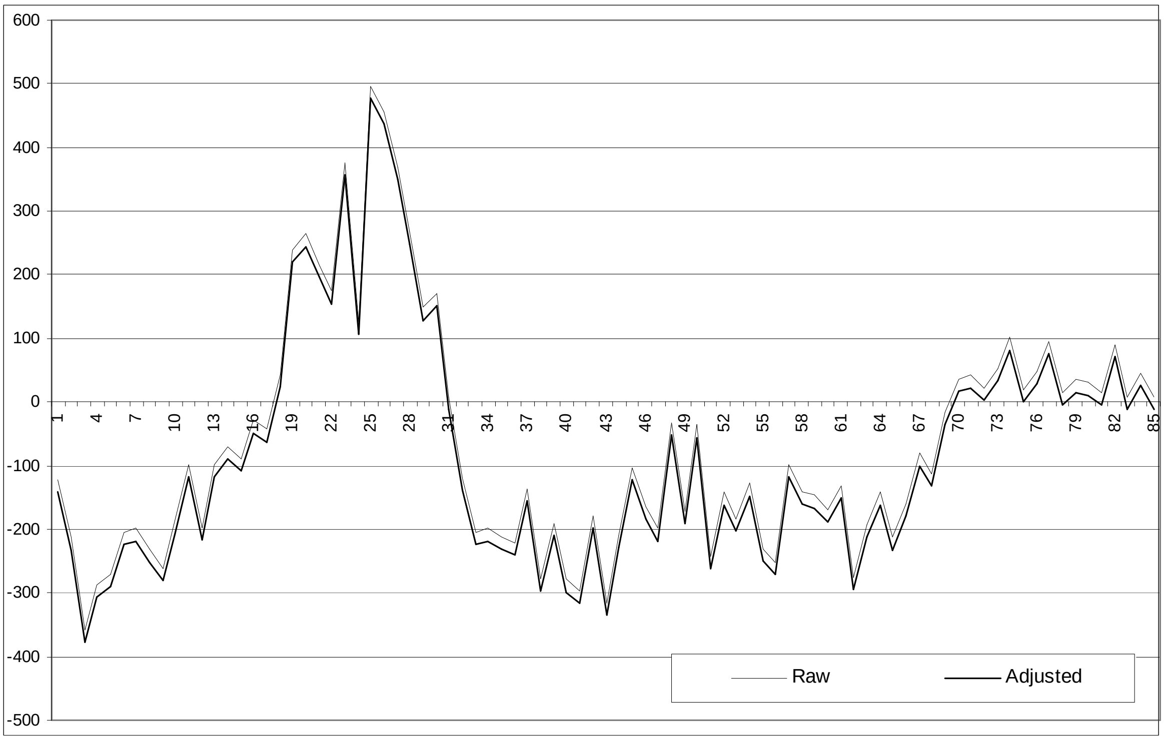
Sydney



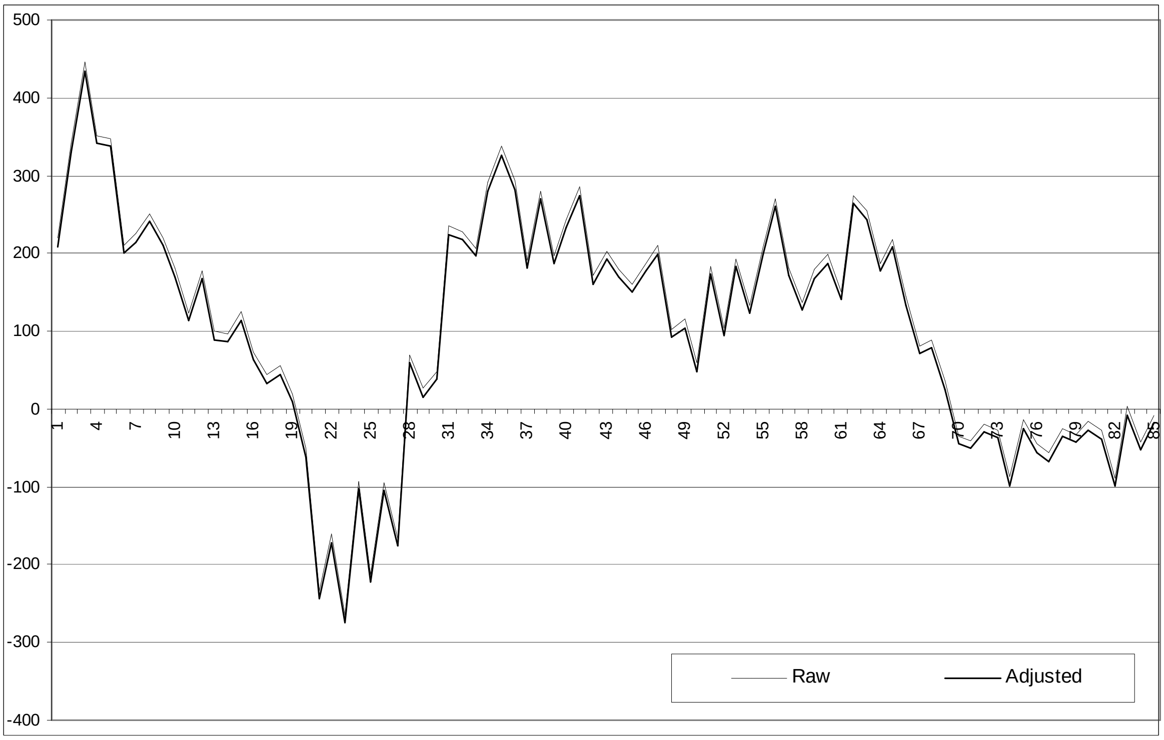
Rest of NSW



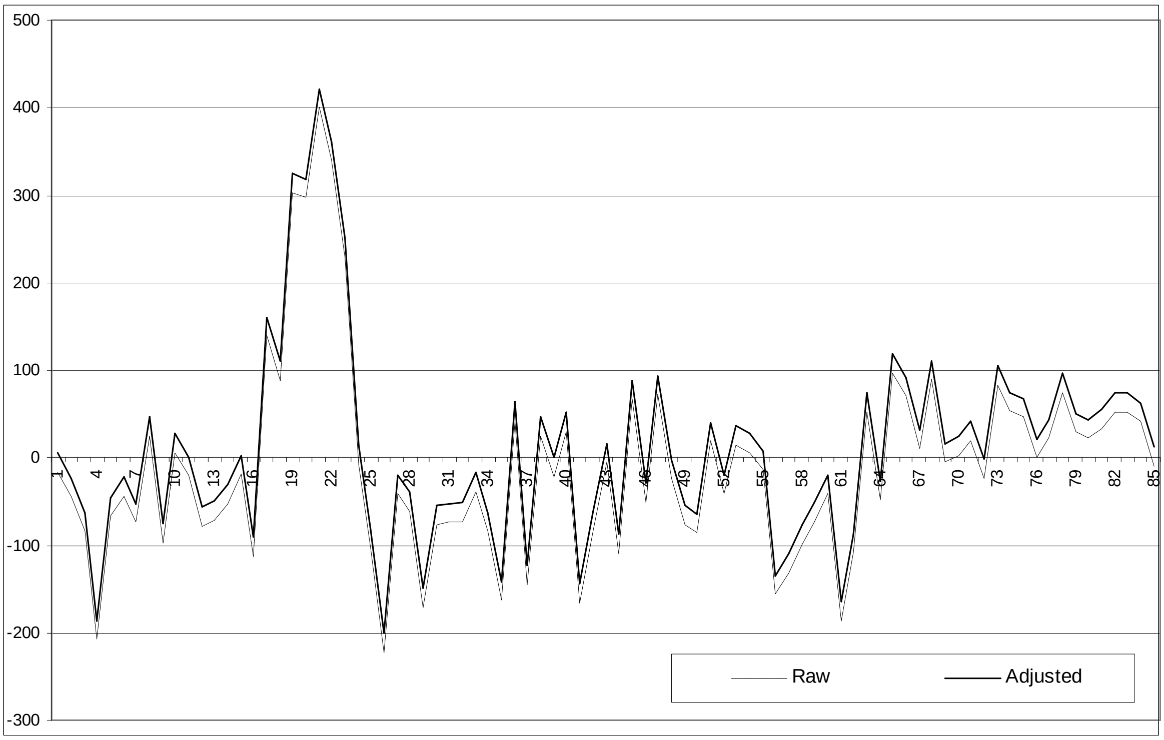
Melbourne



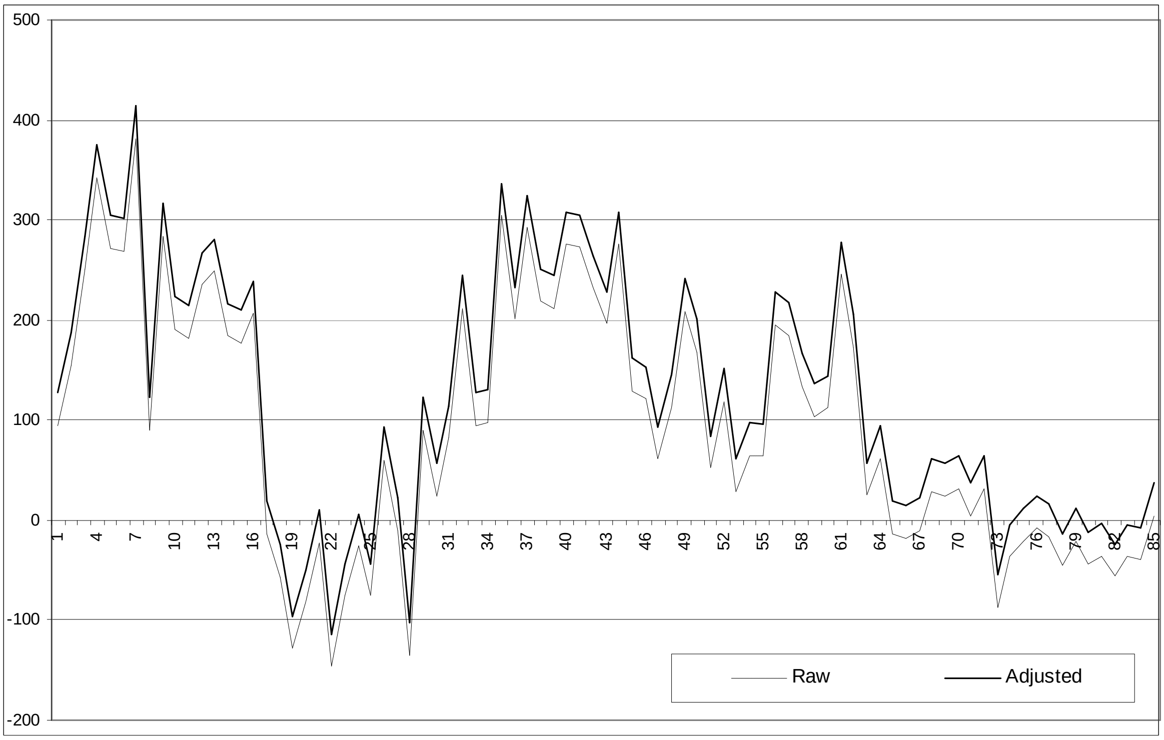
Rest of VIC



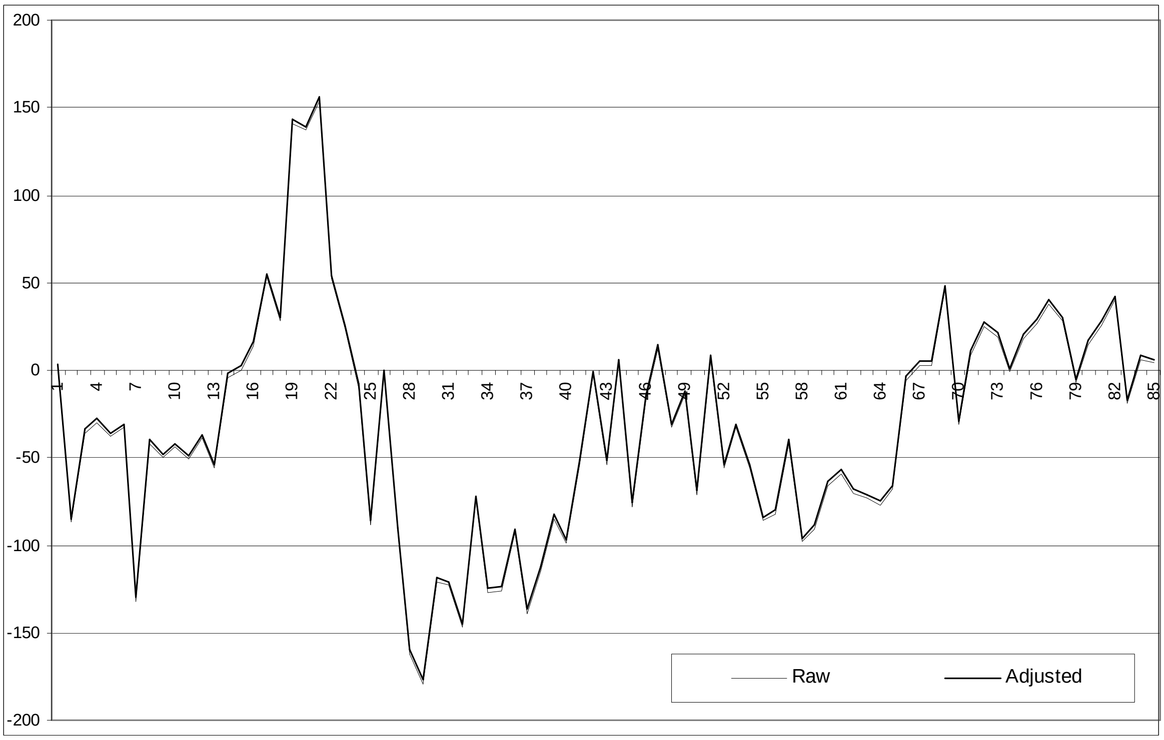
Brisbane



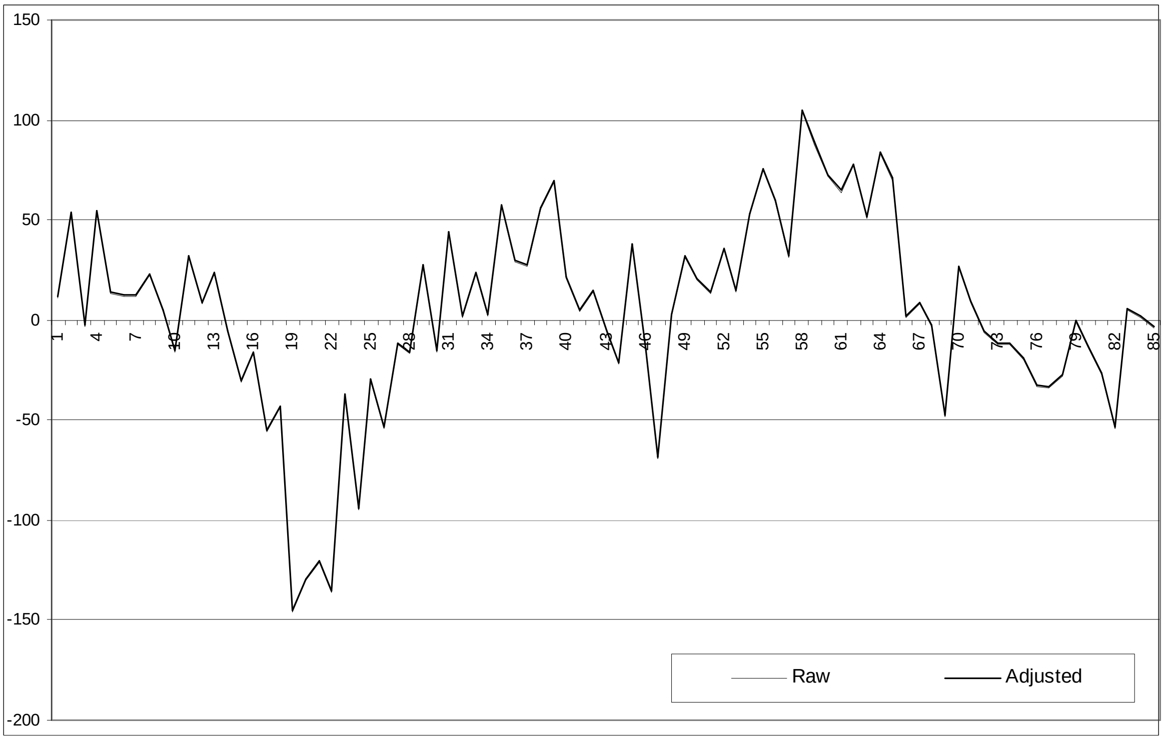
Rest of QLD



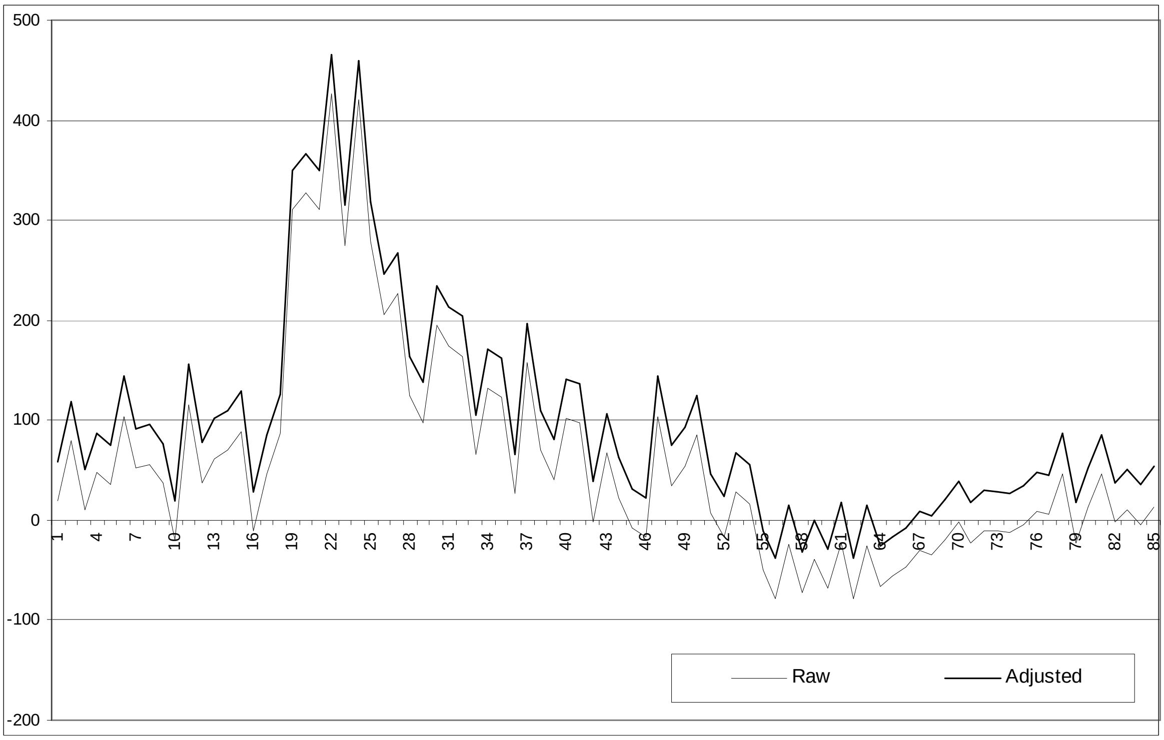
Adelaide



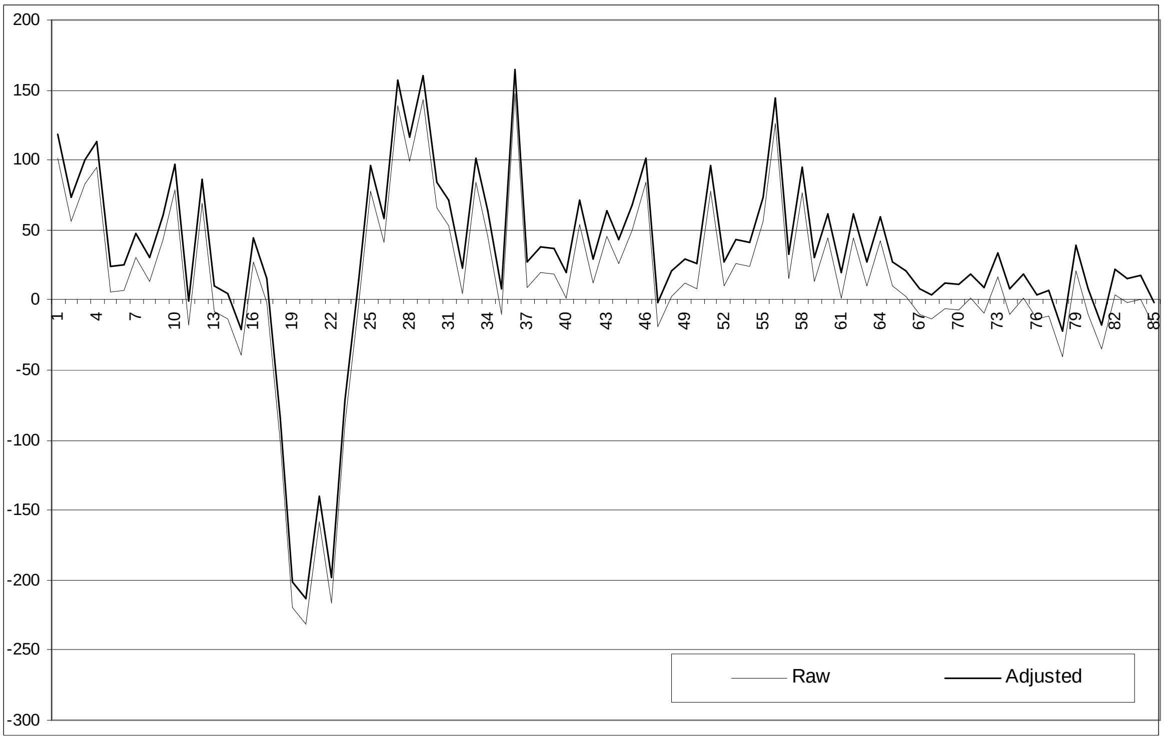
Rest of SA



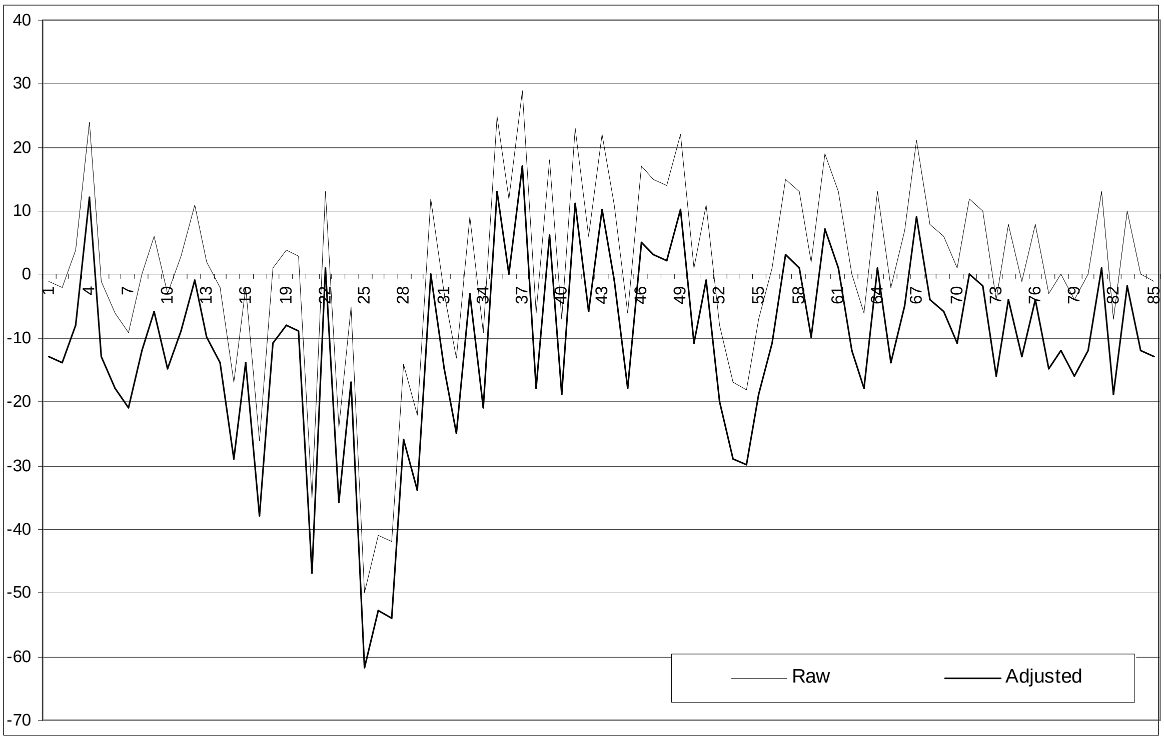
Perth



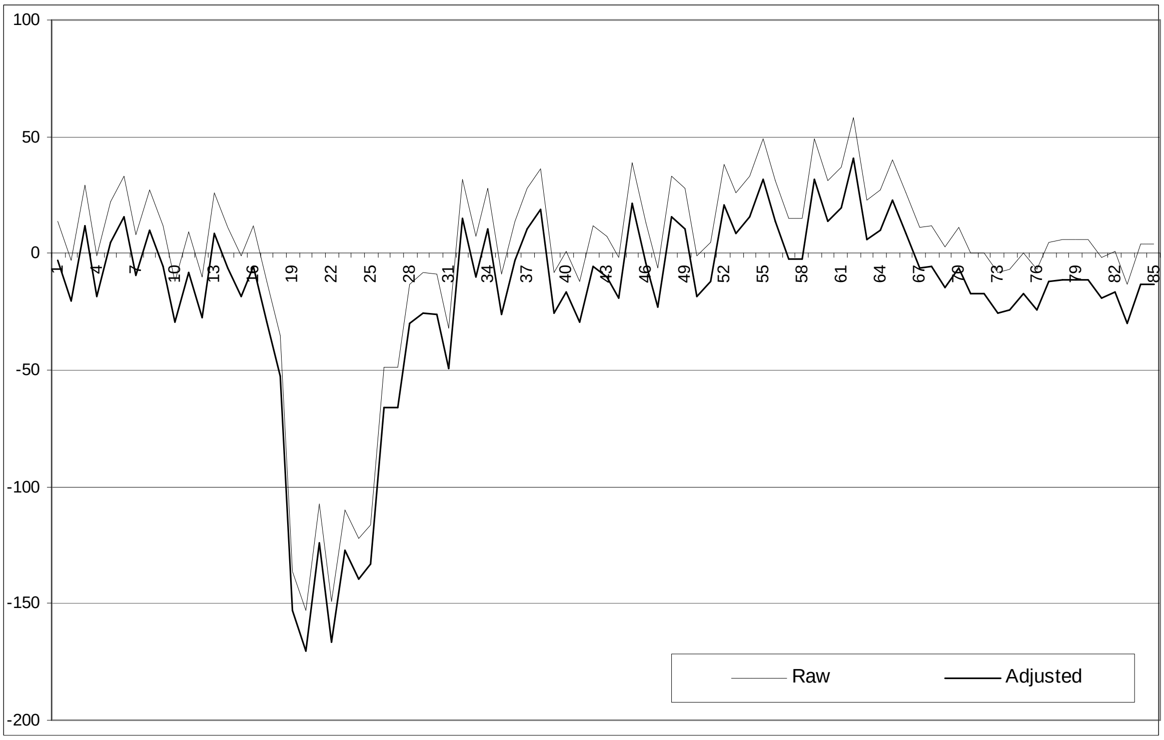
Rest of WA



Hobart



Rest of TAS



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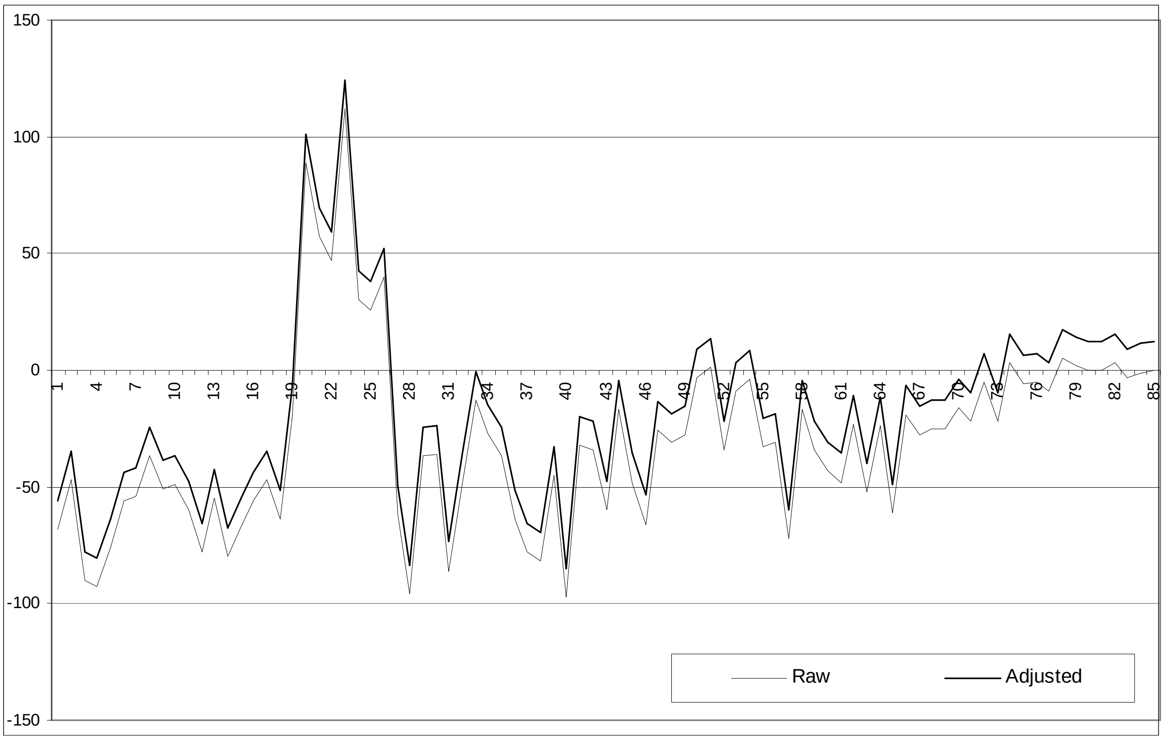

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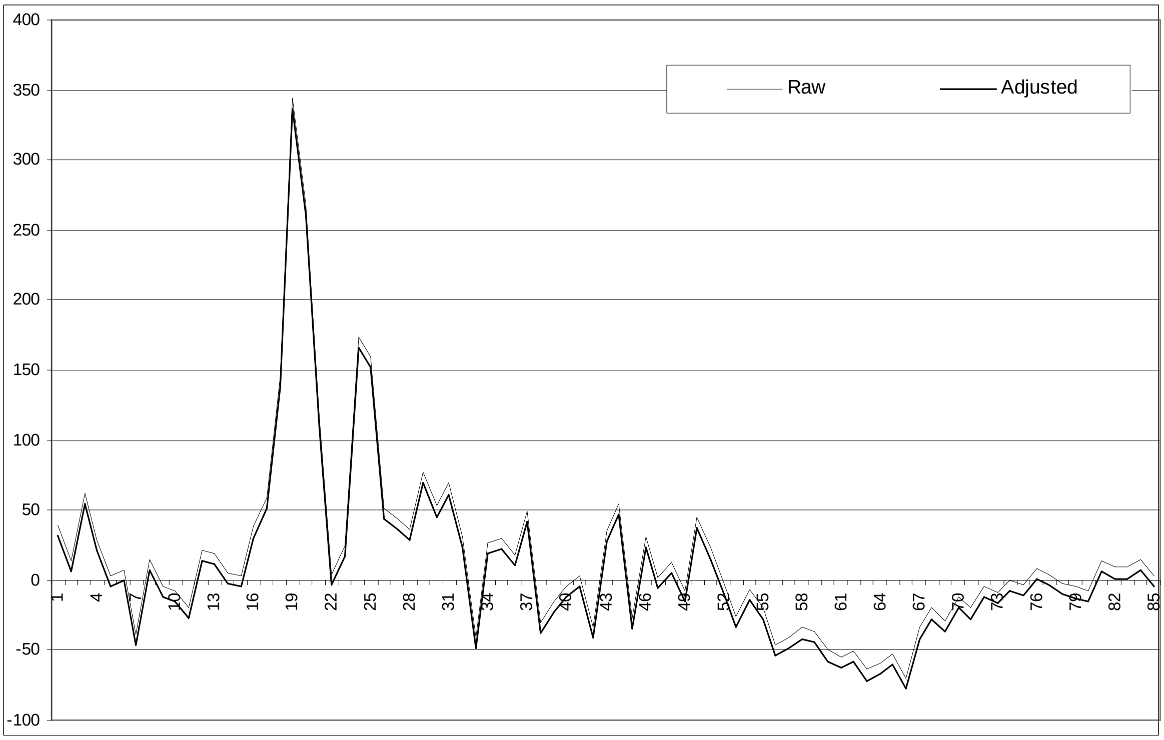

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