

# Demography and GDP per Capita: a Cross National Study

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# Ageing and GDP per Capita

- Many advanced countries today are facing rapid ageing of their populations due to the imminent retirement of their 'baby-boom' generations.
- At the same time, past declines in fertility mean that the numbers coming into the labour force at the young ages are either falling or, at least, not growing.
- All else being equal, this process will lead to a decline in the rate of growth of GDP per capita, a measure often used as a measure of living standards.

# Aims of the Presentation

- This analysis sets out to examine the variability across 11 countries of outcomes over the period, 2010-2050 and examines the sensitivity of outcomes to:
  - demographic responses (fertility and migration) and
  - economic responses (increases in labour productivity and labour force participation rates).

# Components of GDP

- GDP is the product of three components that can be called the three Ps:
- Population
- Participation
- Productivity

# Decomposition of GDP

- $GDP = P \times E/P \times GDP/E$
- Where:
  - GDP= gross domestic product
  - P = population
  - E/P = employment to population ratio
  - GDP/E = labour productivity  
(output per unit of labour input)

# Further decomposition

- Further decomposition of each of these three components enables a very much more detailed decomposition of GDP.

# Population

- A population can be sub-divided into its age and sex distribution: the numbers of each sex at each age.

# Employment

- Employment can be divided into:
  - The rates of labour force participation for each sex at each age
  - The age-sex specific unemployment rates
  - The distribution of employed persons into part-time and full-time employees, by age and sex, and
  - The average number of hours worked by full-time and part-time workers by age and sex



# Productivity

- Productivity can also be subdivided into the level of productivity of each age and sex category.

# MoDEM2

- All of these detailed components form the input for the economic-demographic projection model, MoDEM2, that is used in this analysis.
- MoDEM2 is freely available at:
- *[www.pc.gov.au/research/commissionresearch/.../modem/modem2](http://www.pc.gov.au/research/commissionresearch/.../modem/modem2)*

# Usage of MoDEM2

- MoDEM2 can be used to make projections of employment, GDP and GDP per capita according to varying scenarios for all of the model inputs described earlier.
- We can investigate:
  - The impacts on GDP per capita of changing birth and migration rates and changing age structure of the population.
  - The effects of changes in labour force participation, unemployment or hours of work on GDP per capita
  - The effects of changes in labour productivity.

# Outline

- Eleven countries examined: Italy, Spain, Germany, Austria, France, Sweden, Japan, United Kingdom, United States, Canada and Australia.
- One output shown: annual GDP per capita growth.
- A variety of country-specific scenarios.

# Modem Input

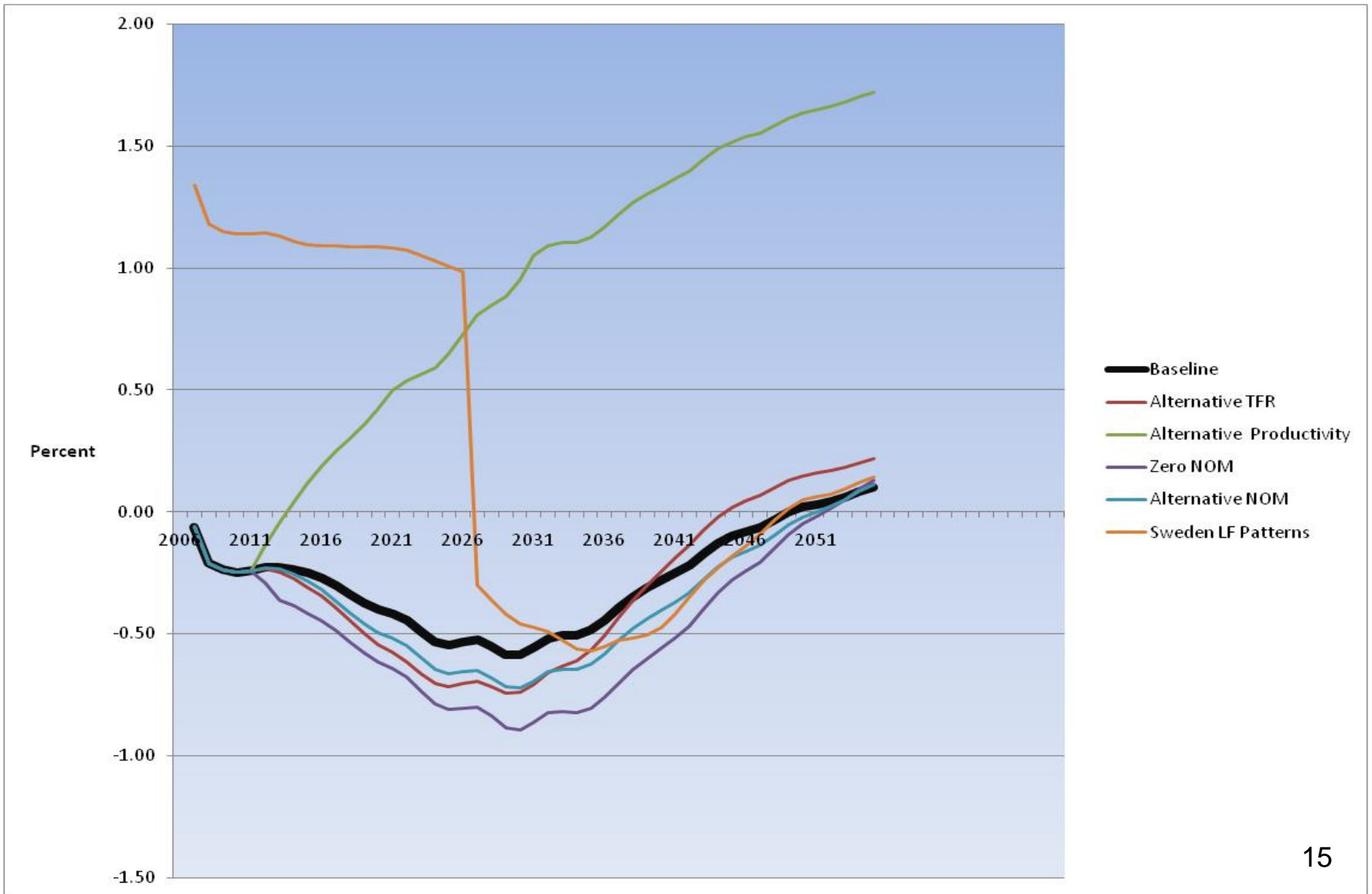
- Population by age and sex in 2005 and 2004
- Age Specific Fertility Rates 2005
- Pattern of immigration and emigration by age and sex
- Net International Migration (NOM) in 2005/2006
- Age pattern of mortality 2005
- Life expectation, male and female in 2005
- Labour force data by age and sex: participation rate, unemployment, part-time share, fulltime hours, part-time hours
- Average labour productivity growth (2001-2008)
- Using publicly available data online: OECD stats, Euro stats, UN data, ILO (laborsta)

# Italy: Scenarios

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.38	330	0.08	50.09
Alternative TFR	<b>Constant to 2010, transitions linearly to 1.7 by 220, then stays constant</b>	330	0.08	50.09
Zero NOM	1.38	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	0.08	50.09
Alternative NOM	1.38	<b>Flat to 2010, transitions to 165 take place linearly over 5 years between 2010-2015</b>	0.08	50.09
Alternative productivity	1.38	330	<b>Constant to 2010, rises linearly to 1% by 2020, and 1.7% by 2030, then constant</b>	50.09
Sweden's LFPR in 2025	1.38	330	0.08	<b>Linear increase from 50.09 in 2005 to 67.27 in 2025*</b>

\* Average for both men and women across all age groups

# Italy: Annual GDP per capita growth



# Italy: summary

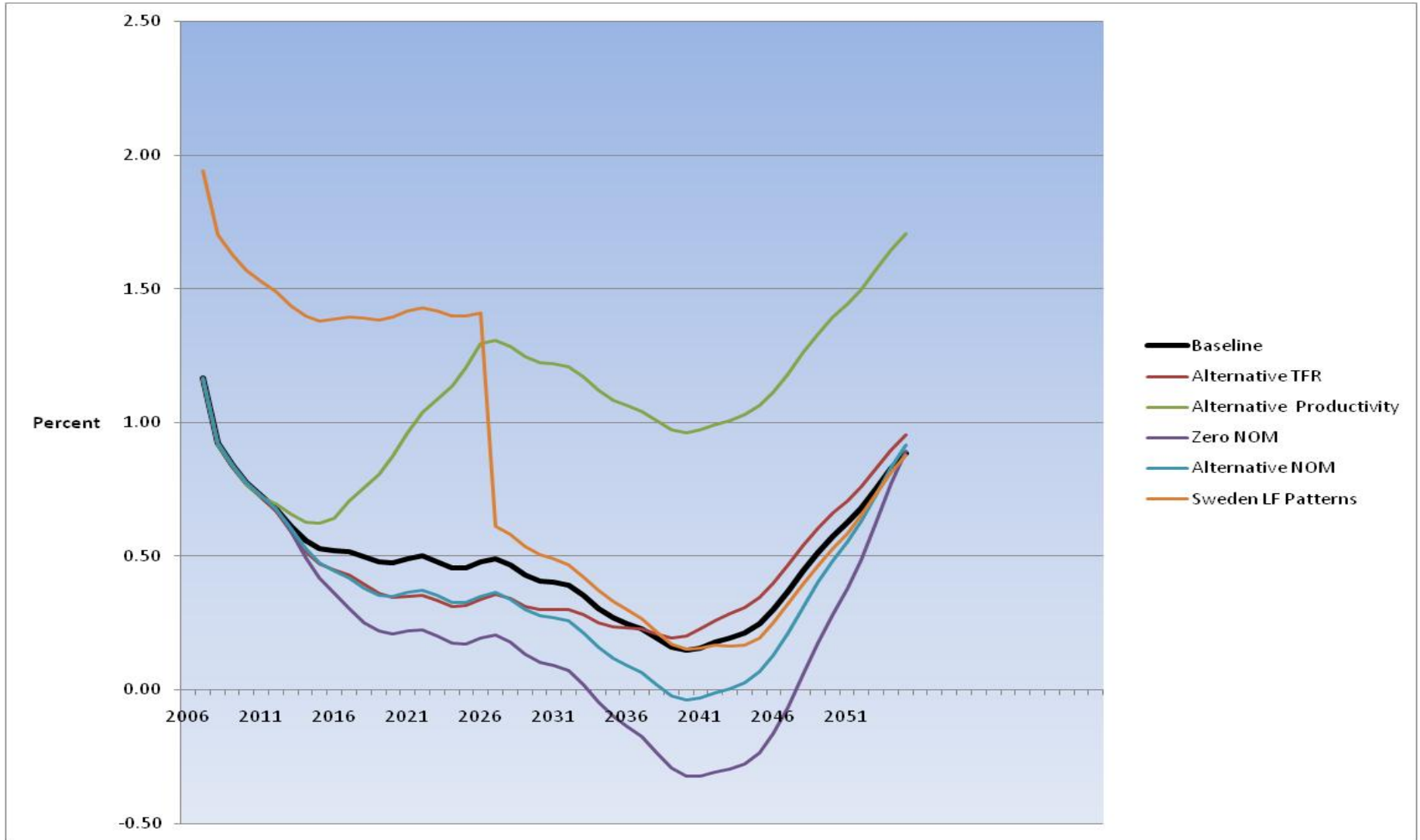
- Italy faces negative rates of growth of GDP per capita almost throughout the projection period. The drop is sharper from 2016 to 2031 (falls from -0.2% to -0.6%). The rate rises from 2030 onwards.
- The alternative demographic scenarios (higher fertility or lower migration) make the situation worse until about 2040 when higher fertility level would produce an improvement.
- Increased labour force participation could have a major impact while the increase is being implemented.
- Italy needs to increase its labour productivity, quickly.



# Spain

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.43	350	0.88	56.19
Alternative TFR	<b>Constant to 2010, transitions linearly to 1.7 in 2020, constant again</b>	350	0.88	56.19
Zero NOM	1.43	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	0.88	56.19
Alternative NOM	1.43	<b>Constant to 2010, transitions to 175 take place linearly over 5 years between 2010-1015</b>	0.88	56.19
Alternative productivity	1.43	350	<b>Constant to 2010, rises linearly to 1% by 2020, and 1.7% by 2025, then constant</b>	56.19
Sweden's LFPR in 2025	1.43	350	0.88	<b>Linear increase from 56.19 in 2005 to 67.27 in 2025*</b>
* Average for both men and women across all age groups				17

# Spain: Annual GDP per capita growth



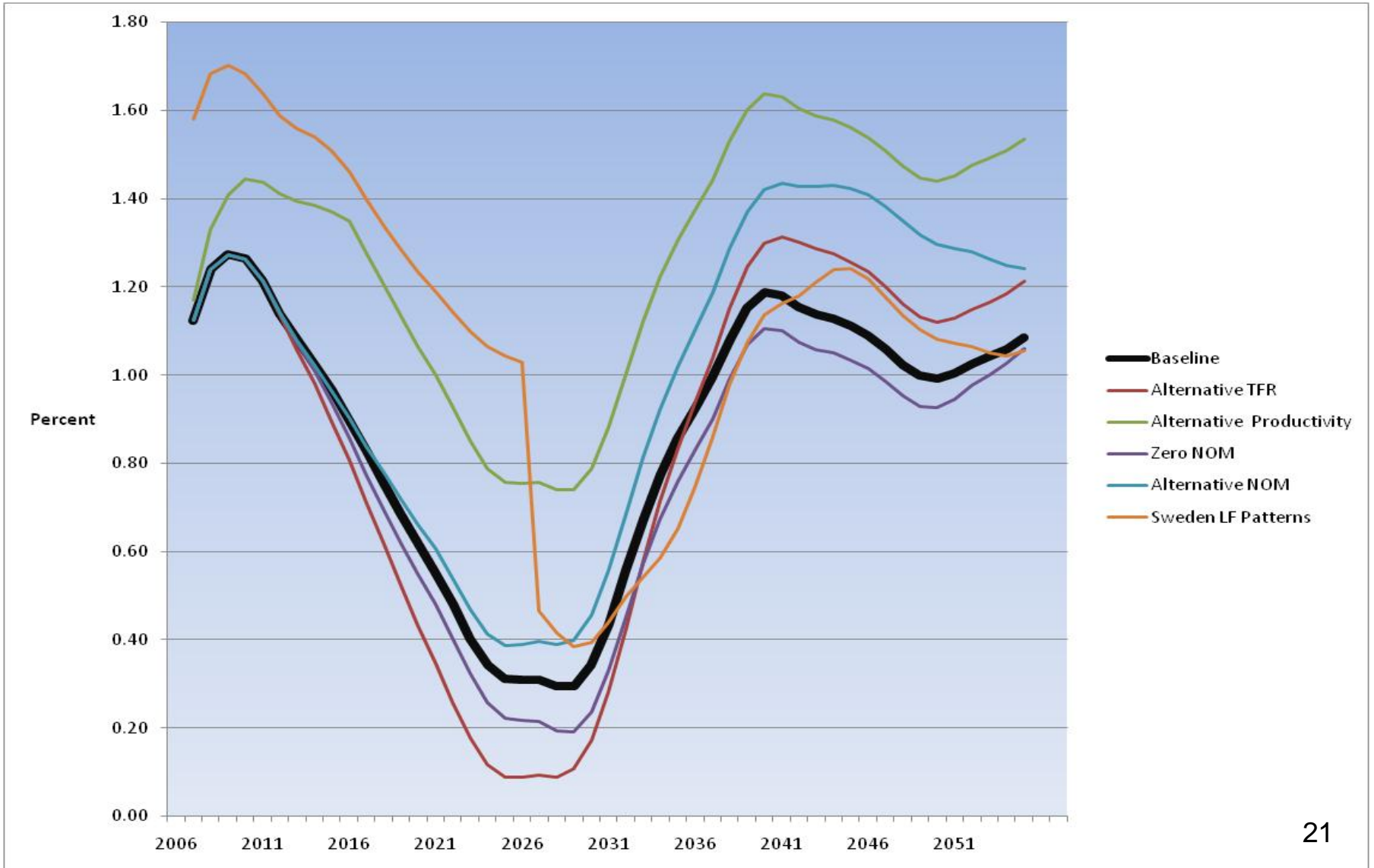
# Spain: Summary

- Spain is facing a severe, immediate fall in the rate of growth of GDP per capita as a result of ageing and the fall is long-term continuing to 2040 (1.2% to 0.2%).
- Like Italy, demographic responses (higher fertility and lower migration) make the situation worse for the entire period.
- Increased labour force participation seems like the only way that Spain can deal with this issue in the short term. Over time, increases in labour productivity would also be beneficial.

# Germany

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.32	110	1.25	60.74
Alternative TFR	<b>Constant to 2010, increases linearly to 1.7 in 2020, and then constant</b>	110	1.25	60.74
Zero NOM	1.32	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	1.25	60.74
Alternative NOM	1.32	<b>Constant to 2010, transitions to 330 take place linearly over 5 years between 2010-1015</b>	1.25	60.74
Alternative productivity	1.32	110	<b>Increases linearly to 1.7 by 2015 (from 2005)</b>	60.74
Sweden's LFPR in 2025	1.32	110	1.25	<b>Linear increase from 60.74 in 2005 to 67.27 in 2025</b>

# Germany: Annual GDP per capita growth



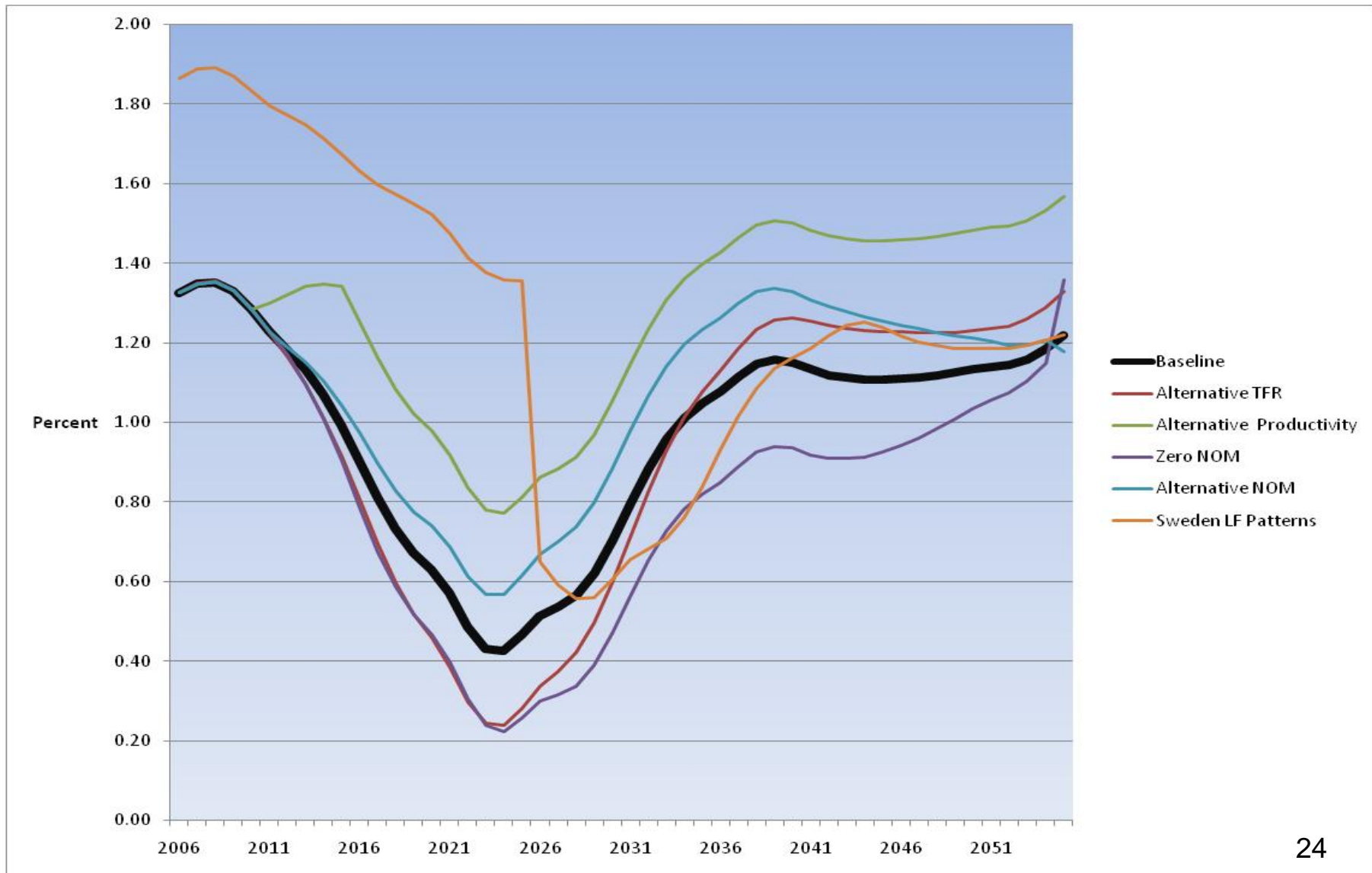
# Germany: Summary

- Germany faces a massive and immediate decline in the rate of growth of GDP per capita as a result of ageing (1.25% to 0.3%).
- The hypothesised demographic scenarios will make almost no difference to the result until an assumed higher level of migration begins to have an impact in the 2020s.
- The situation rapidly reverses in the 2030s as rates of GDP growth rise sharply.
- Before the reversal, Germany needs to consider both increases in labour force participation and to improve labour productivity.

# Austria

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.38	32	1.35	59.10
Alternative TFR	<b>Constant to 2010. transitions linearly to 1.7 by 2020, constant again</b>	32	1.35	59.10
Zero NOM	1.38	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	1.35	59.10
Alternative NOM	1.38	<b>Constant to 2010, transitions to 60 take place linearly over 5 years between 2010-2015</b>	1.35	59.10
Alternative productivity	1.38	32	<b>Constant to 2010, then rises linearly to 1.7 by 2015</b>	59.10
Sweden's LFPR in 2025	1.38	32	1.35	<b>Linear increase from 59.10 in 2005 to 67.27 in 2025</b>

# Austria: Annual GDP per capita growth





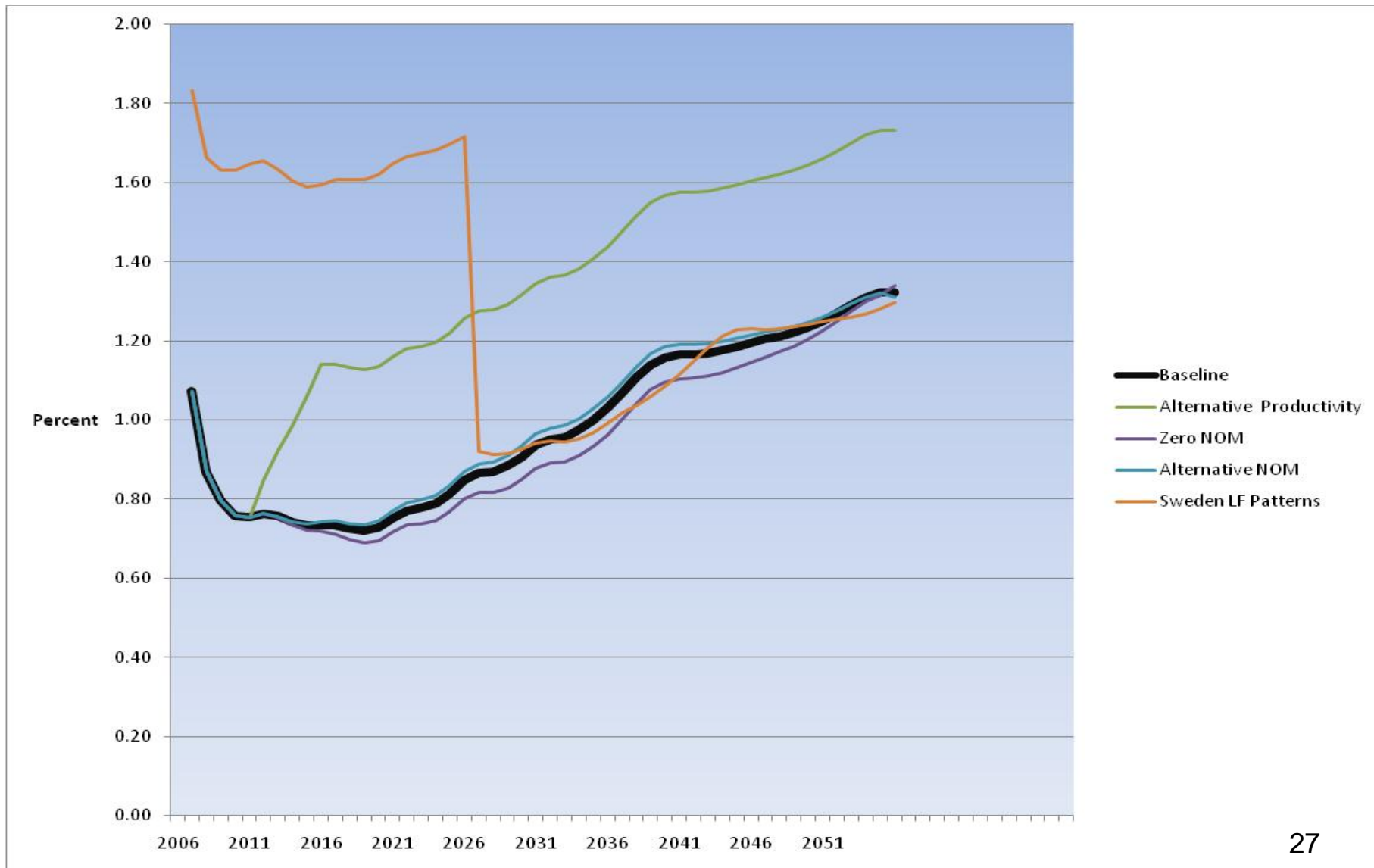
# Austria: Summary

- Austria faces a future similar to that of Germany: immediate sharp fall in GDP per capita (1.35% to 0.4%) due to ageing followed by an equally sharp rise from the mid 2020s.
- Getting through the next 15 years would be supported by increases in labour force participation and productivity and/or increases in migration (shown here as double the current level).

# France

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.89	100	1.29	56.59
Alternative TFR	1.89	100	1.29	56.59
Zero NOM	1.89	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	1.29	56.59
Alternative NOM	1.89	<b>Constant to 2010, transitions to 150 take place linearly over 5 years between 2010-1015</b>	1.29	56.59
Alternative productivity	1.89	100	<b>Constant to 2010, then rises linearly to 1.7 by 2015</b>	56.59
Sweden's LFPR in 2025	1.89	100	1.29	<b>Linear increase from 56.59 in 2005 to 67.27 in 2025</b>

# France: Annual GDP per capita growth



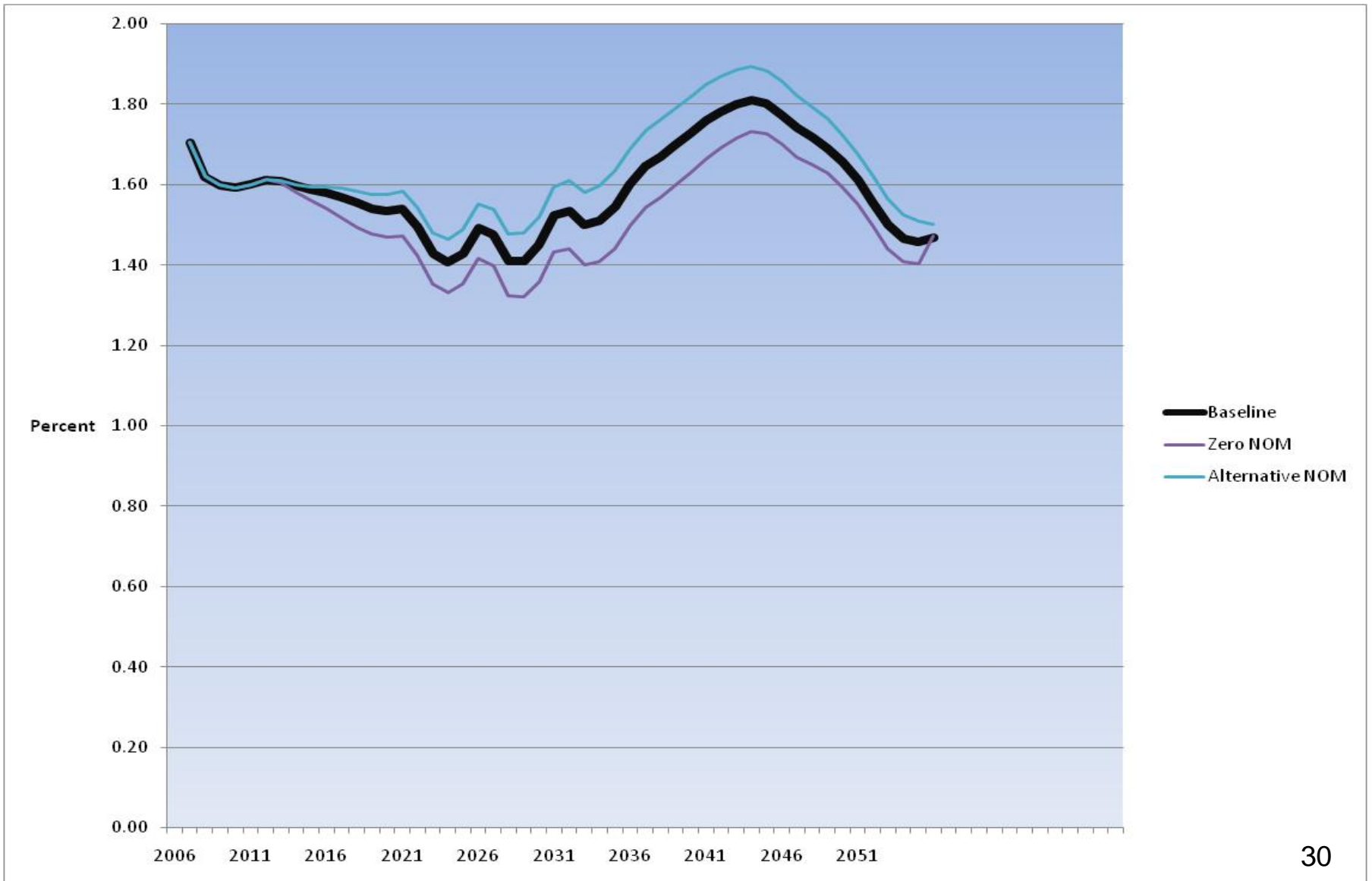
# France: Summary

- France differs from the countries reported so far. From 2010 onwards, the rate of growth of GDP per capita is flat to 2020 and then rises continually (from 0.75% in 2020 to 1.3% in 2050).
- Migration 50% higher than at present would make little difference.
- There is scope for France to achieve an even more favourable result through increased participation and increased productivity.

# Sweden

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.87	30	1.76	67.27
Alternative TFR	1.87	30	1.76	67.27
Zero NOM	1.87	<b>Constant until 2010, transition to zero NOM take place over next 5 years</b>	1.76	67.27
Alternative NOM	1.87	<b>Flat to 2010, transitions to 60 take place linearly over 5 years between 2010-2015</b>	1.76	67.27
Alternative productivity	1.87	30	<b>1.76</b>	67.27
Sweden's LFPR in 2025	1.87	30	1.76	67.27

# Sweden : Annual GDP per capita growth



# Sweden: Summary

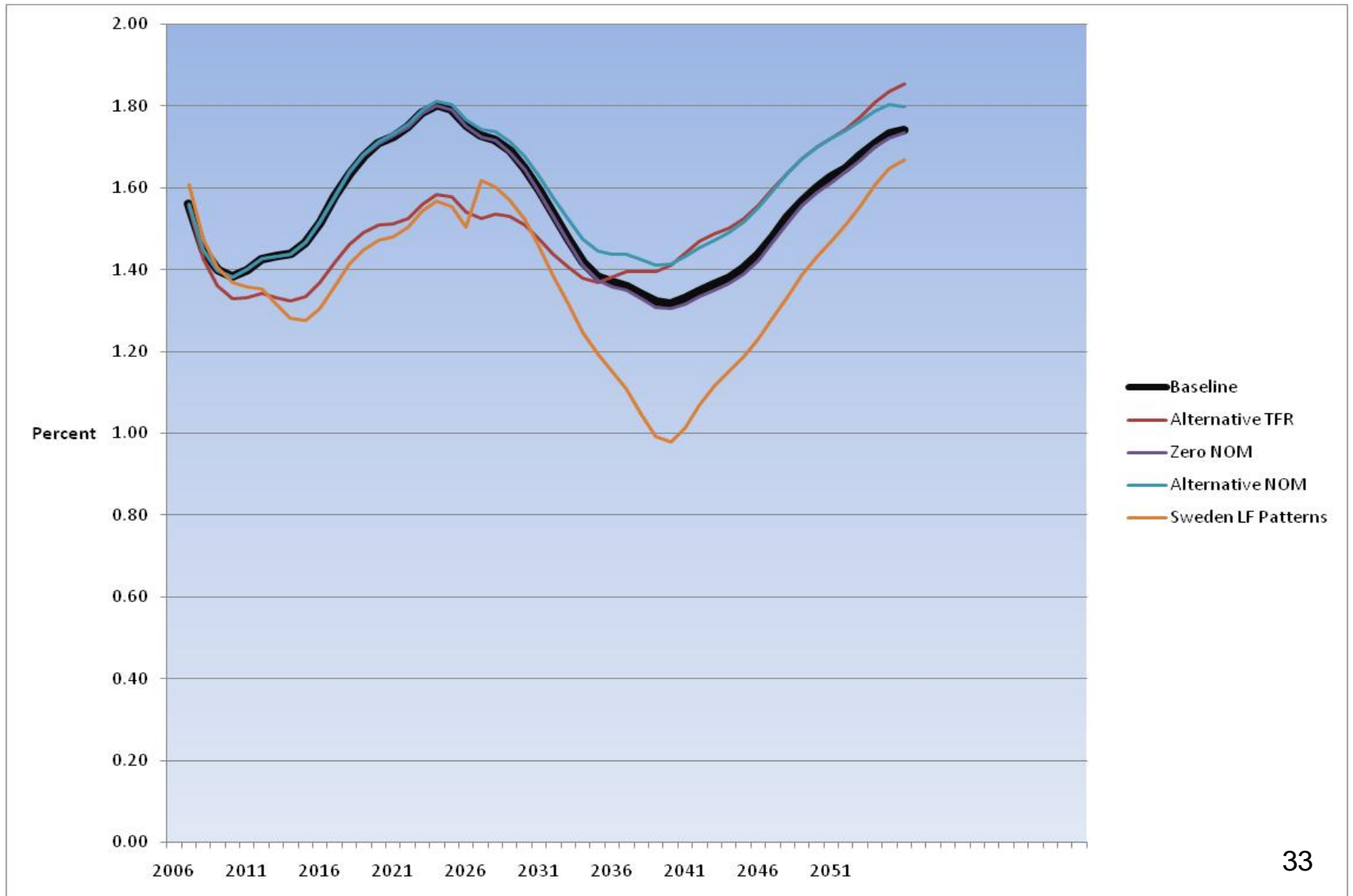
- GDP per capita growth falls initially as a result of ageing (1.6% to 1.4%) but it remains relatively high and increases from the mid 2020s.
- Immigration being 50% higher or 50% lower has small but predictable impacts.
- As Sweden's participation and labour productivity are already high, no alternative assumptions are used

# Japan

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.27	30	1.84	64.22
Alternative TFR	<b>TFR rises to 1.4 by 2010 and then to 1.7 by 2020</b>	30	1.84	64.22
Zero NOM	1.27	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	1.84	64.22
Alternative NOM	1.27	<b>Constant to 2010, transitions to 300 take place linearly by 2020</b>	1.84	64.22
Alternative productivity	1.27	30	<b>1.84</b>	64.22
Sweden's LFPR in 2025	1.27	30	1.84	<b>Linear increase from 64.22 in 2005 to 67.27 in 2025</b>



# Japan: Annual GDP per capita growth



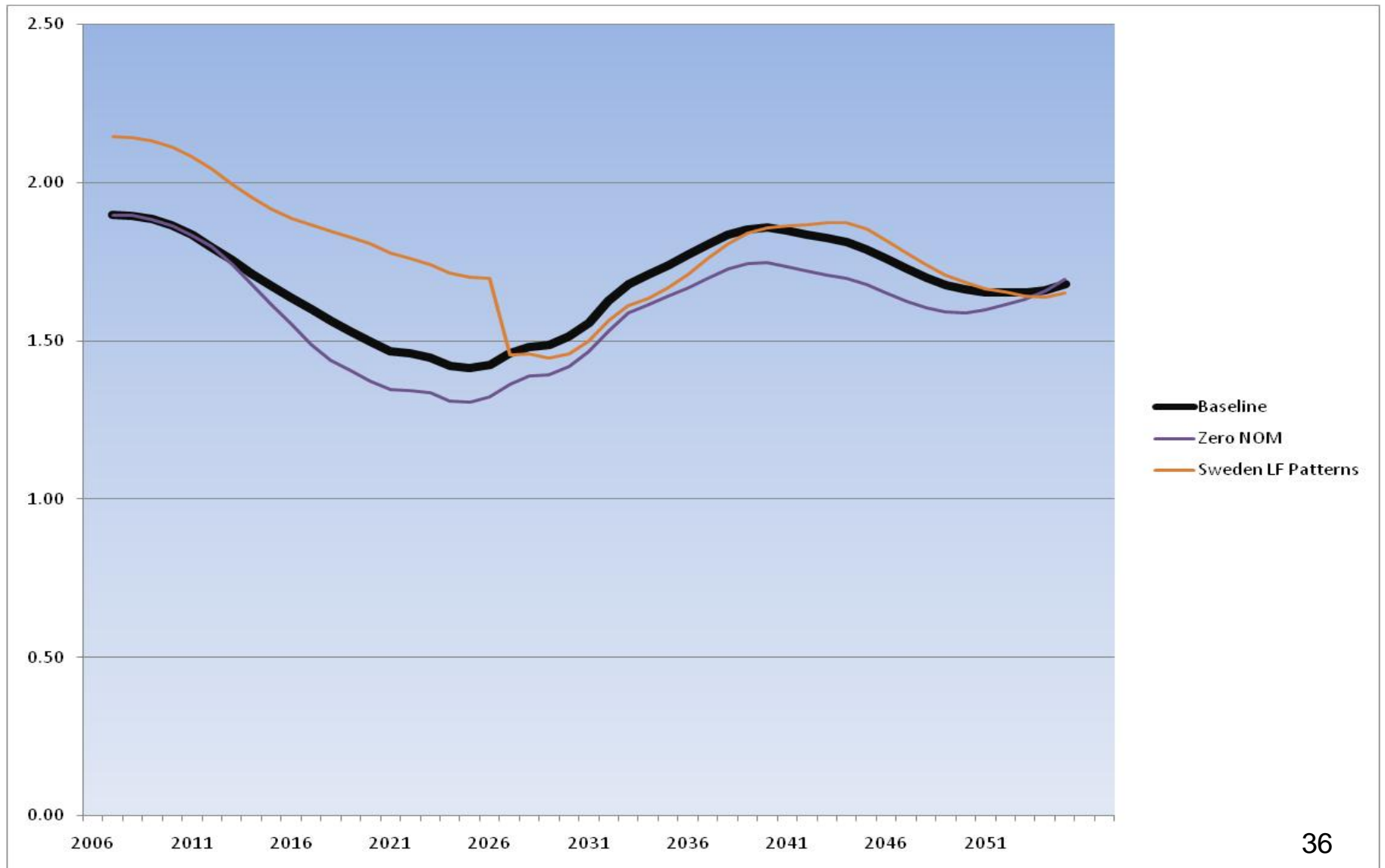
# Japan: Summary

- Although Japan's population and labour supply decline in the future, the age structural changes do not produce a decline in the rate of growth of GDP per capita. In fact, age structure leads to a rise between 2010 and 2025 (1.4% to 1.8%).
- This is probably because the Japan population has already aged and there is a benefit to GDP per capita growth of recent low fertility.

# United Kingdom

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.84	190	1.84	64.2
Alternative TFR	1.84	190	1.84	64.2
Zero NOM	1.84	<b>Constant to 2010, transition to 0 takes place linearly over 5 years between 2010-2015</b>	1.84	64.2
Alternative NOM	1.84	190	1.84	64.2
Alternative productivity	1.84	190	1.84	64.2
Sweden's LFPR in 2025	1.84	190	1.84	<b>Linear increase from 64.2 in 2005 to 67.27 in 2025</b>

# UK: Annual GDP per capita growth



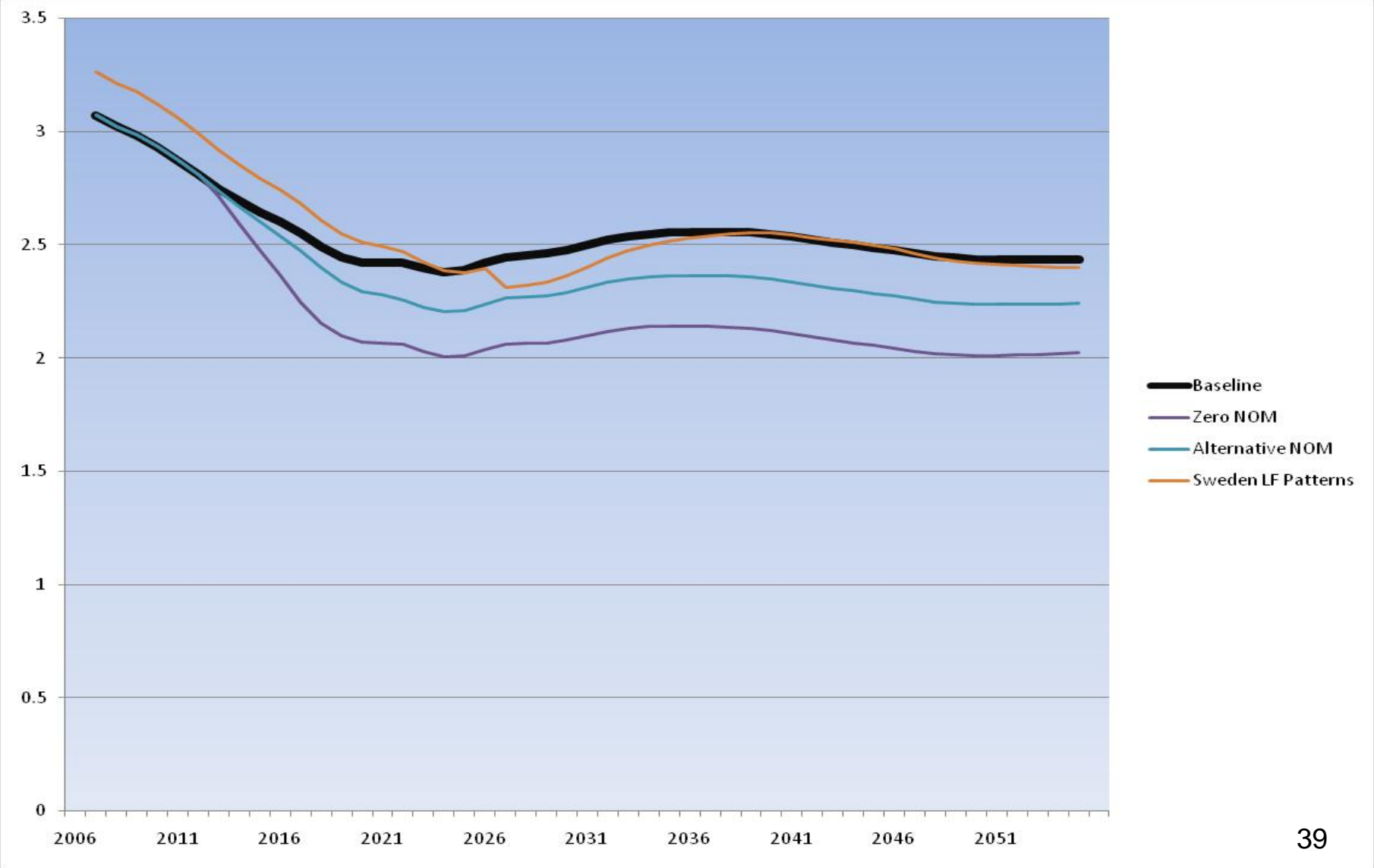
# UK: Summary

- Ageing will bring down the rate of growth of GDP per capita in the UK over the next 15 years (1.9% to 1.4%) but not nearly as sharply as in Germany, Austria and Spain.
- From the mid 2020s, the rate of growth of GDP per capita would rise.
- A shift to zero migration would not have a major impact on the UK rate of growth of GDP per capita but its labour supply would fall in the longer term.

# USA

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.84	1010	1.99	65.3
Alternative TFR	1.84	1010	1.99	65.3
Zero NOM	1.84	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	1.99	65.3
Alternative NOM	1.84	<b>Constant to 2010, halve over 10 years, then constant</b>	1.99	65.3
Alternative productivity	1.84	1010	1.99	65.3
Sweden's LFPR in 2025	1.84	1010	1.99	<b>Linear increase from 65.3 in 2005 to 67.27 in 2025</b>

# USA: Annual GDP per capita growth



# USA: Summary

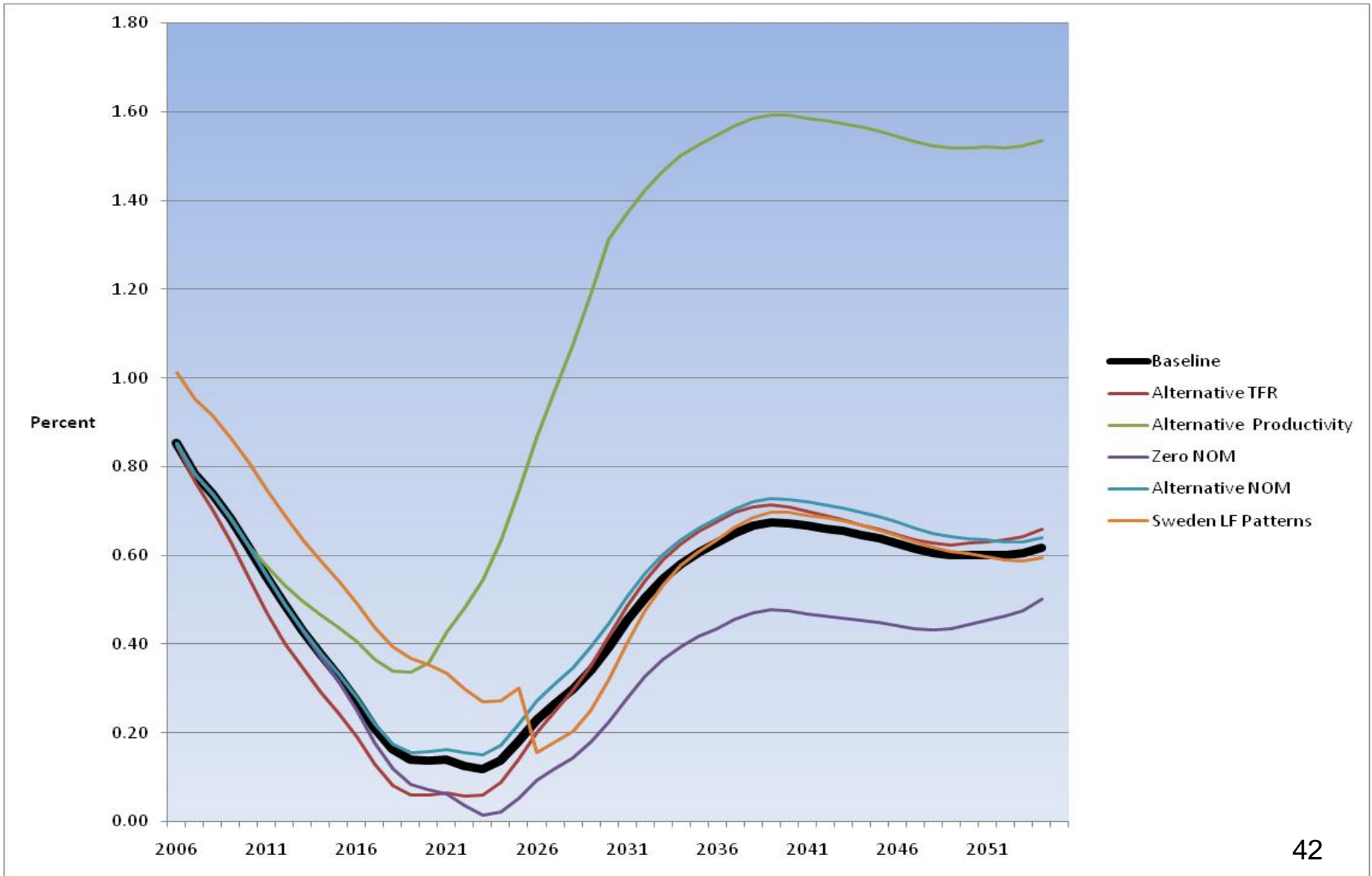
- The already very high rate of growth of GDP per capita in the USA (because of high participation and high productivity) would fall somewhat due to ageing (from 3% to 2.5% between 2010 and 2025) and then remain flat.
- Compared to zero migration, the current level of immigration to the US adds a large 0.5% to the annual growth rate of GDP per capita.



# Canada

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.566	210	0.78	65.5
Alternative TFR	<b>TFR rises to 1.7 by 2010</b>	210	0.78	65.5
Zero NOM	1.566	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	0.78	65.5
Alternative NOM	1.566	<b>Constant to 2010, transitions to 300 by 2020</b>	0.78	65.5
Alternative productivity	1.566	210	0.78	65.5
Sweden's LFPR in 2025	1.566	210	0.78	<b>Linear increase from 65.5 in 2005 to 67.27 in 2025</b>

# Canada: Annual GDP per capita growth



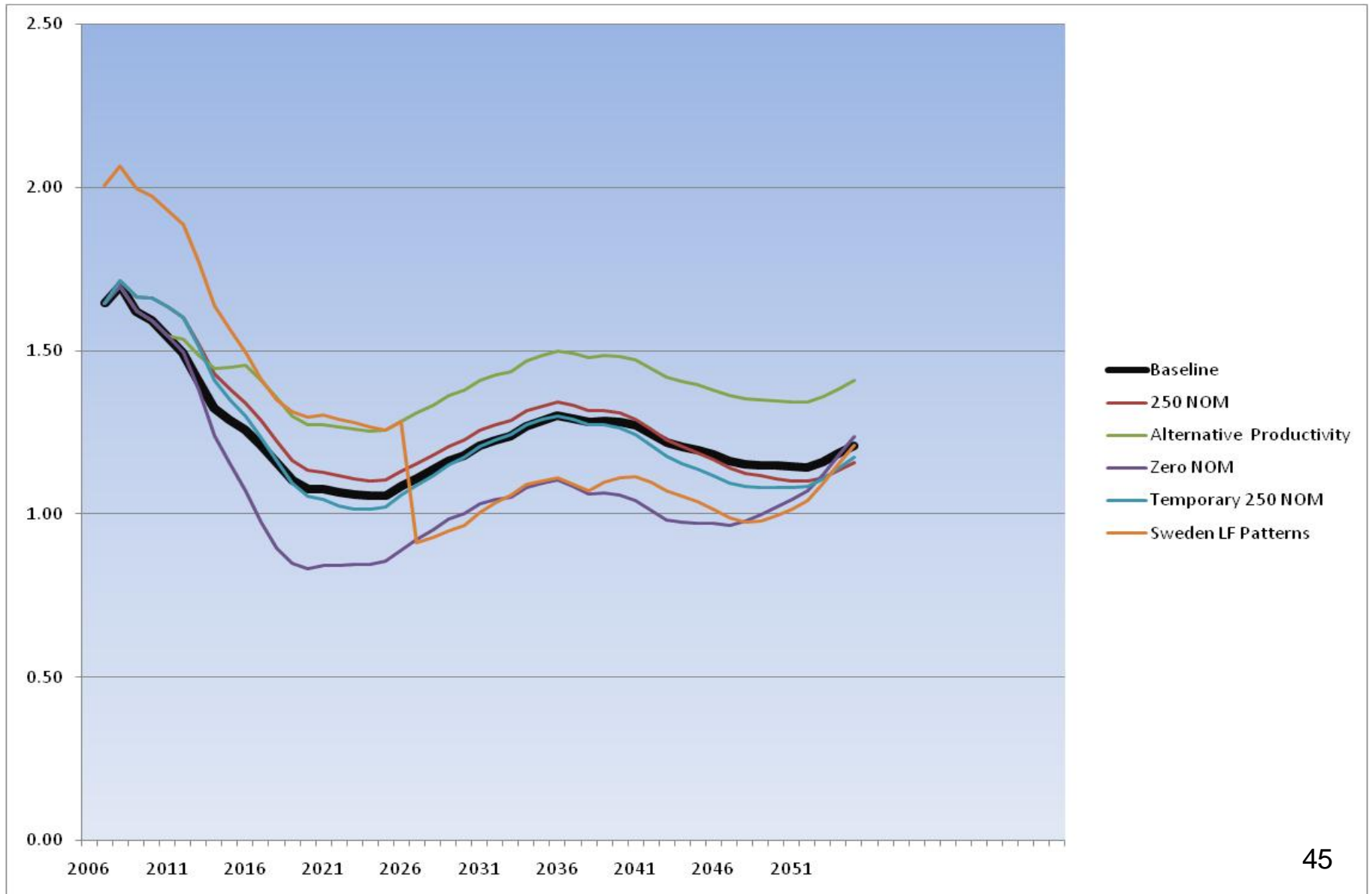
# Canada: Summary

- Canada is facing a severe and immediate fall in the rate of growth of GDP per capita due to ageing (from 0.8% to about 0.1% in 2020).
- The rate would subsequently rise but only to about 0.6%.
- The main issue for Canada is low labour productivity.
- Zero net migration would make the Canadian result much worse.

# Australia

Scenarios	TFR	Migration (000)	Productivity	LFPR *
Baseline	1.83	180	1.5	63
Zero NOM	1.83	<b>Constant until 2010. transition to zero NOM take place over next 5 years</b>	1.5	63
Alternative NOM 1 (250 NOM)	1.83	<b>Transitions from 180 to 250 by 2010, constant at 250</b>	1.5	63
Alternative NOM 2 (Temporary 250 NOM)	1.83	<b>Transitions from 180 to 250 by 2010, fall to 180 by 2020, stay at 180</b>	1.5	63
Alternative NOM 3 (100 NOM)	1.83	<b>Transitions from 180 to 250 by 2010, falls to 100 by 2020, stay at 100</b>	1.5	63
Alternative productivity	1.83	30	<b>Flat to 2010, then rises linearly to 1.7 by 2015</b>	63
Sweden's LFPR in 2025	1.83	30	1.5	<b>Linear increase from 64.22 in 2005 to 67.27 in 2025</b>

# Australia: Annual GDP per capita growth



# Australia: Summary

- Due to ageing, Australia also faces an immediate fall in the growth of GDP per capita from about 1.7% to 1.1%.
- Higher participation and higher productivity would have the expected upwards impacts.
- Zero migration would have a large negative impact on the growth of GDP per capita.

# Potential Limitations

- Differential productivity of immigrants.
- Complementarity of productivity for different age groups.
- Absolute size of economy effects, redundancy costs.
- Only labour productivity is considered, not multi-factor productivity.
- No account taken of the costs of ageing, eg. social security and health costs.