A scenic view of a coastal city, likely Reykjavik, with snow-capped mountains in the background. The city is built on a hillside overlooking the water. The sky is a clear, pale blue.

Ocean, Fishery and Society

Interconnections Among Systems in Change

Lawrence Hamilton

University of New Hampshire

<http://pubpages.unh.edu/~lch/>

PICES, Dalian, China, October 2008

FUTURE research questions:

- 1) How do ecosystems respond to natural and anthropogenic forcing?**
- 2) What determines an ecosystem's resilience and vulnerability to natural and anthropogenic forcing?
- 3) How do human activities affect coastal ecosystems and *how are societies affected by changes in these ecosystems?***

Also: forging partnerships with social scientists

Case studies of ocean, fishery and society interactions

- Iceland herring towns
- Northwest Newfoundland cod
- Faroe Islands fisheries crisis
- Greenland's transition from seal hunting to cod fishing, and from cod fishing to shrimp fishing
- New work on western Alaska

References for examples in this talk can be found in: "[Climate, fishery and society interactions: Observations from the North Atlantic](#)," L.C. Hamilton (2007). *Deep-Sea Research II*, doi:10.1016/j.dsr2.2007.08.020.

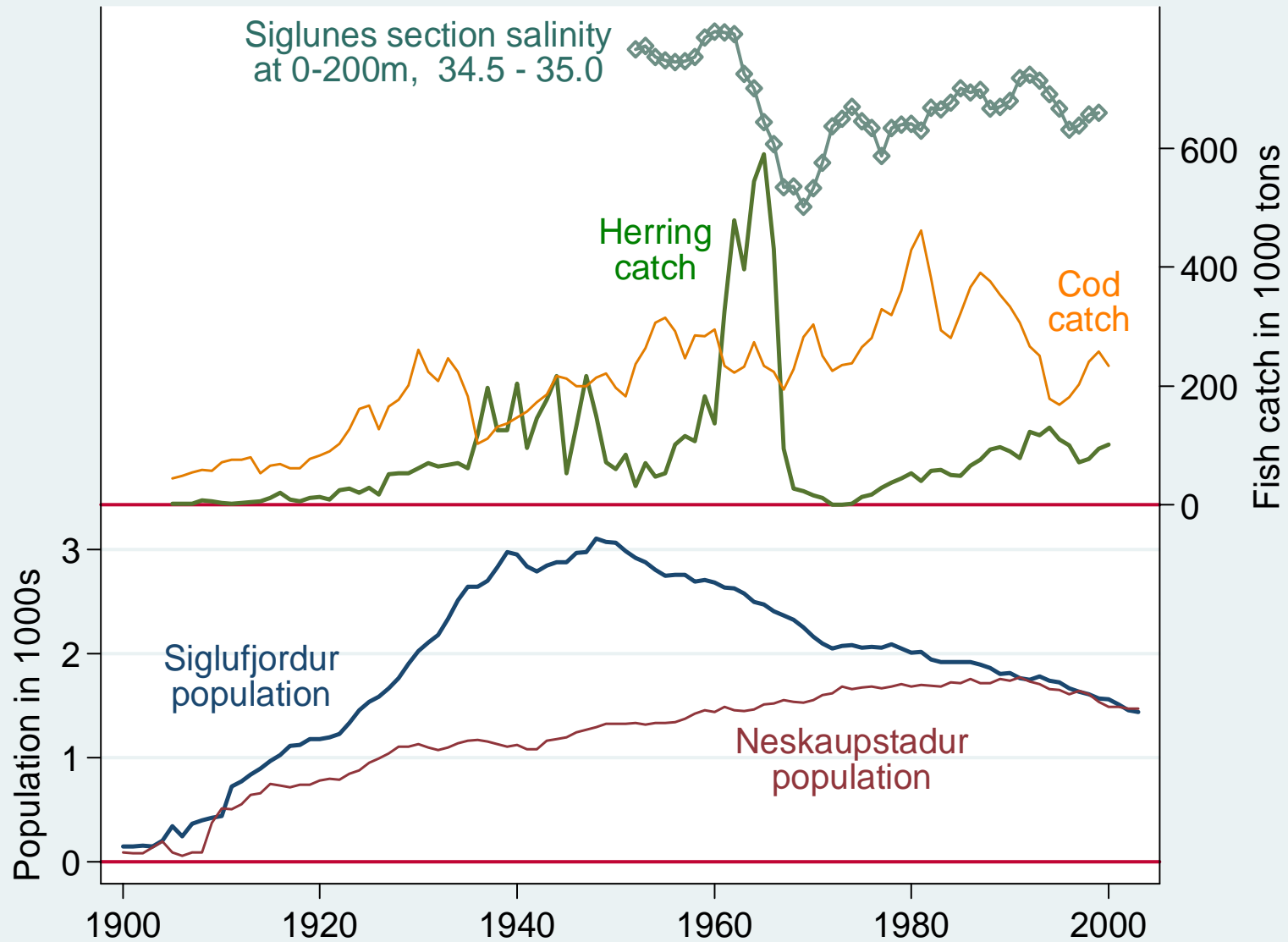
To download individual papers, see:
<http://pubpages.unh.edu/~lch/>

Rise and fall of two Iceland “herring towns”

- Herring fishery grew in early 20th century
- Labor-intensive, near-shore fishery benefited North Iceland (e.g., Siglufjordur) until 1950s
- As stocks declined, a capital-intensive offshore fishery benefited East Iceland (e.g. Neskaupstadur) until 1960s
- Combination of overfishing & environmental change led to collapse
- Human population of herring towns reflects details of fishery and ecosystem change



Rise and fall of two Iceland “herring towns”



Hamilton et al. (2004) “Sea changes ashore: The ocean and Iceland’s Herring Capital.” *Arctic*.

http://pubpages.unh.edu/~lch/Herring_Capital.pdf

Hamilton et al. (2005) “Rise and of the herring towns: Climate and the human teleconnections.” *Climate Change and the Economics of the World’s Fisheries*.

<http://pubpages.unh.edu/~lch/HamiltonCh04.pdf>

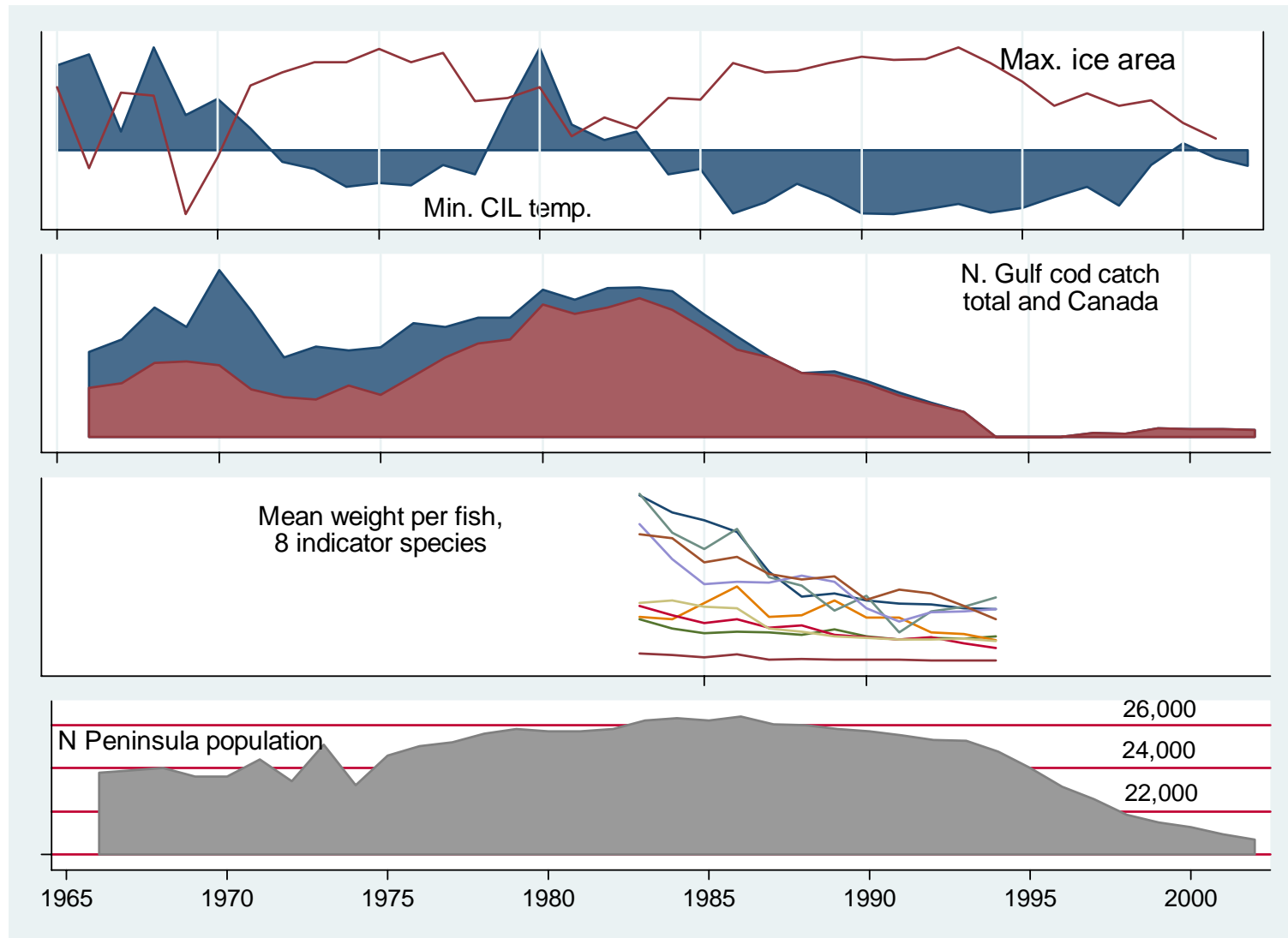


Cod collapse and Northwest Newfoundland

- Cod fishery supported Newfoundland outports for centuries
- In 1960s and 70s, overfishing reduced groundfish stocks
- Overfishing & environmental conditions led to decline in late 80s and multi-species collapse in early 90s
- Human population of NW Newfoundland reduced, became older
- Smaller families, more emphasis on education



Codfish collapse and Northwest Newfoundland



Hamilton et al. (2004) “[Above and below the water: Social/ecological transformation in NW Newfoundland.](http://www.docurights.com/drmaker.cgi?vid=3899&objid=271121)” *Population and Environment*.
<http://www.docurights.com/drmaker.cgi?vid=3899&objid=271121>

Hamilton and Butler (2001) “[Outport adaptations: Social indicators through Newfoundland’s cod crisis.](http://www.humanecologyreview.org/pastissues/her82/82hamiltonbutler.pdf)” *Human Ecology Review*.
<http://www.humanecologyreview.org/pastissues/her82/82hamiltonbutler.pdf>

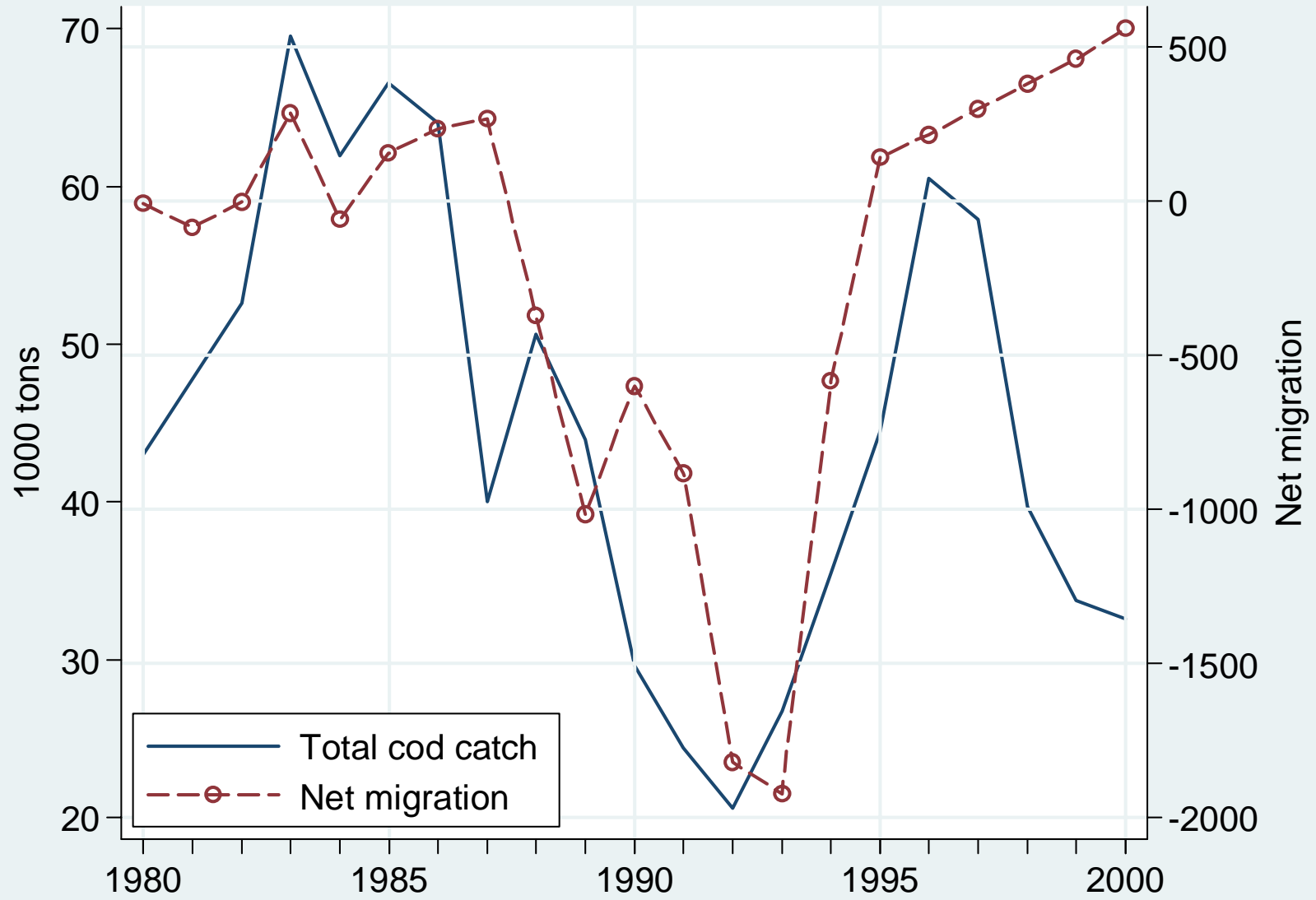


Faroe Islands fisheries crisis

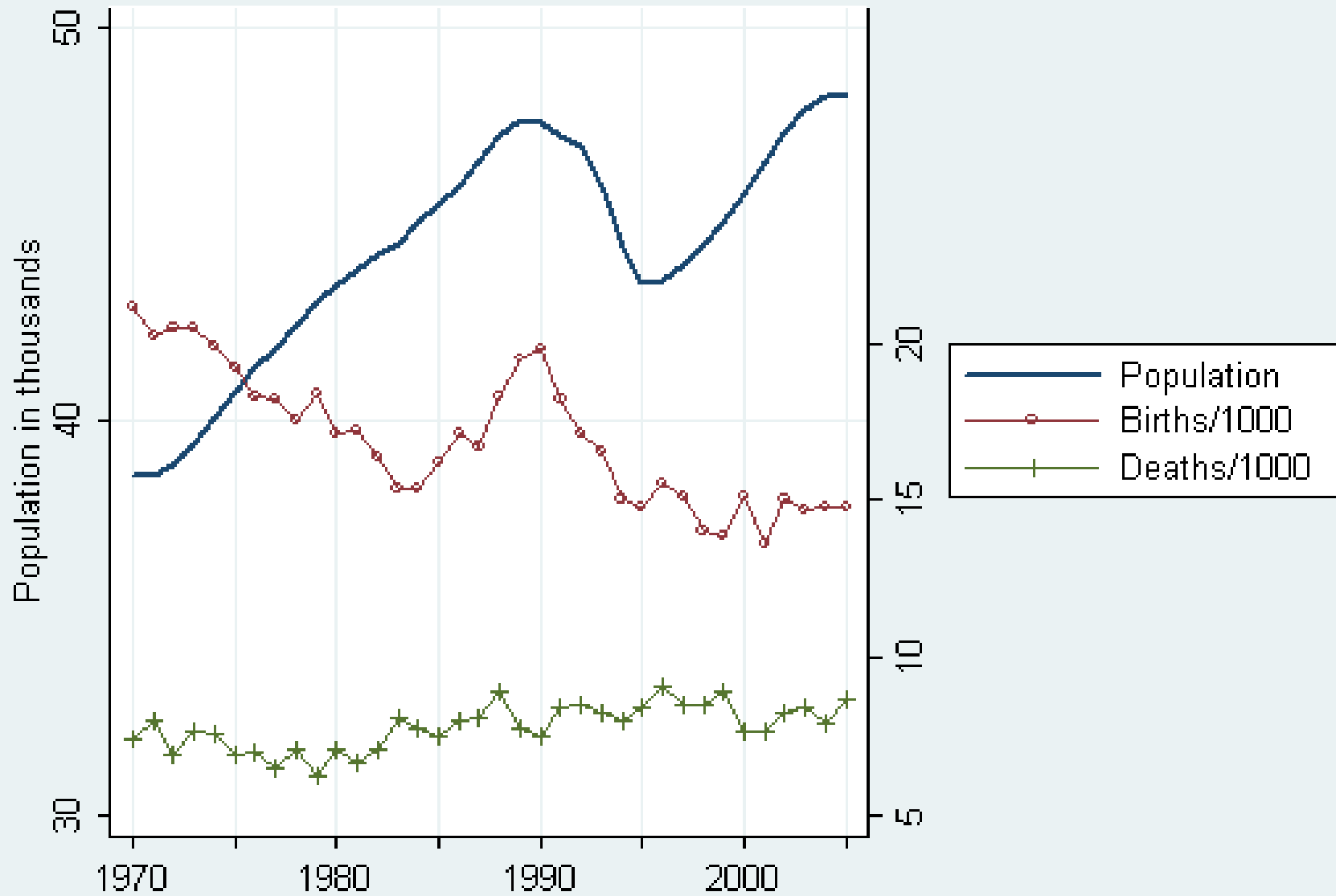
- Fishing pressure & environmental variations led to cod and other fisheries decline in 1980s
- Many young people left the islands due to economic crisis
- The population rapidly became smaller and older
- Young adults moved away, so there were fewer children
- Some Faroese moved back as economy improved in 1990s

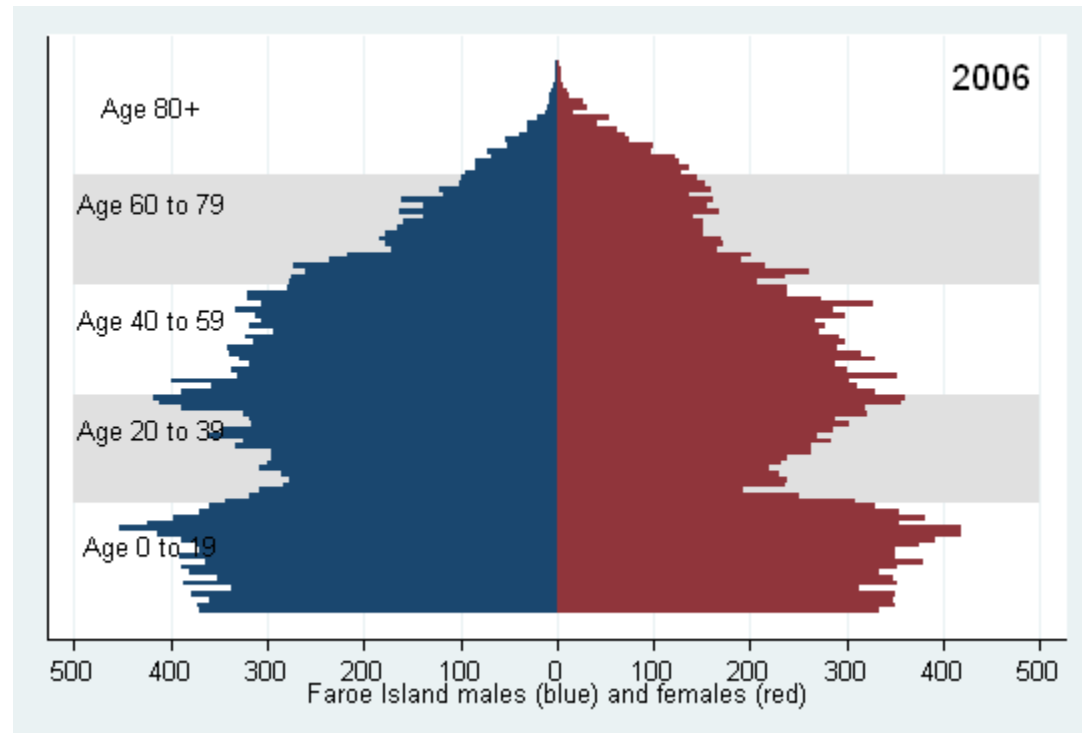


Faroe Islands fisheries crisis

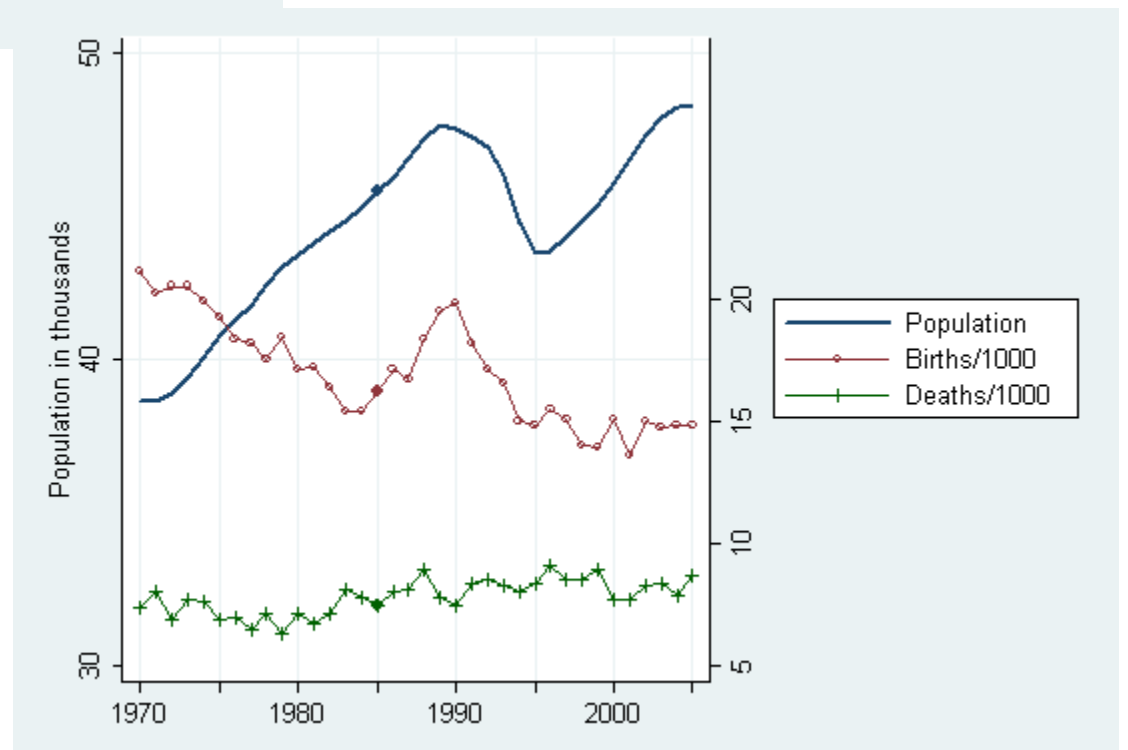
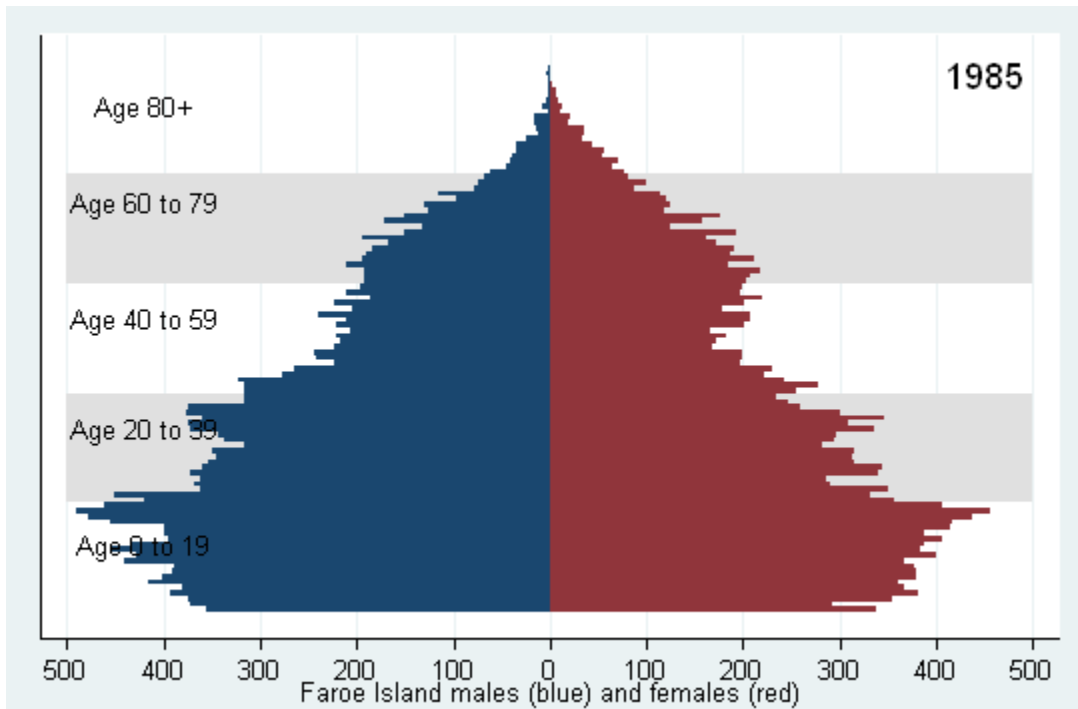


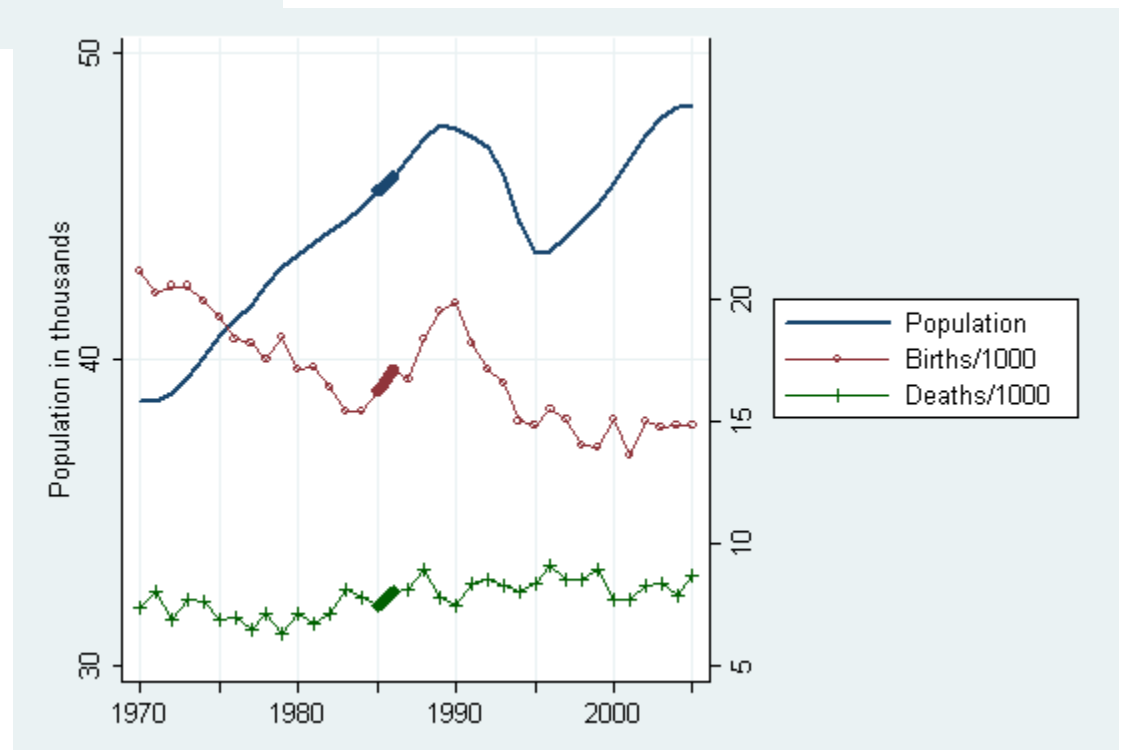
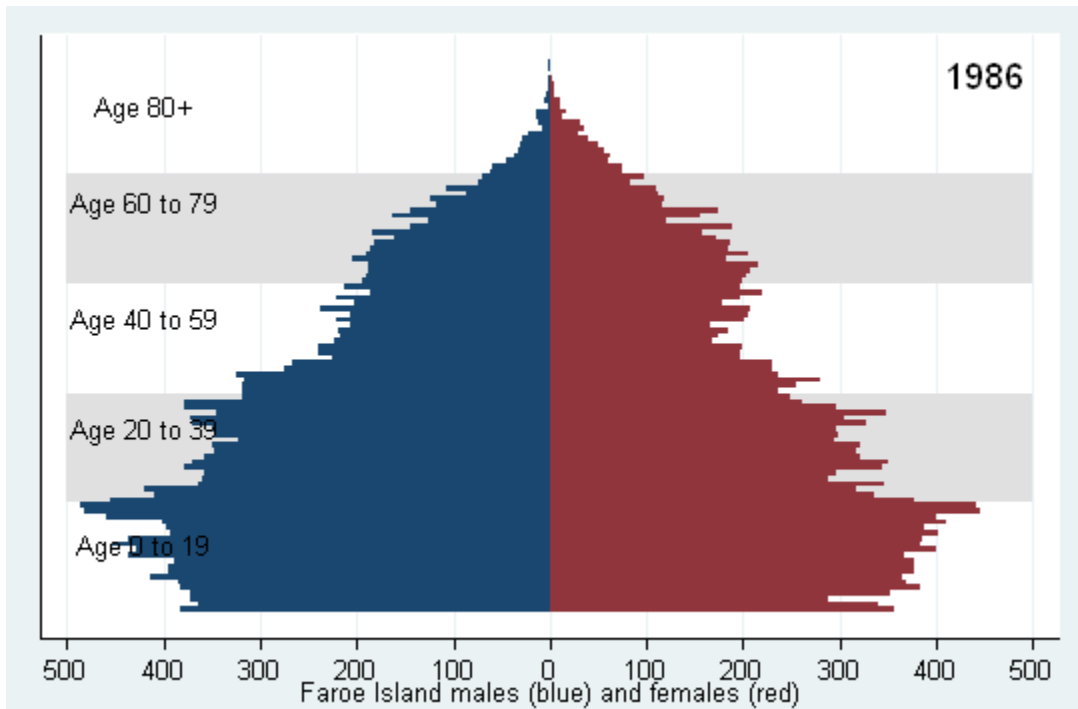
Faroes population, birth & death rates 1970–2006

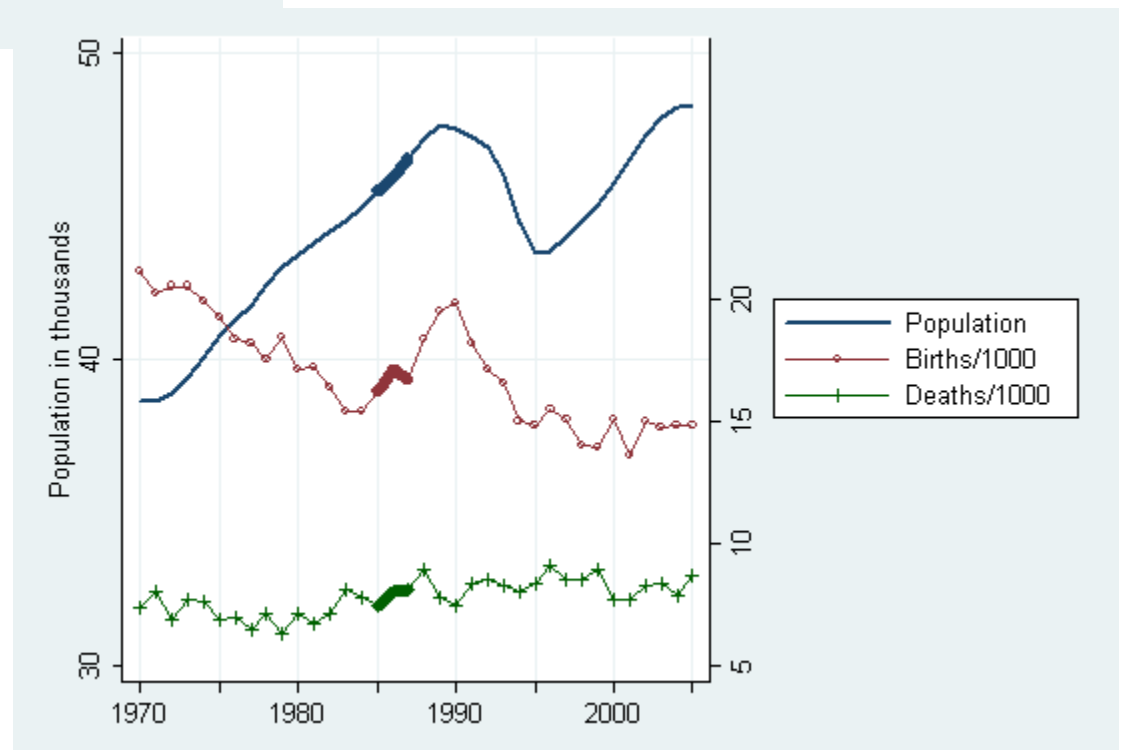
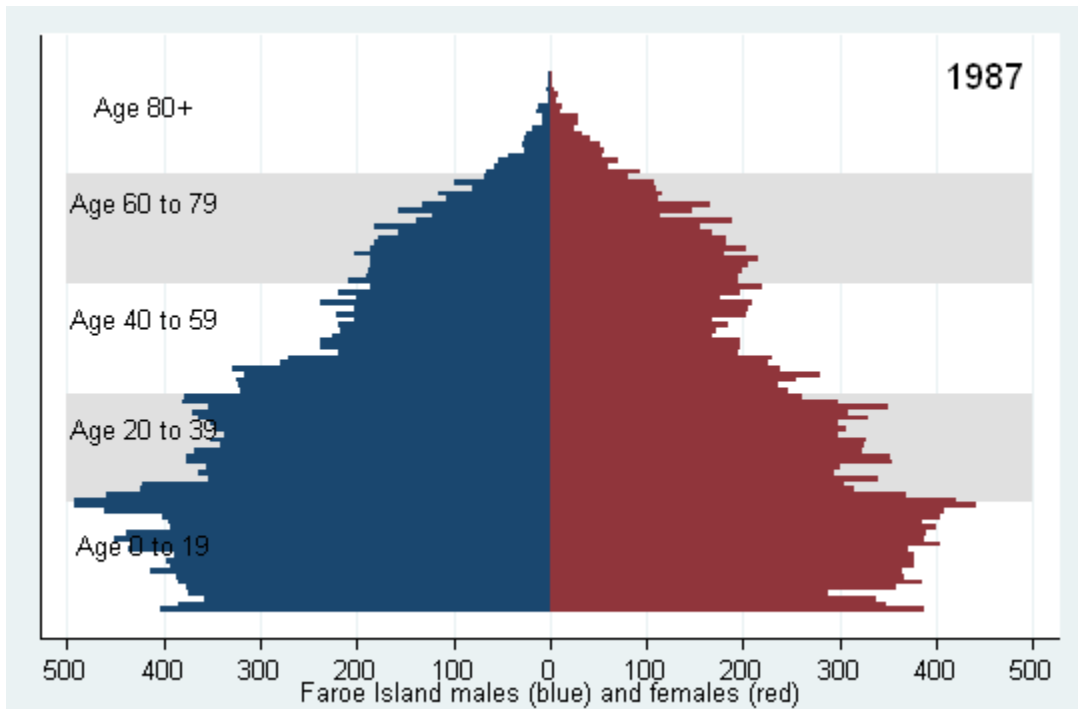


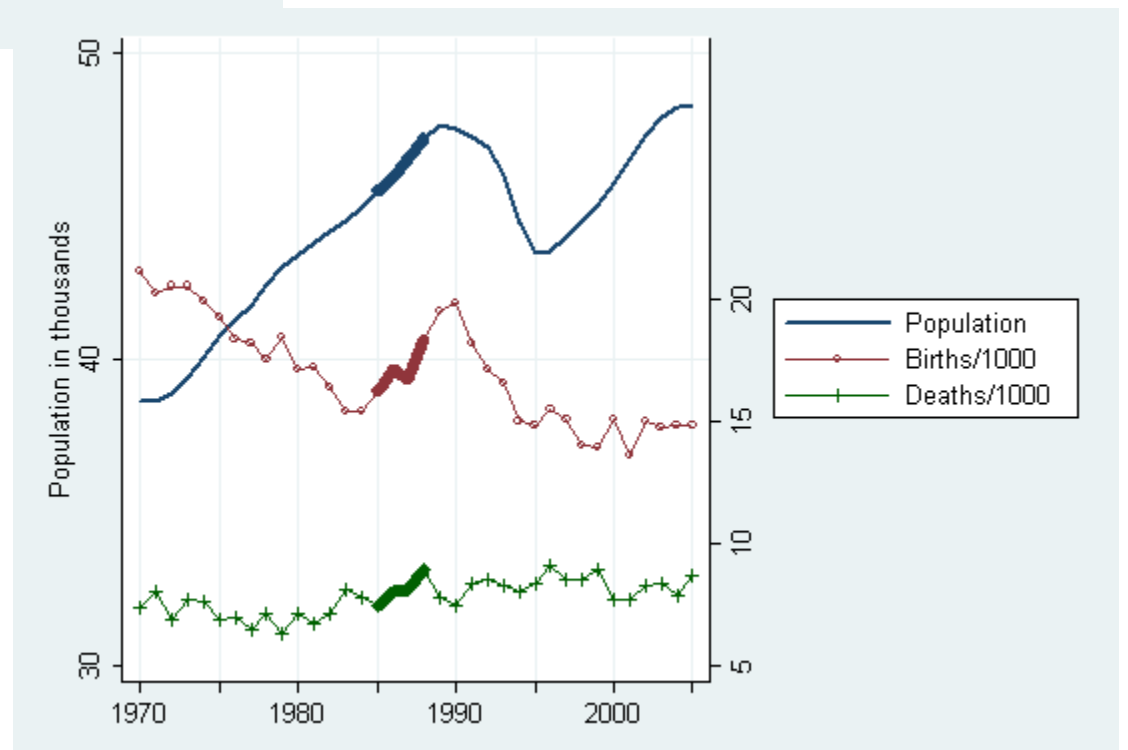
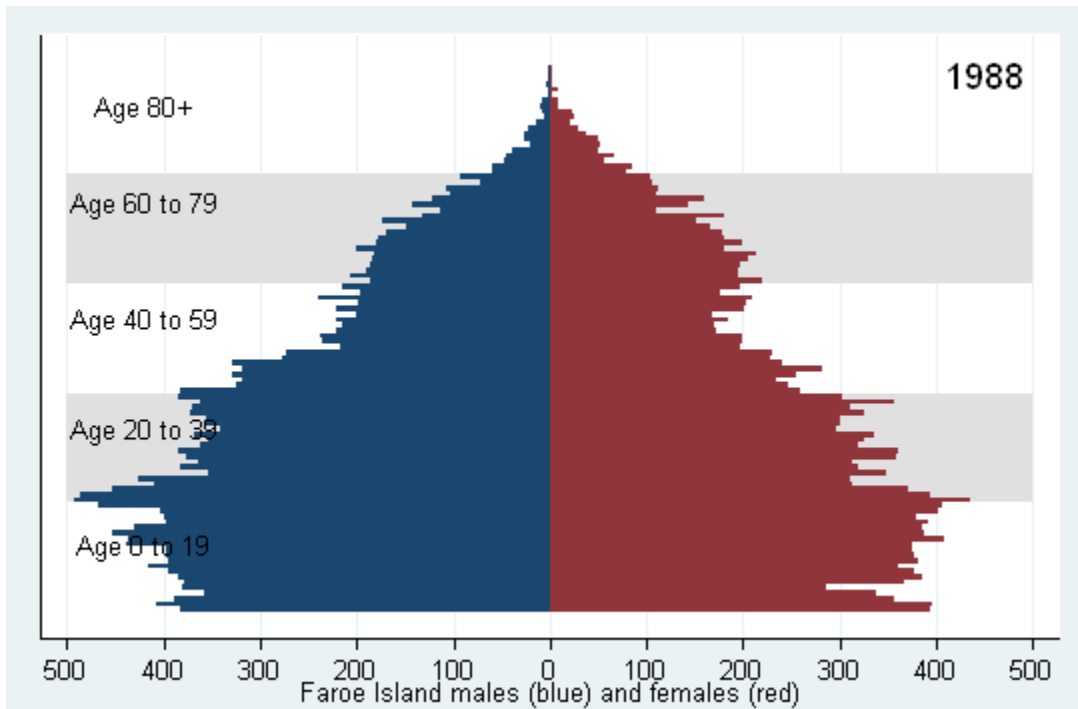


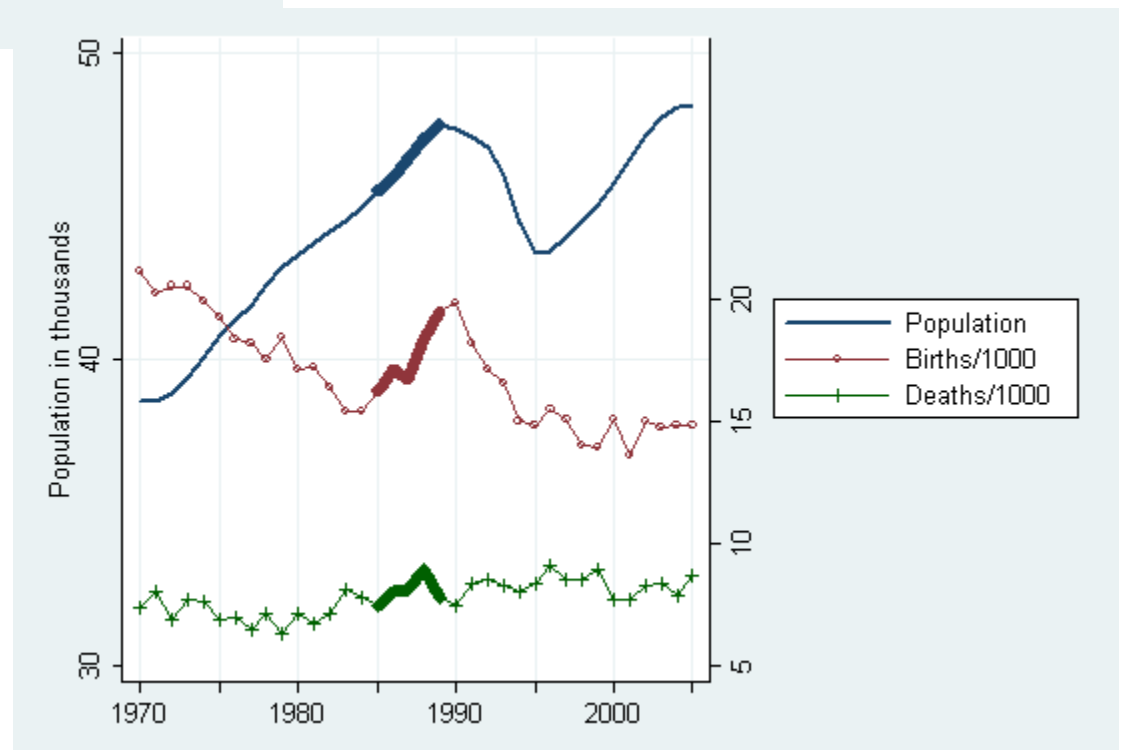
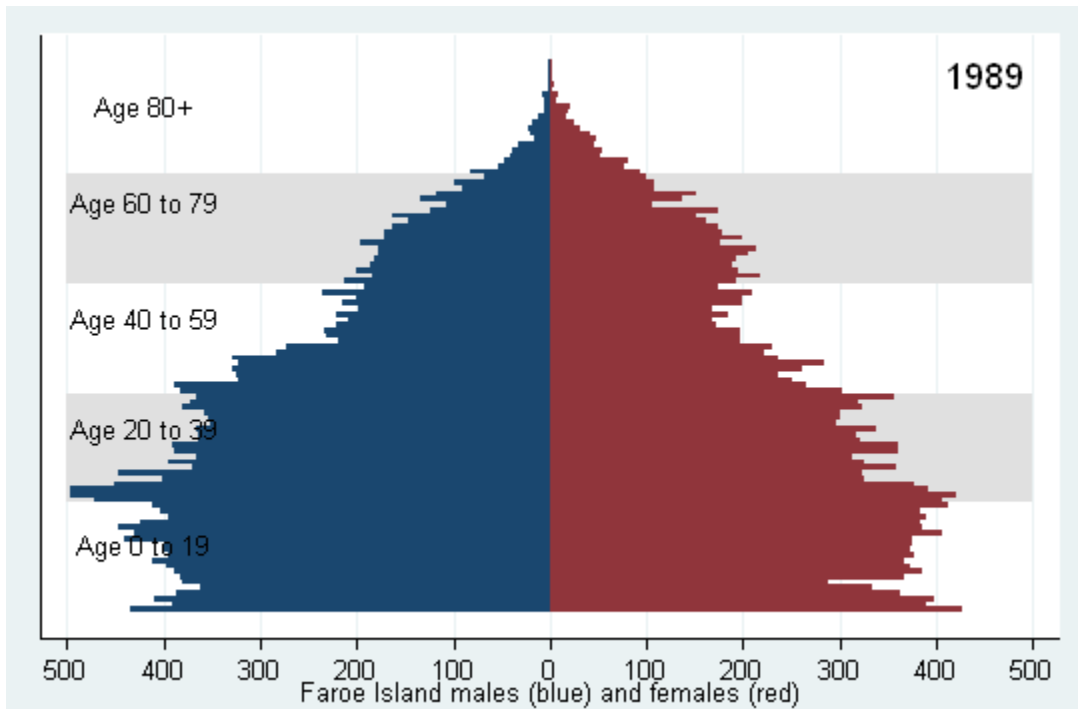
This population pyramid for 2006 shows the number of males (blue) and females (red) at each age from 0 to 101 years.

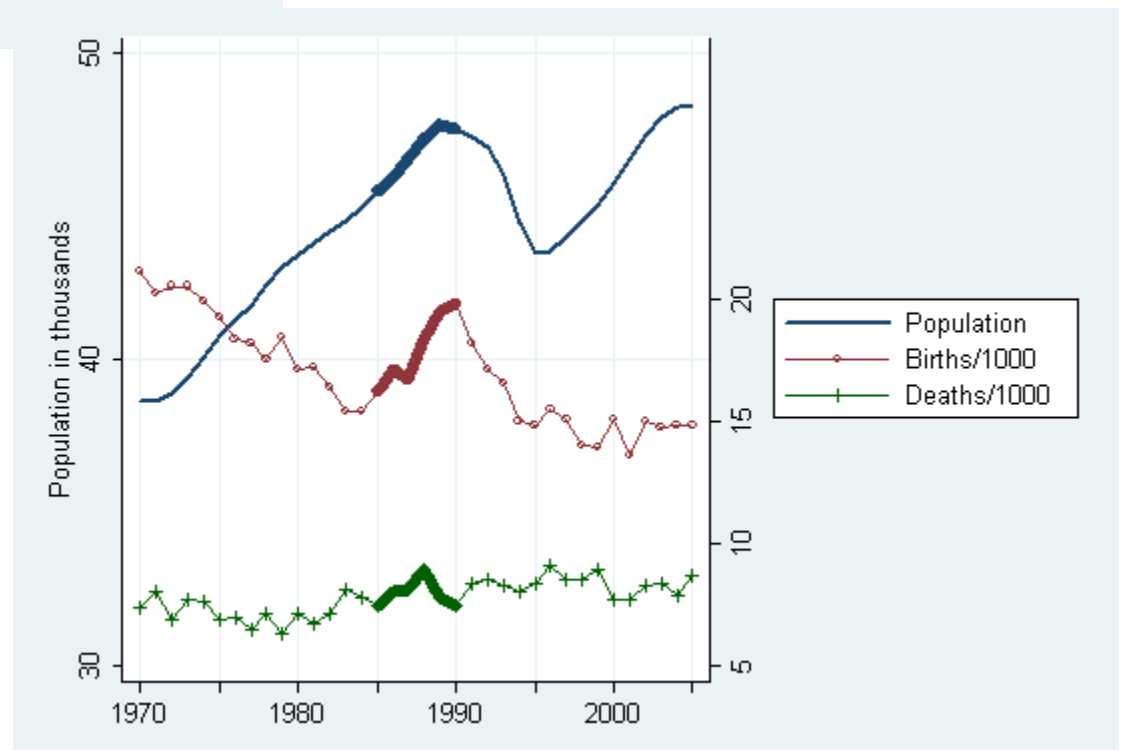
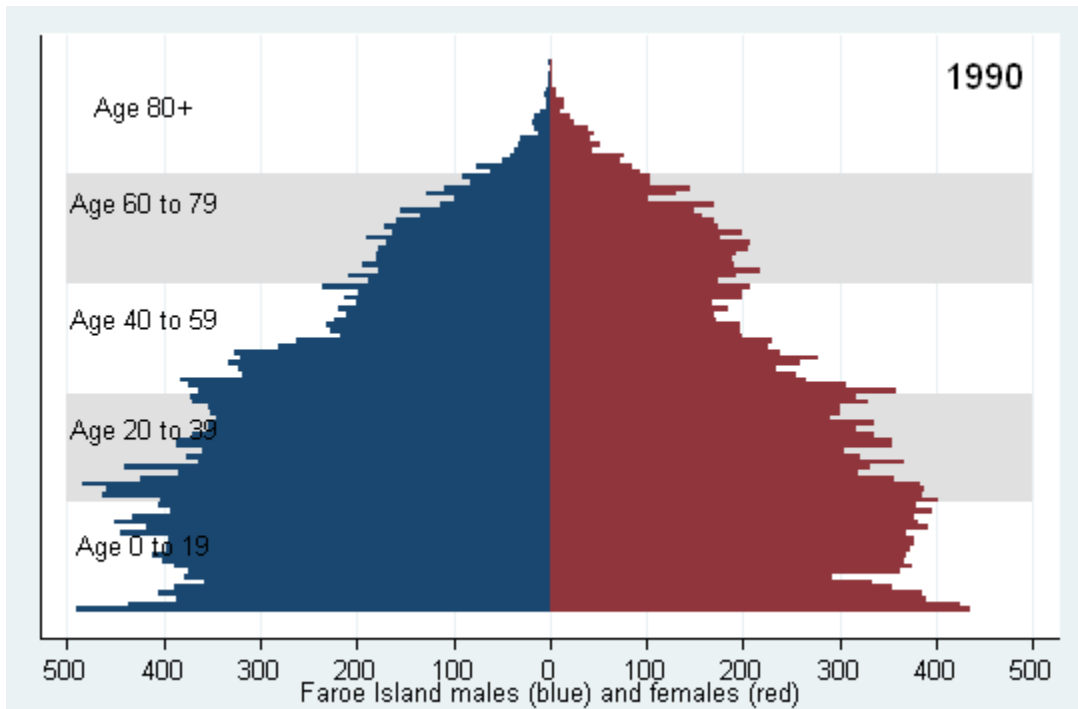


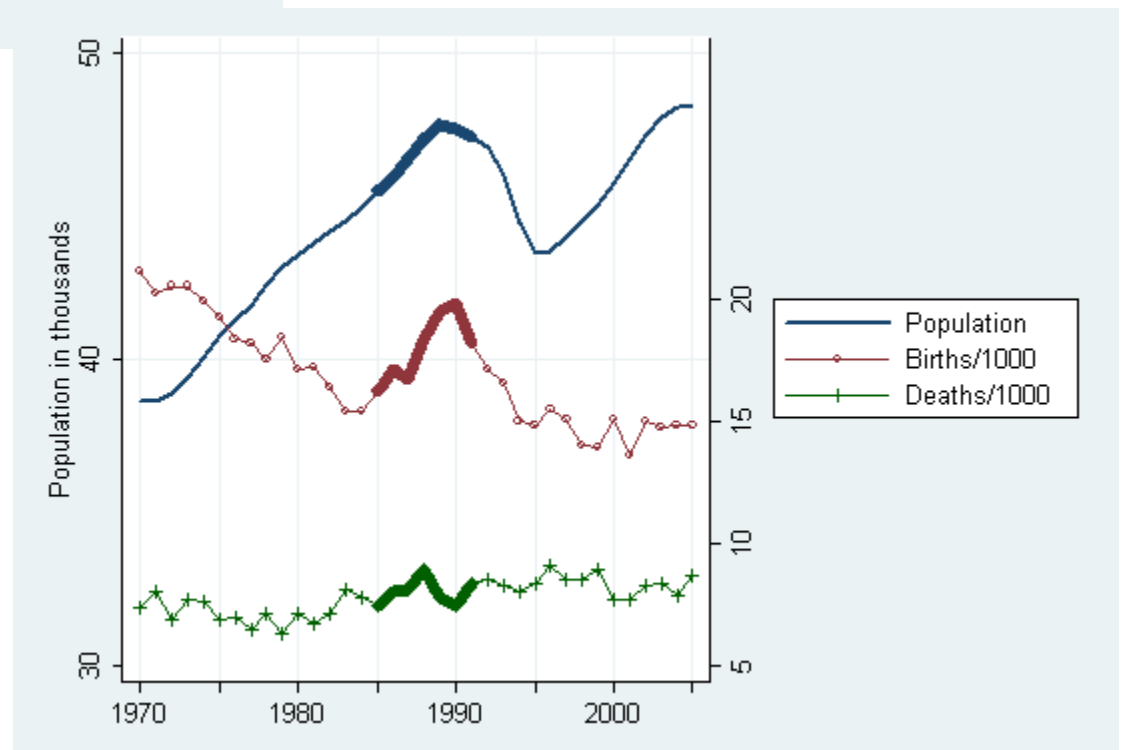
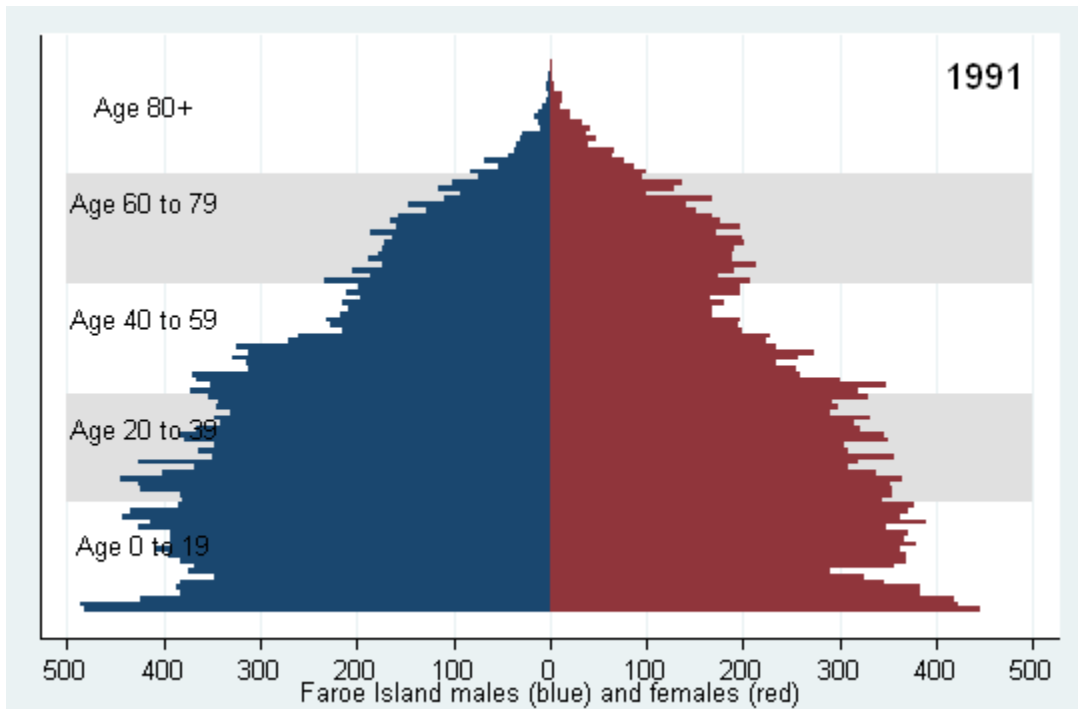


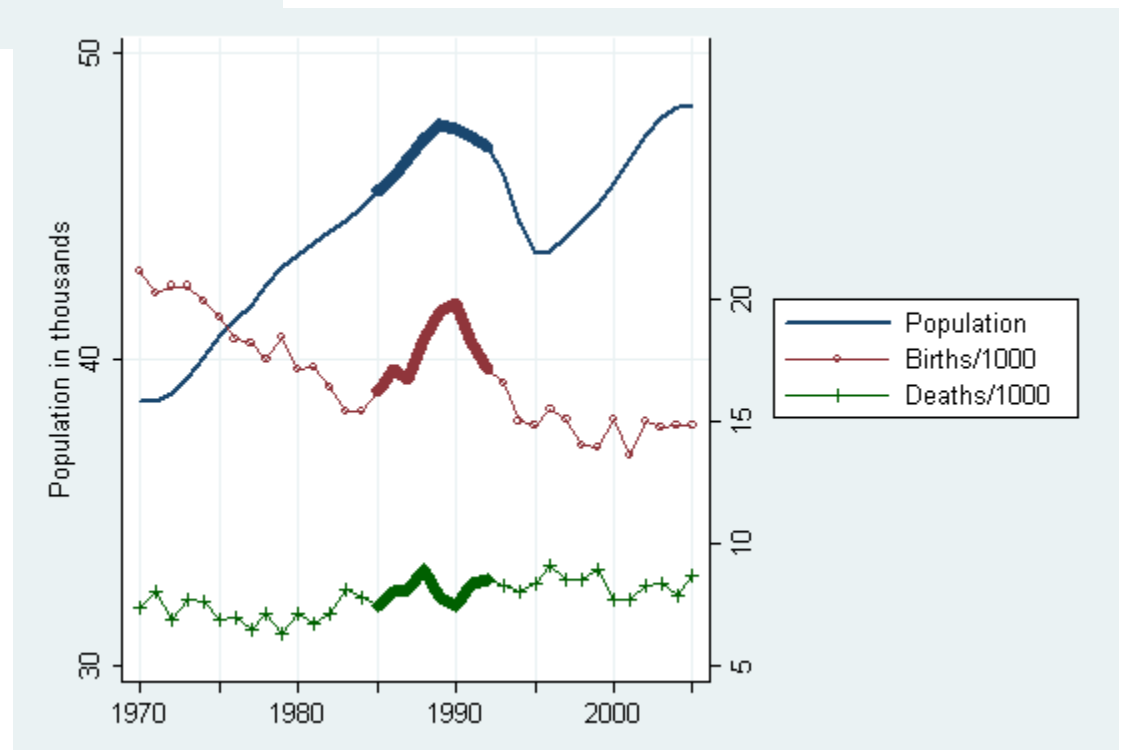
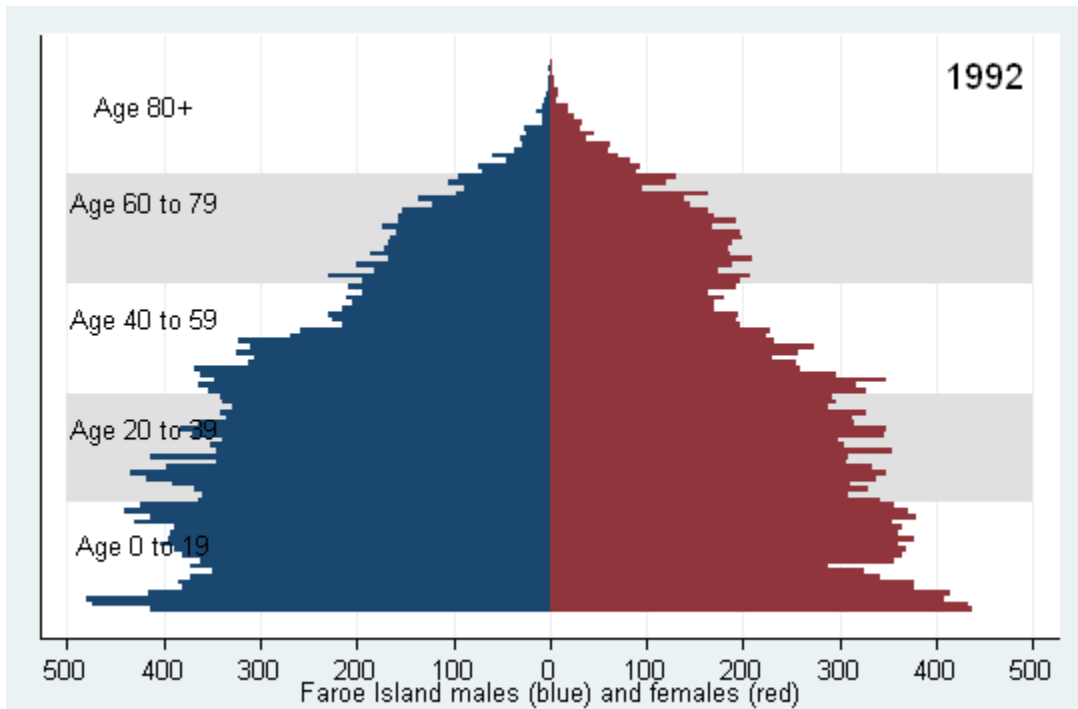


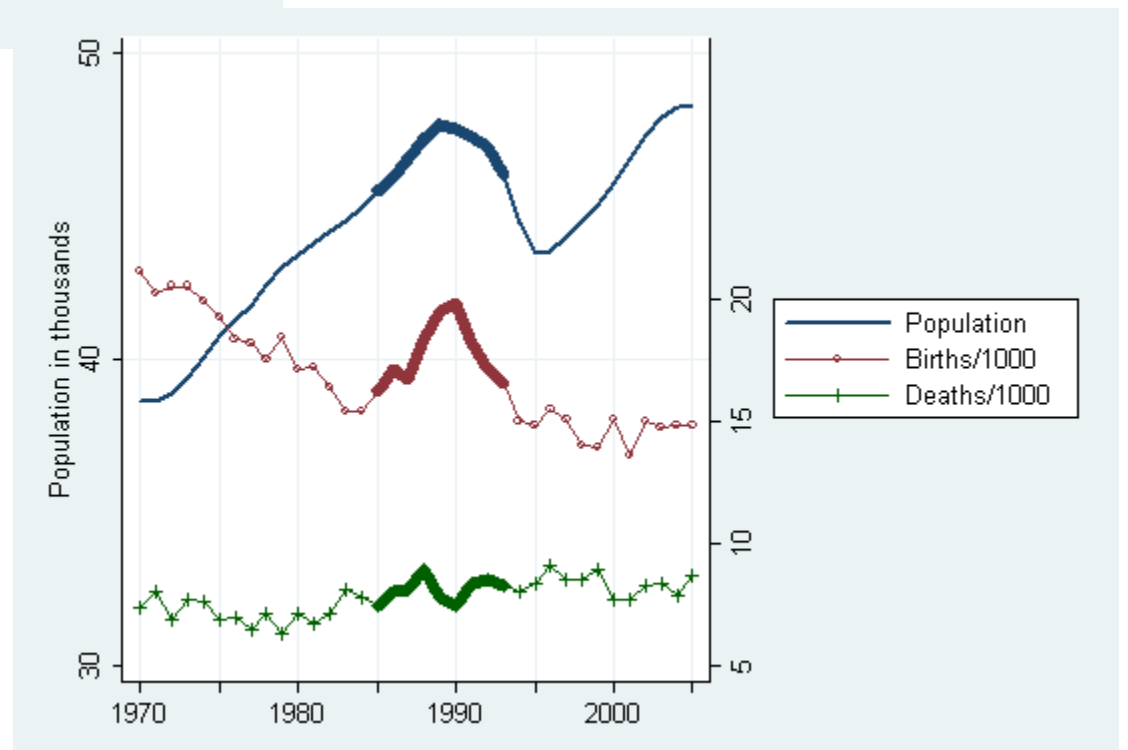
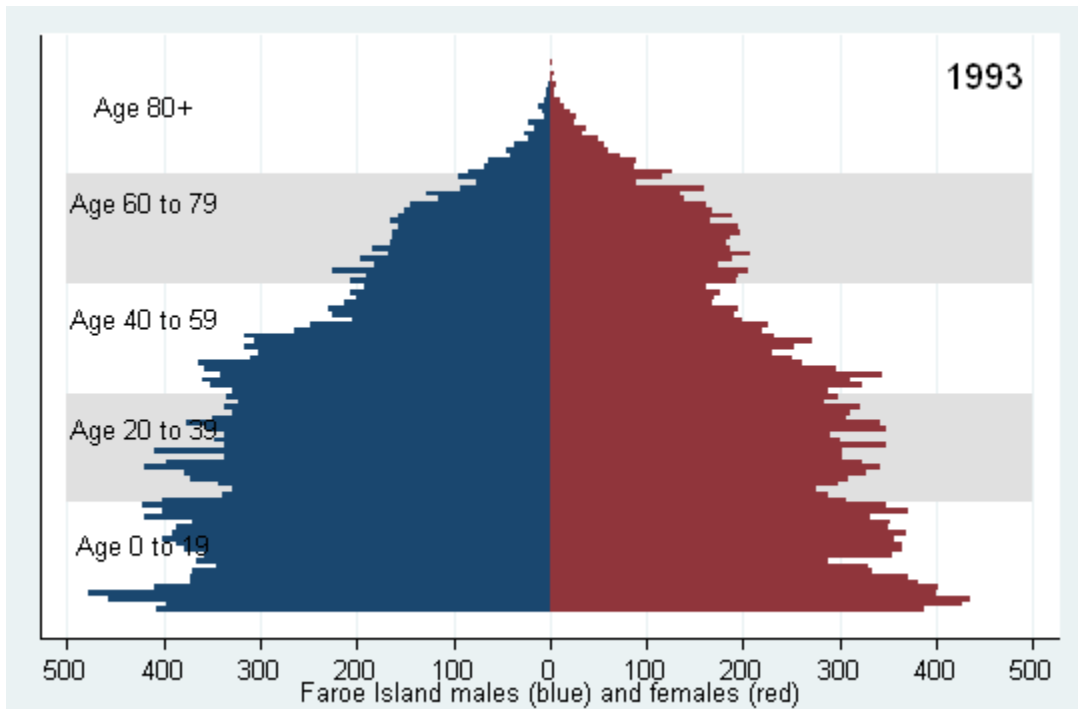


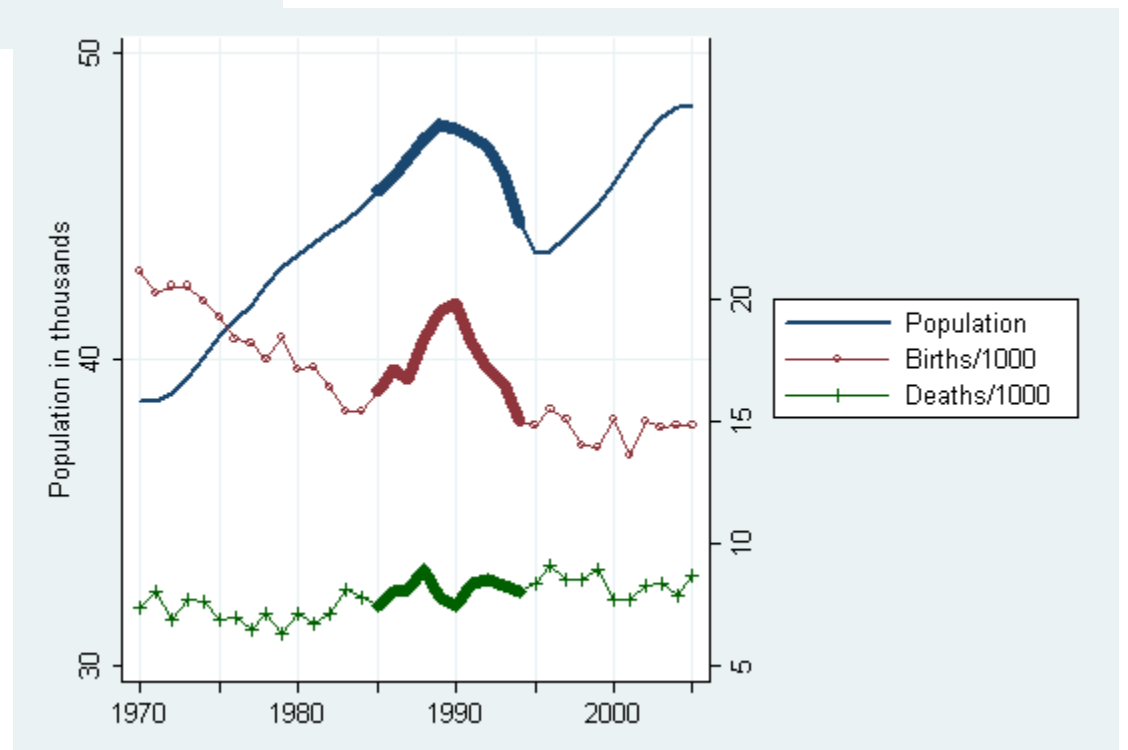
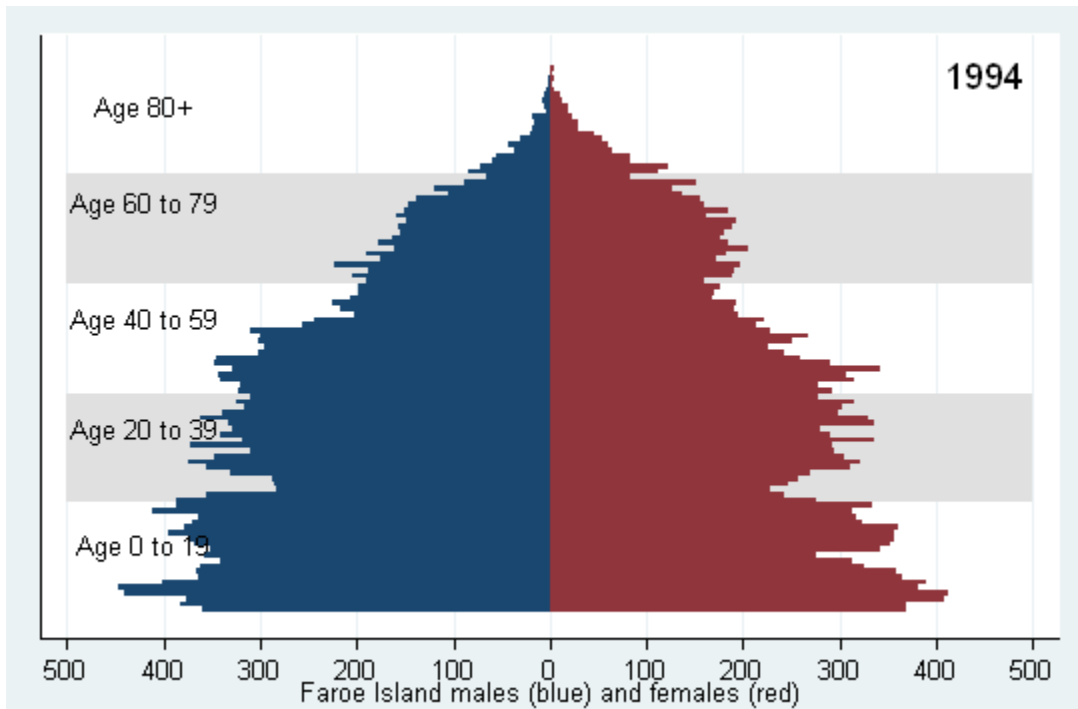


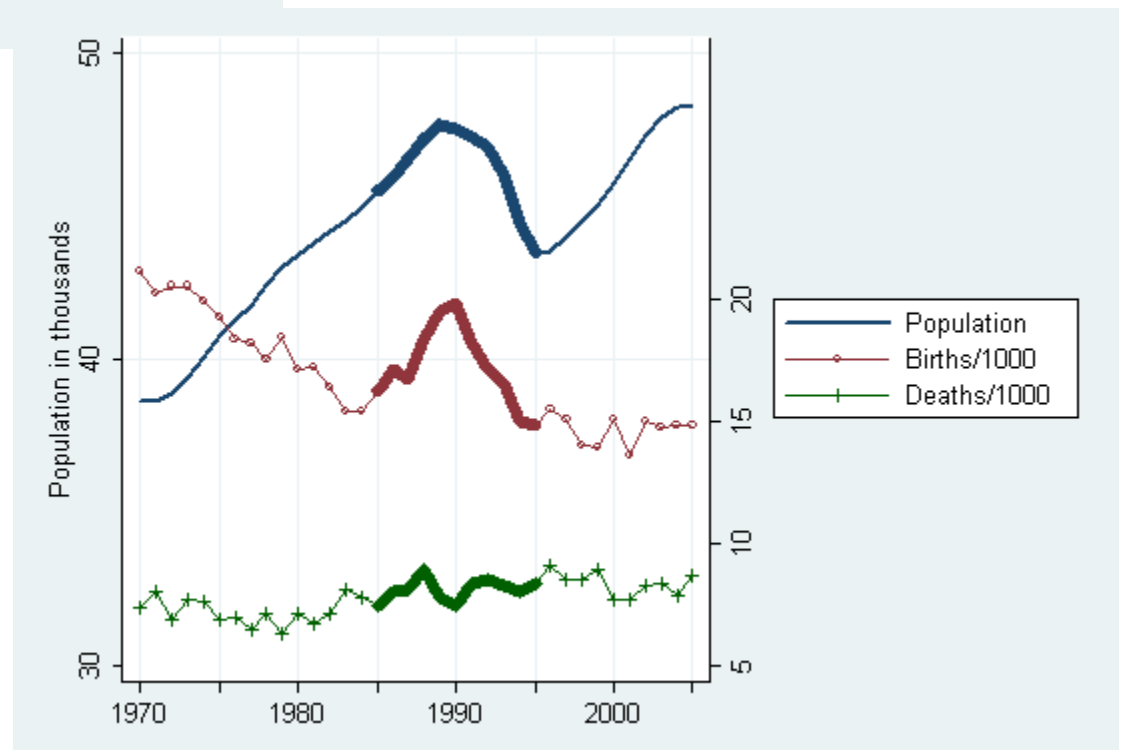
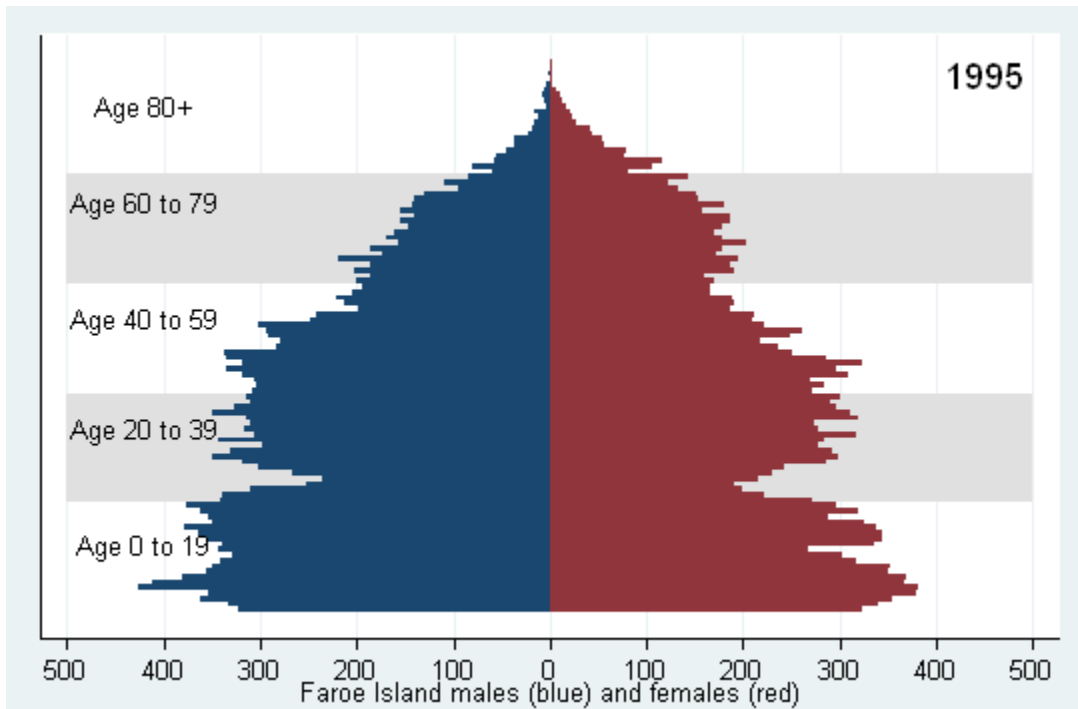


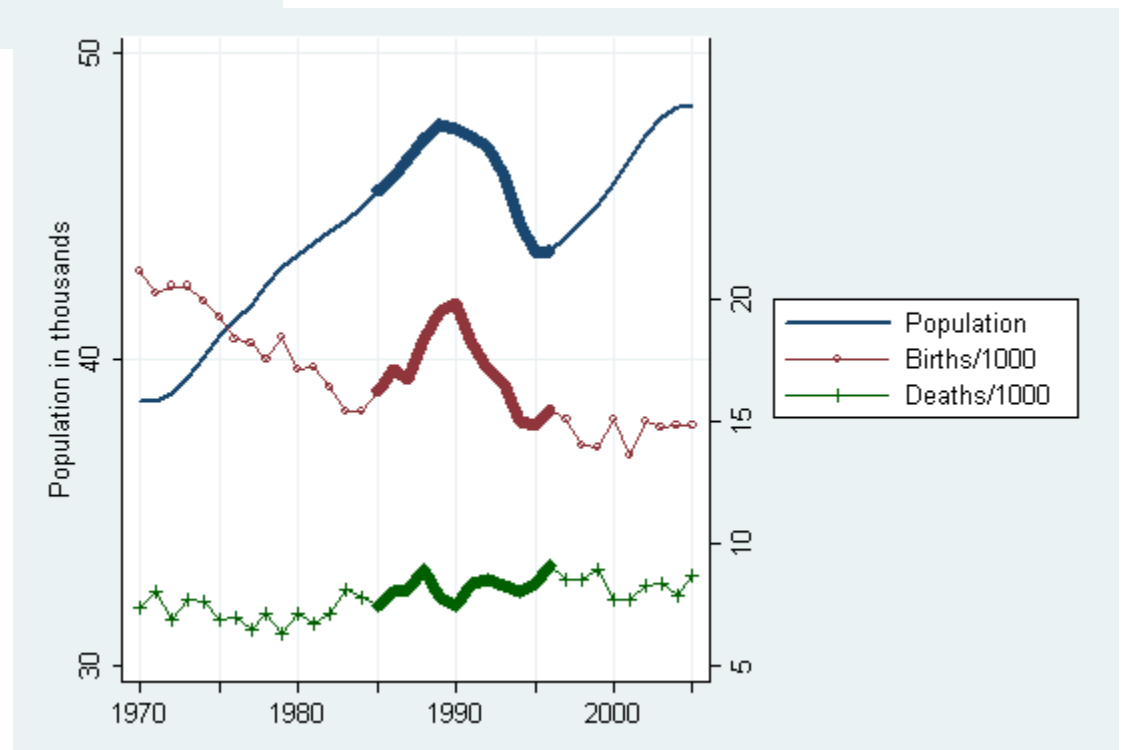
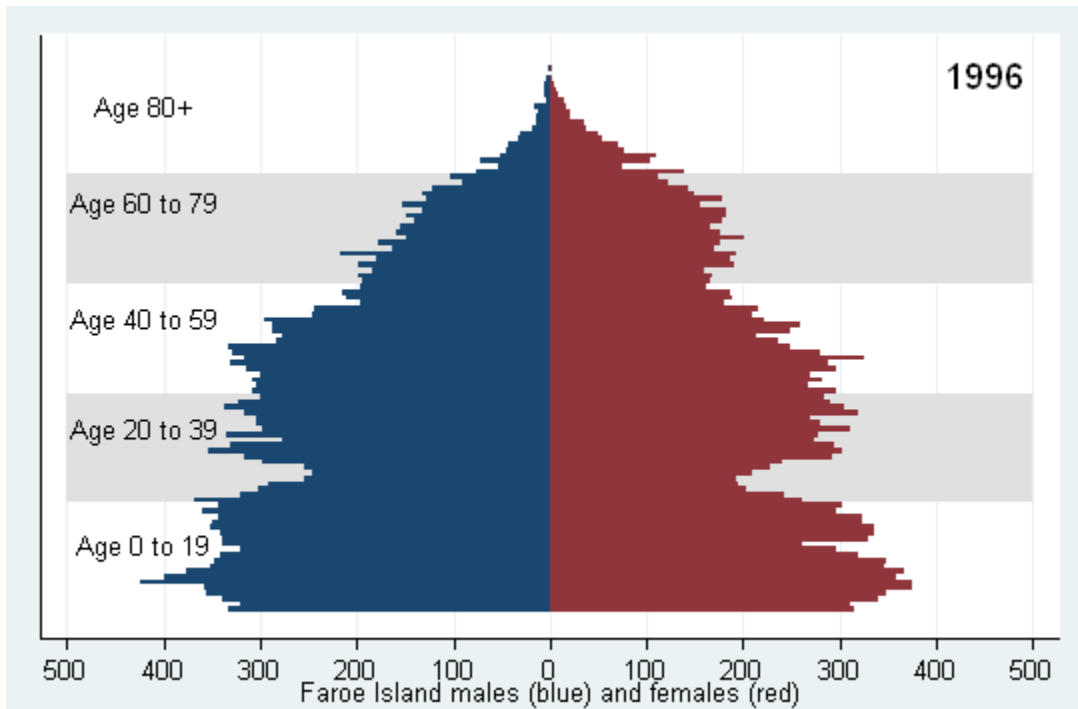


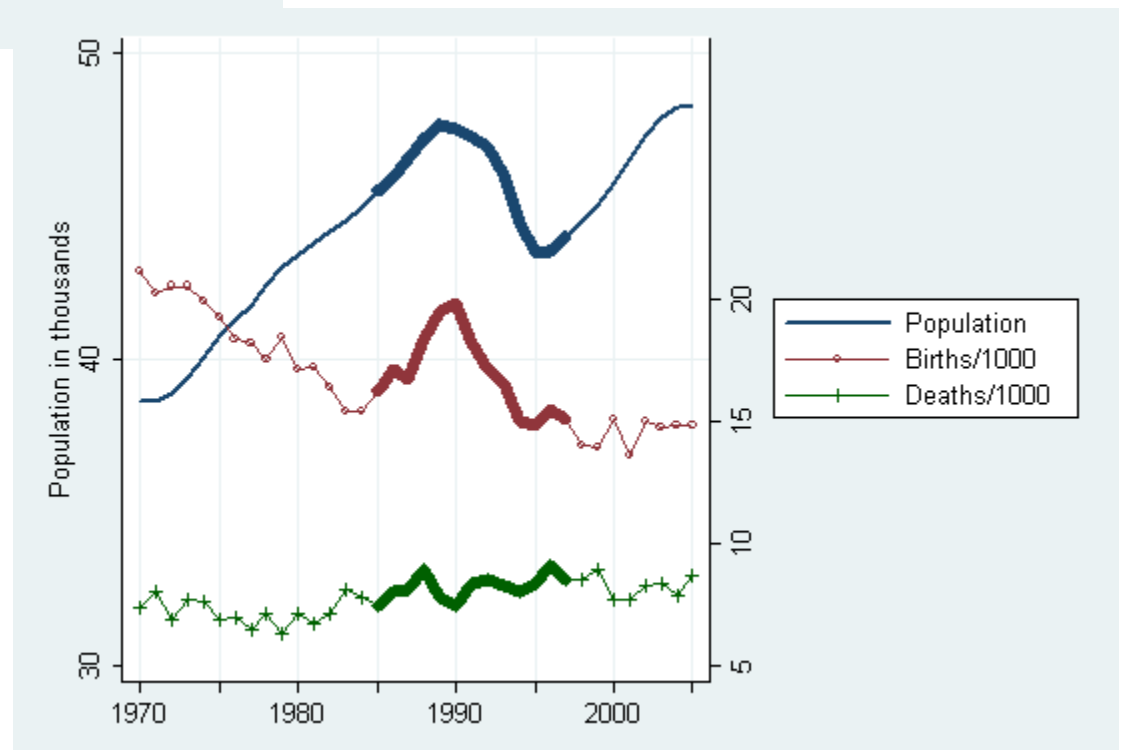
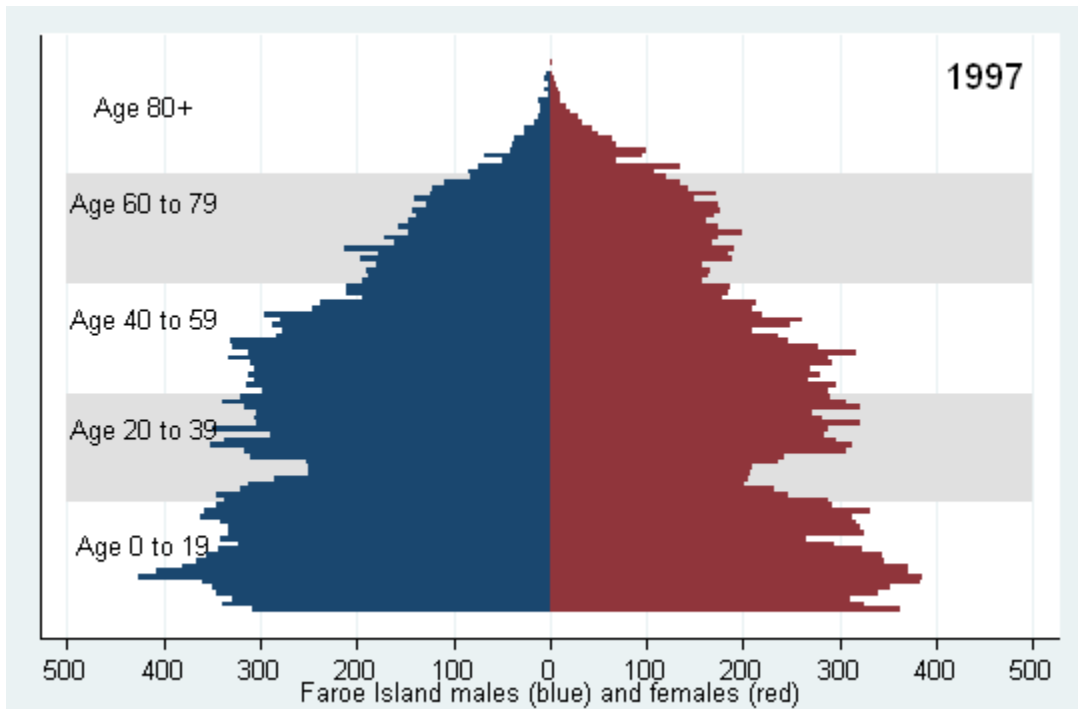


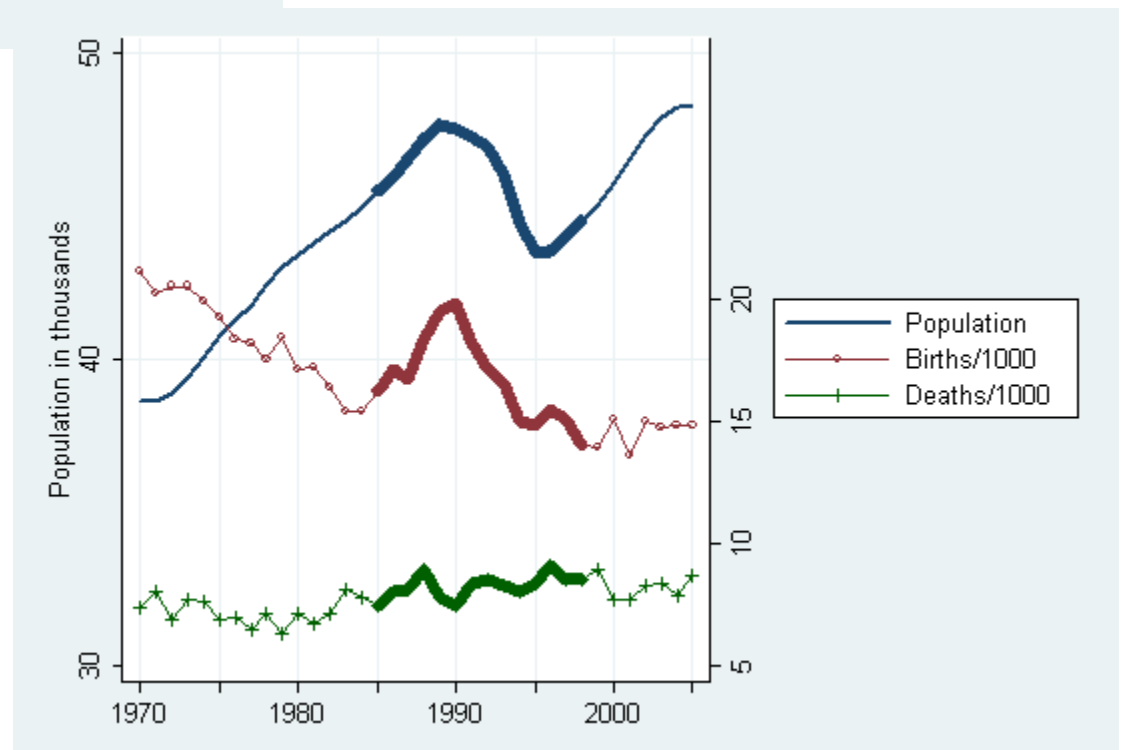
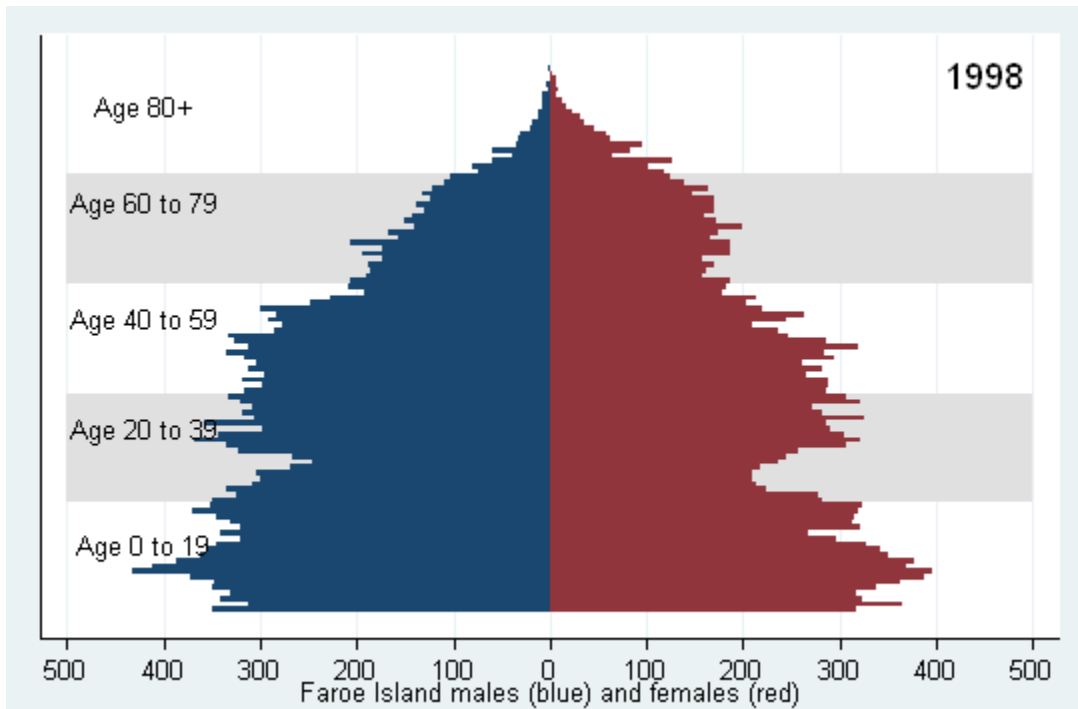


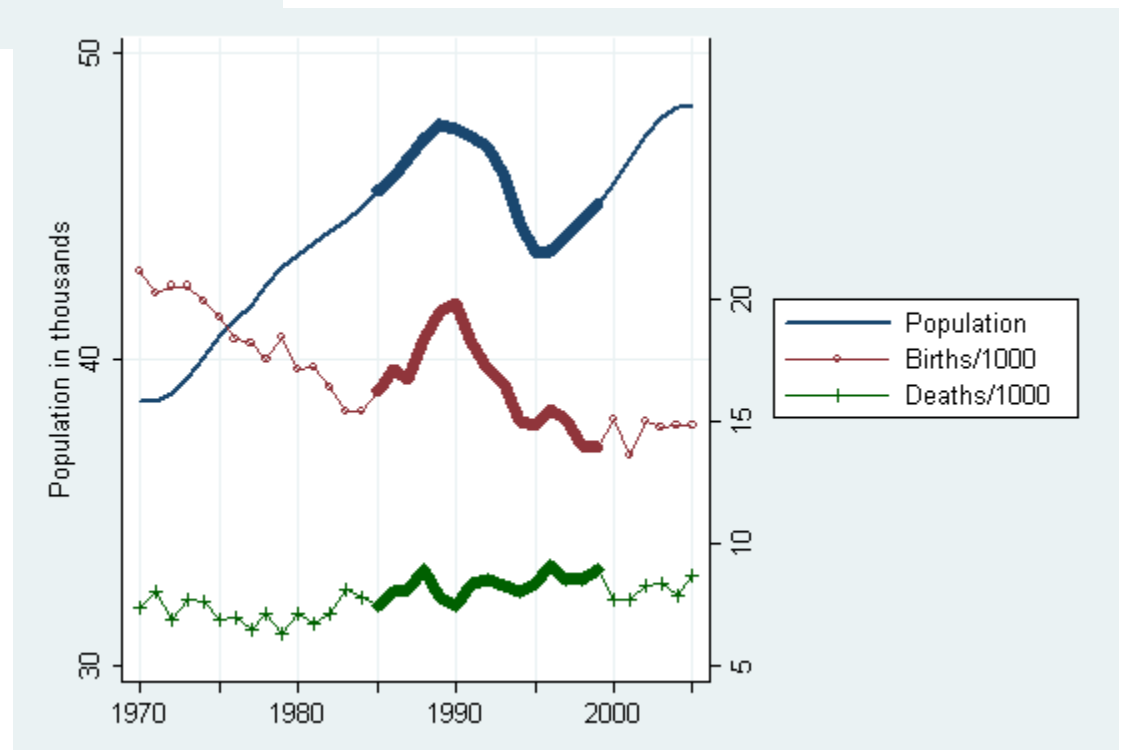
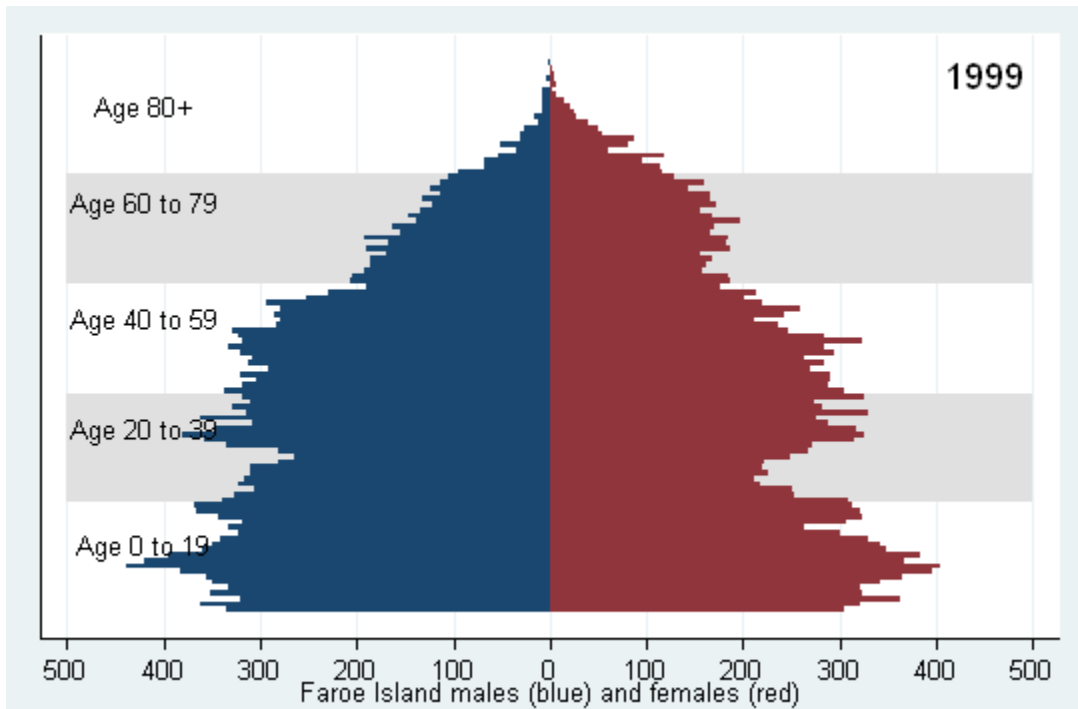


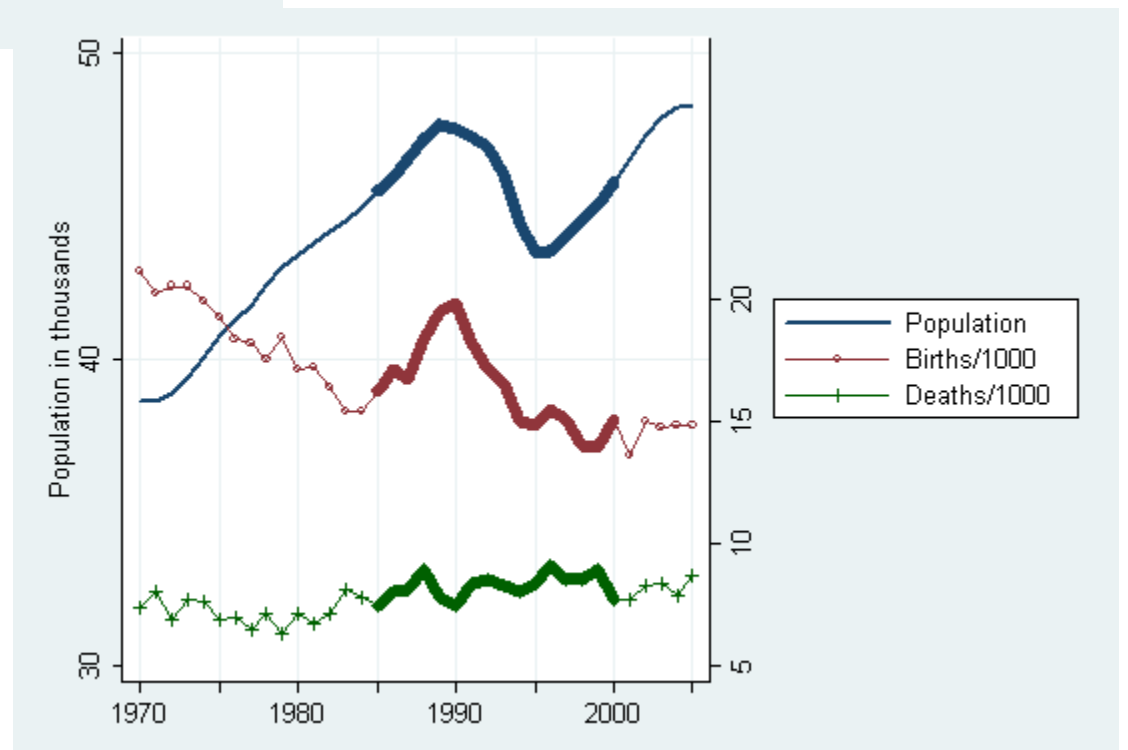
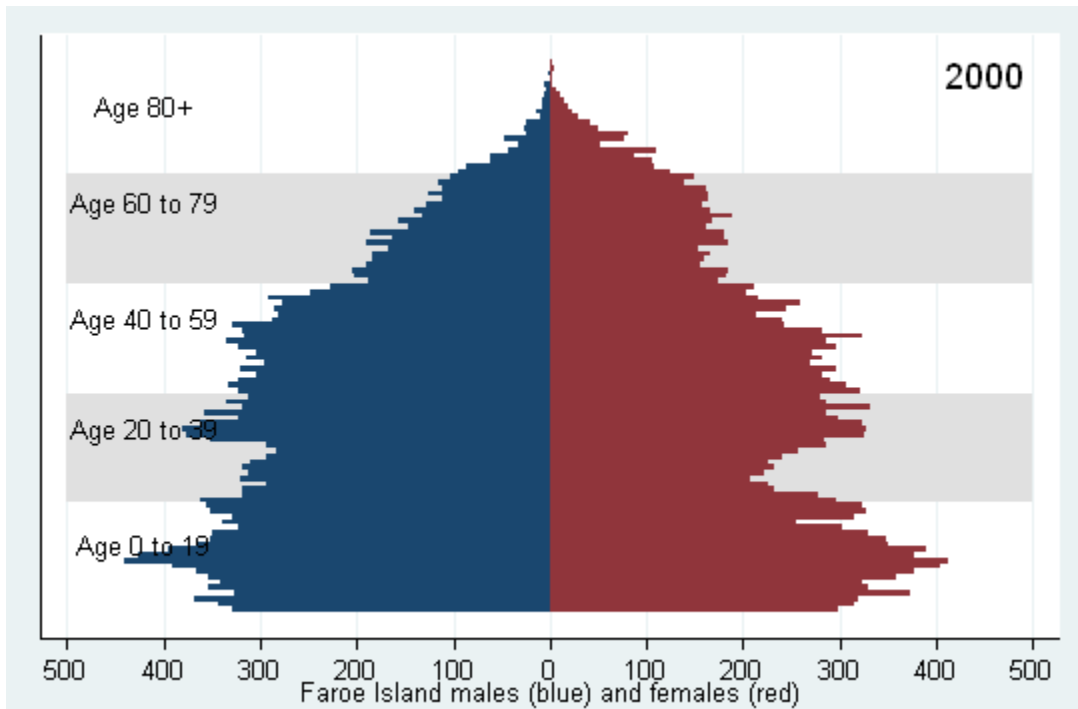


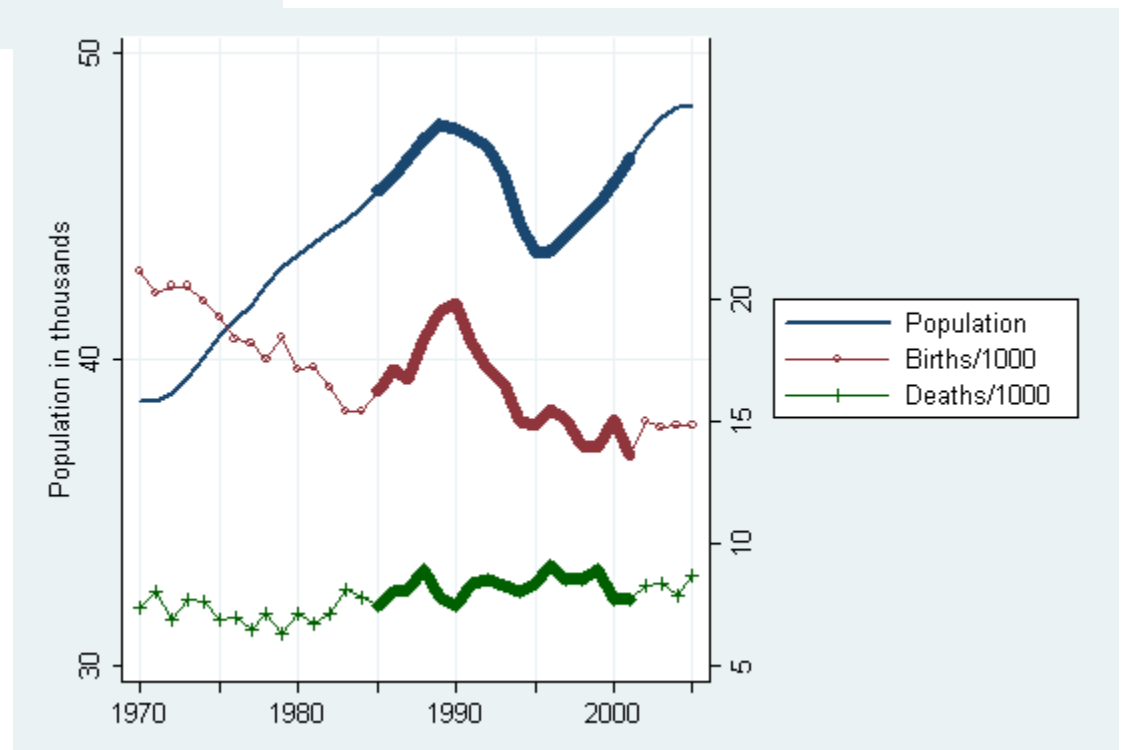
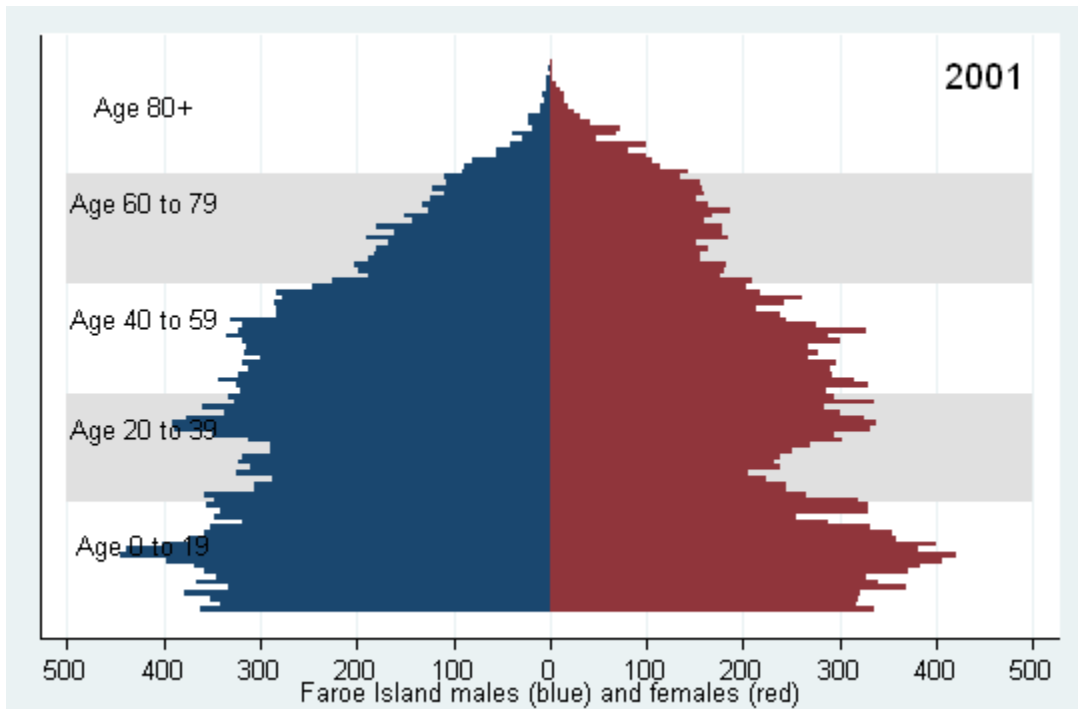


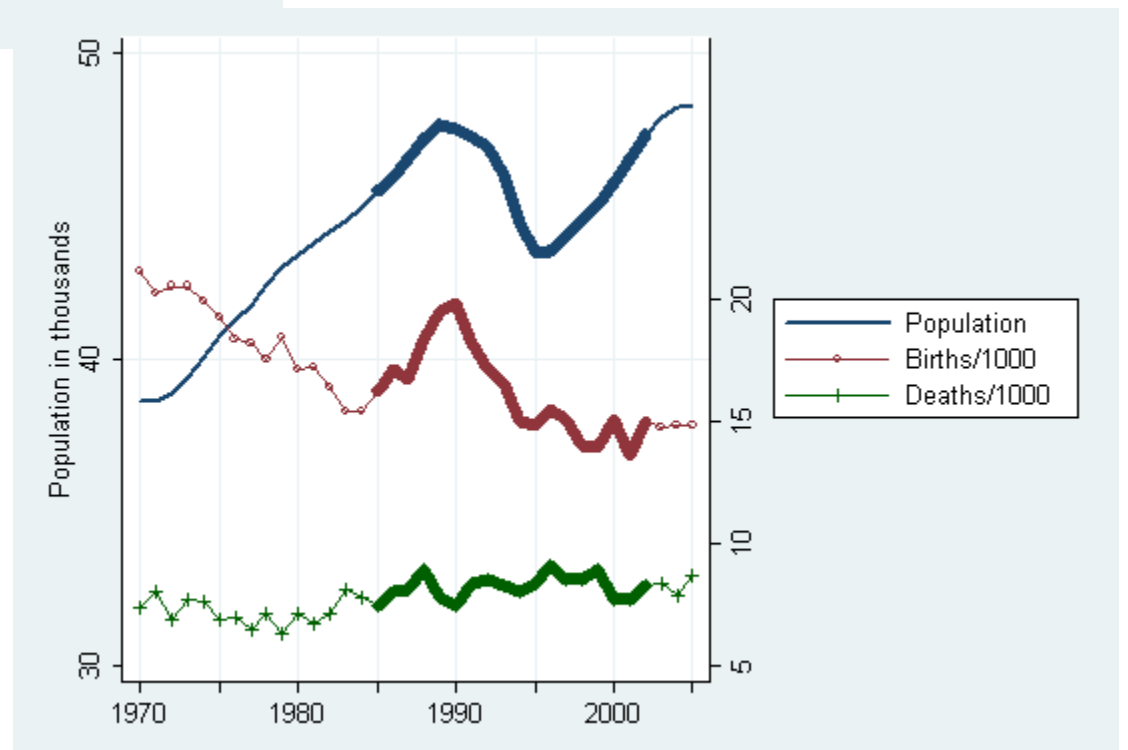
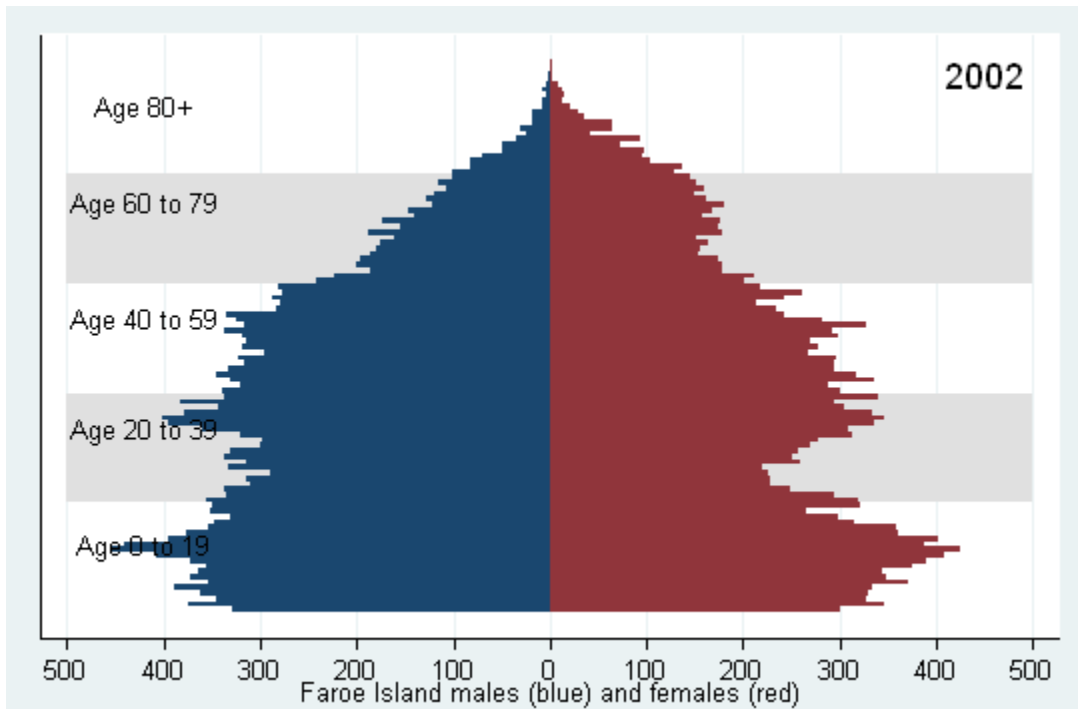


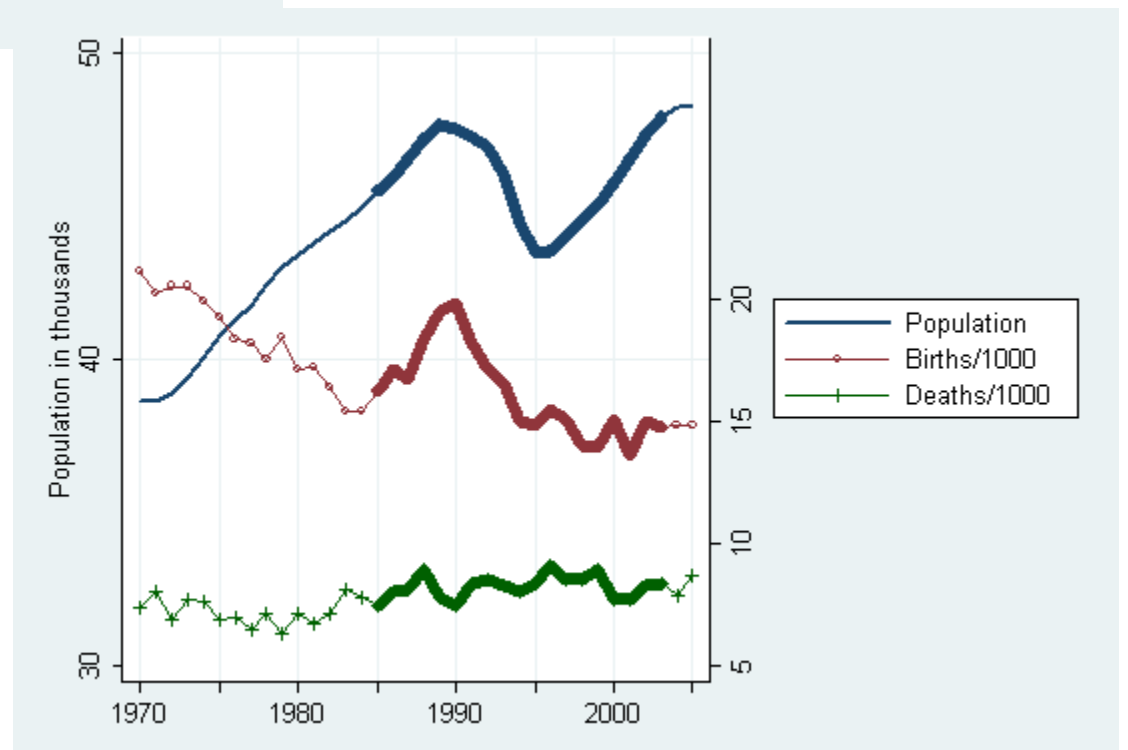
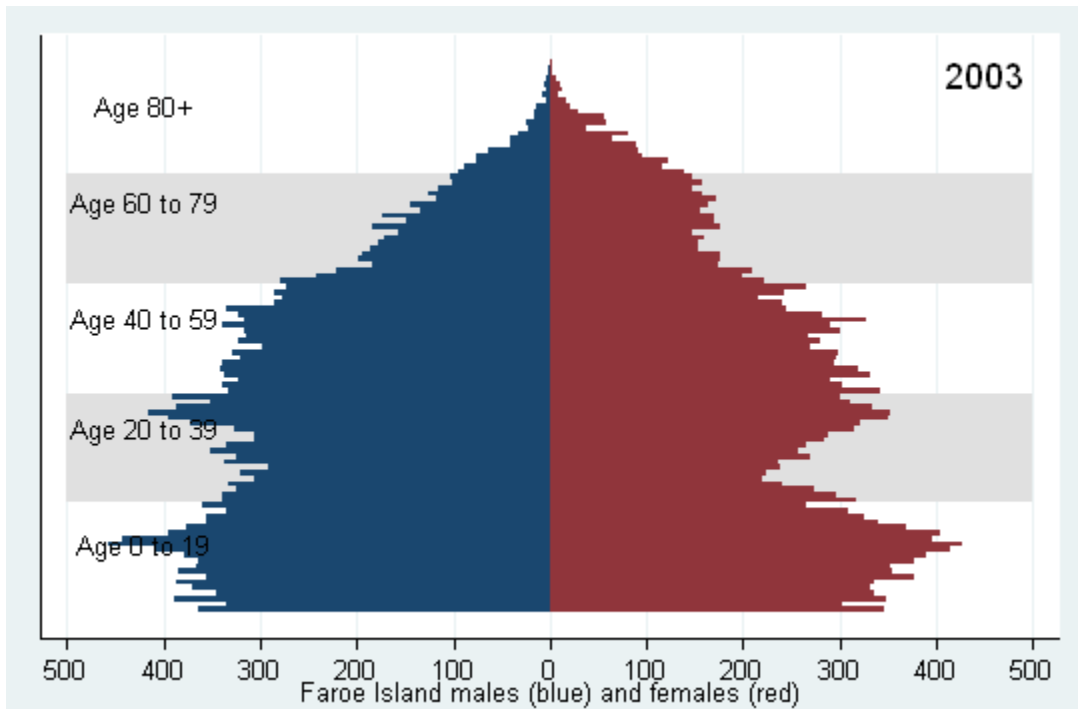


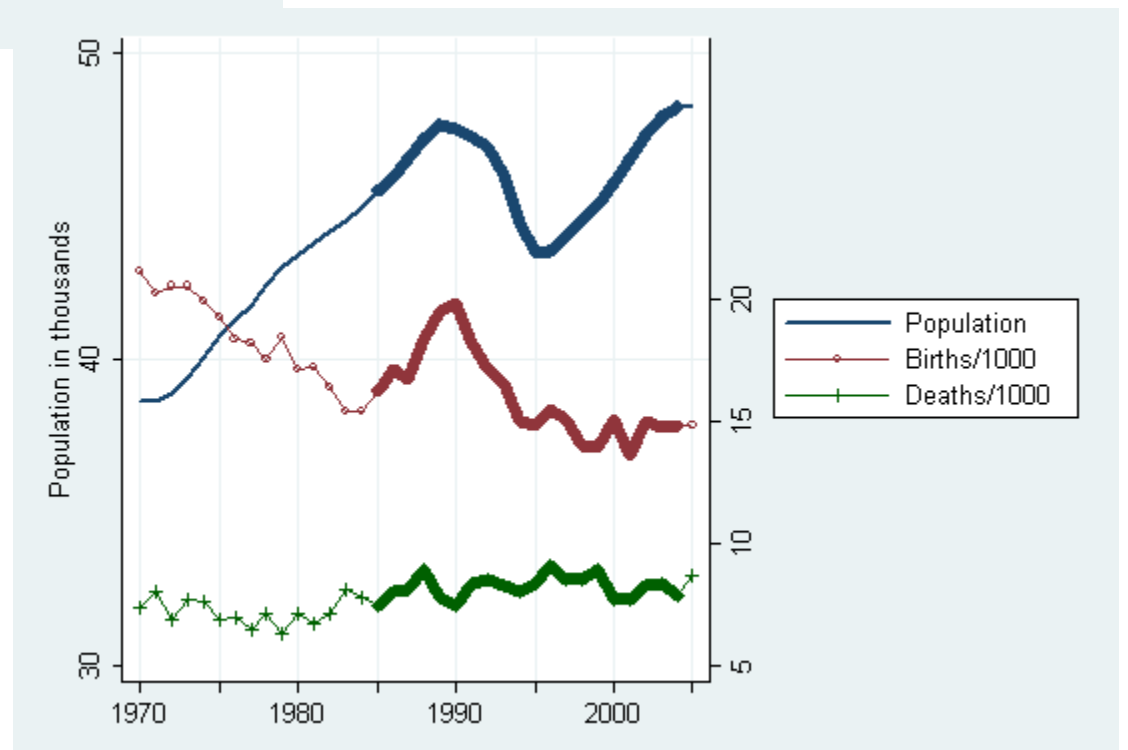
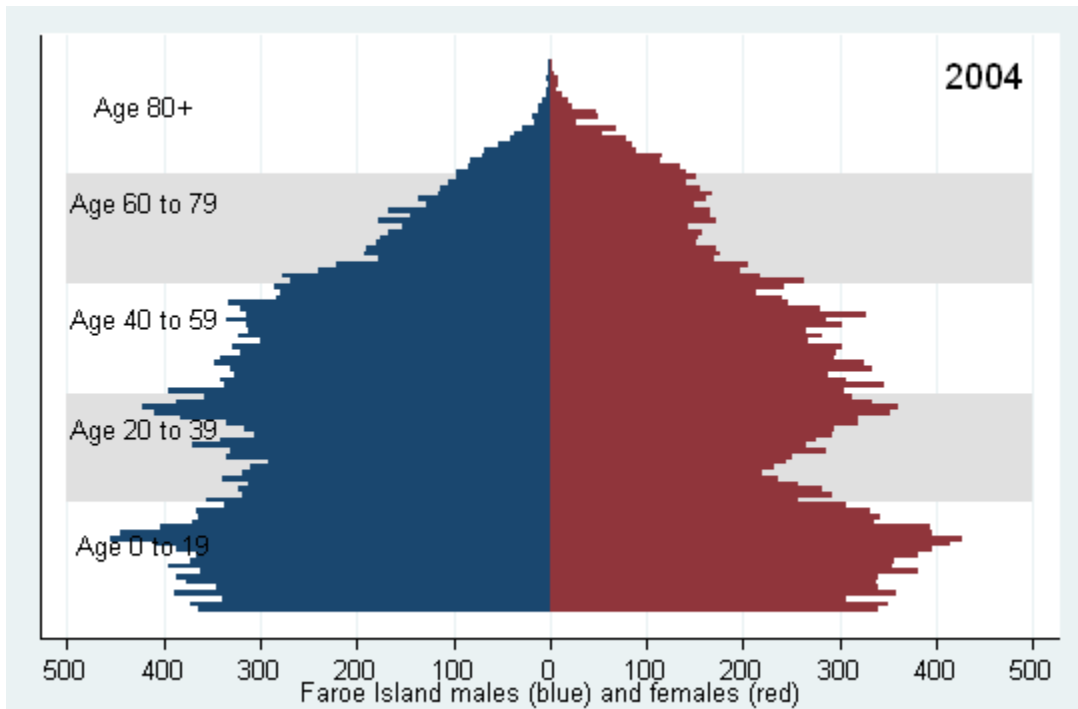


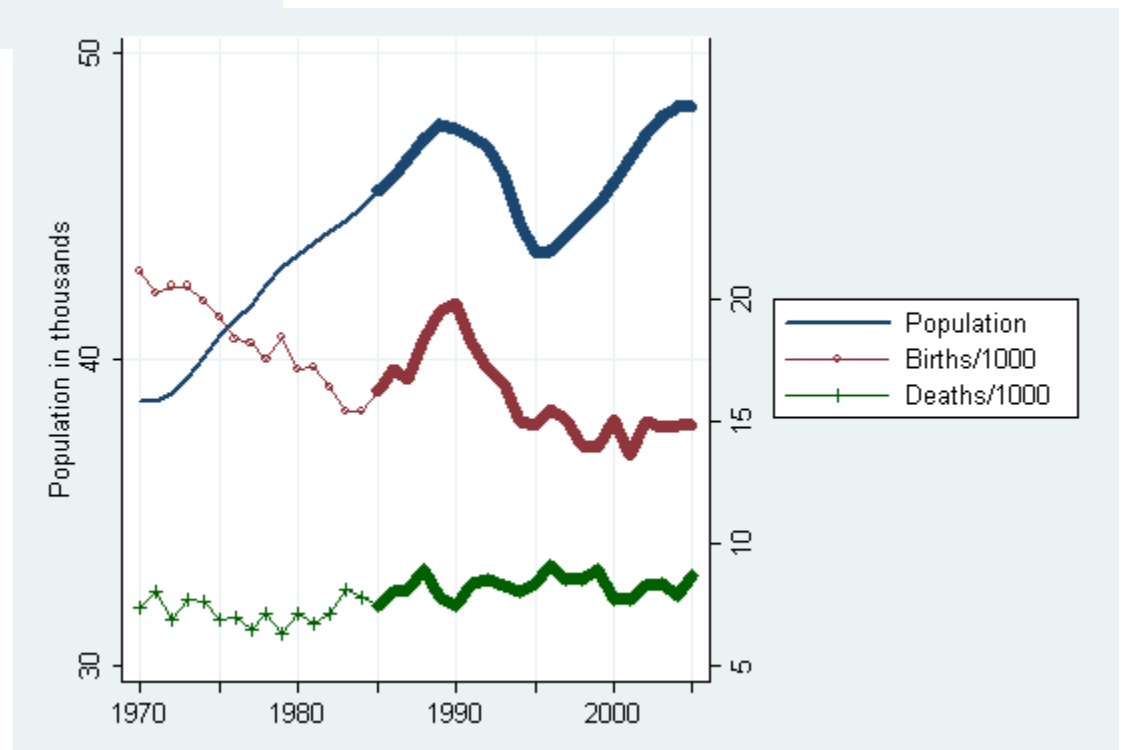
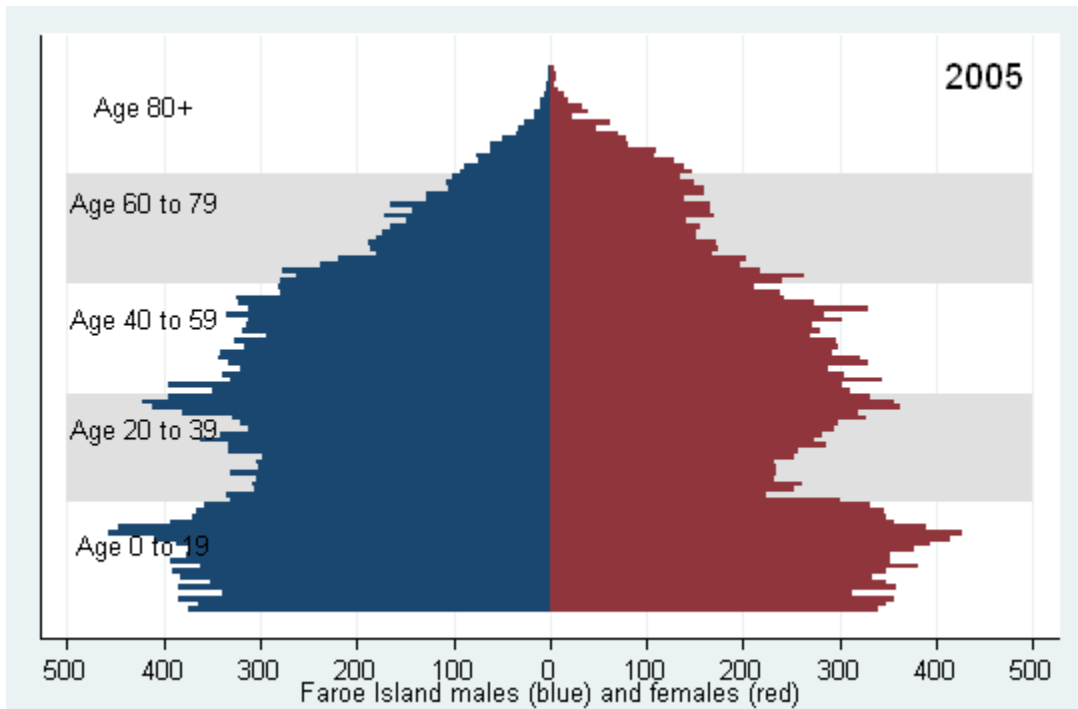


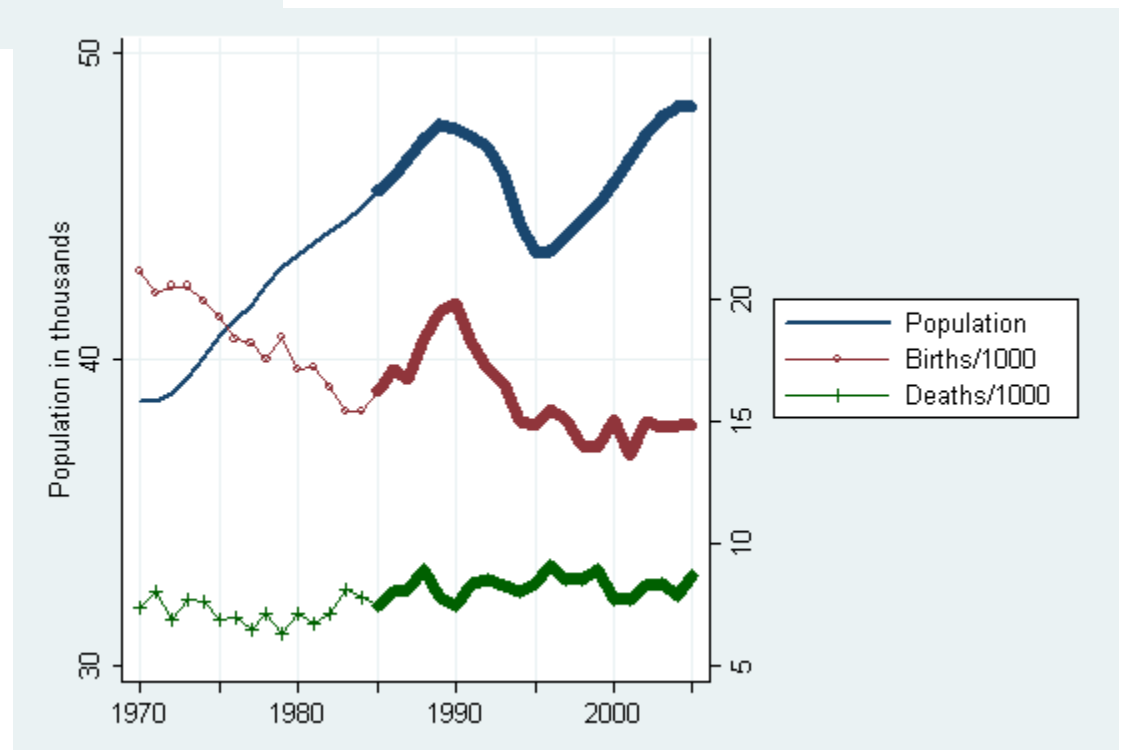
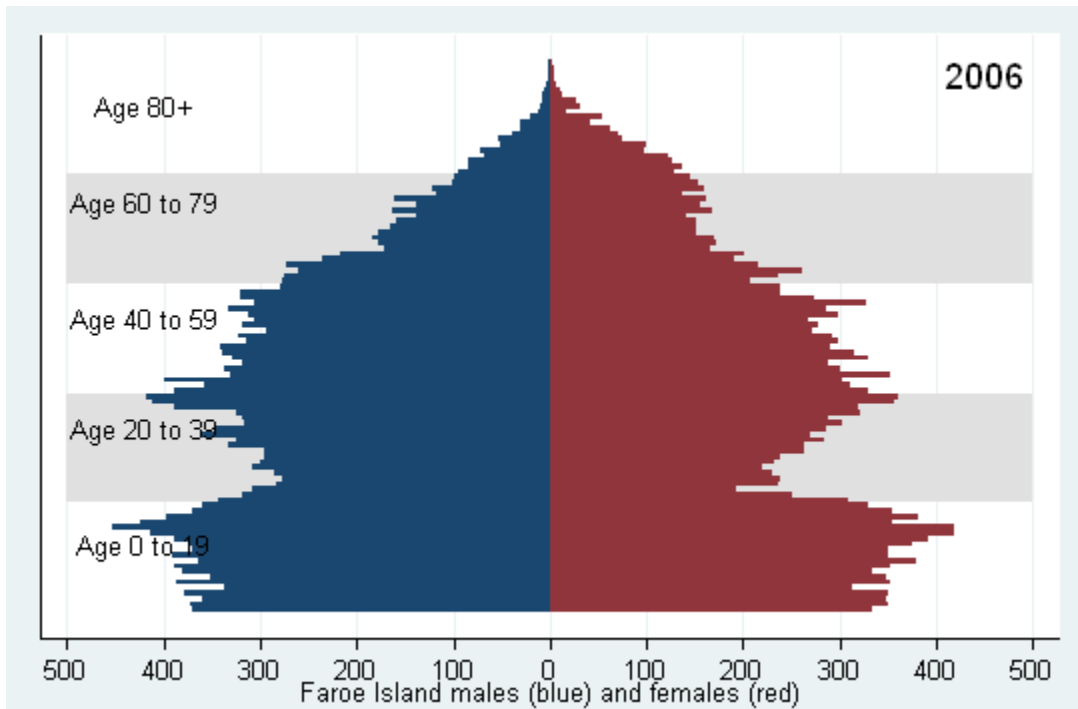


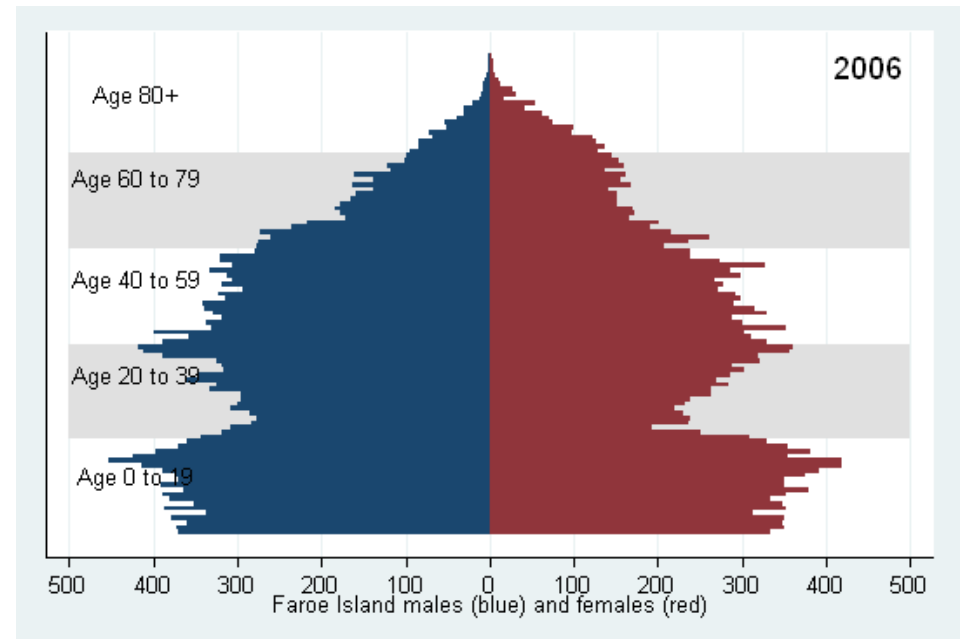
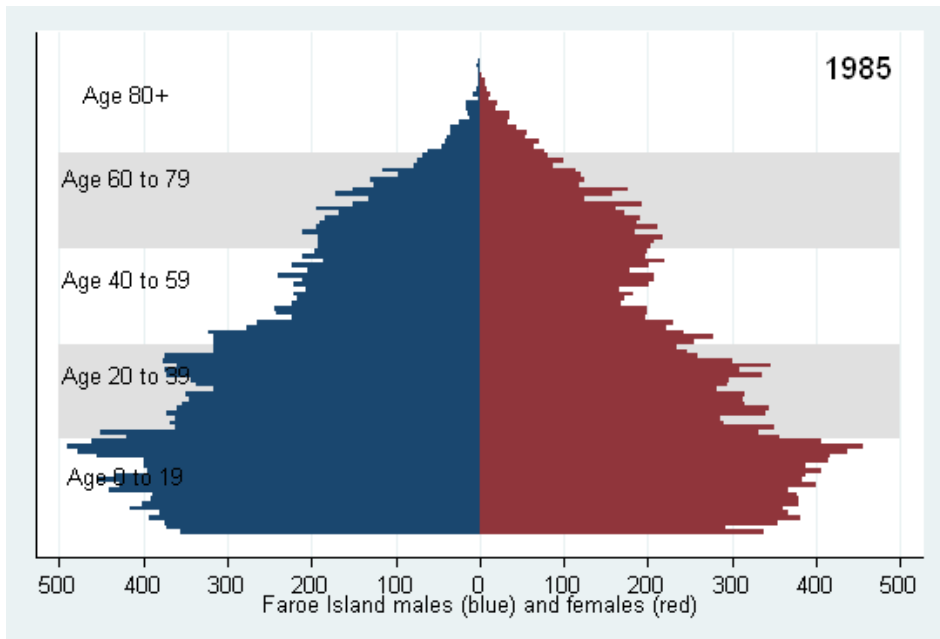




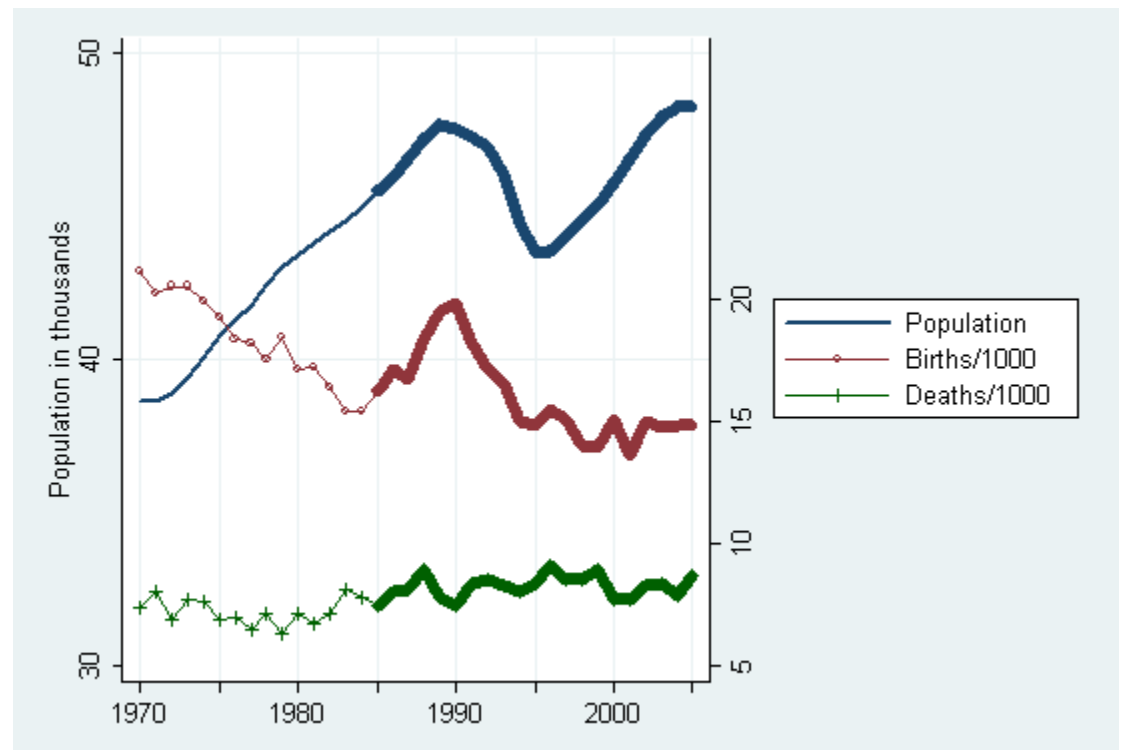








Outmigration during the Faroe Islands' fisheries crisis noticeably reduced younger cohorts born after about 1965, and left older cohorts proportionally more dominant.



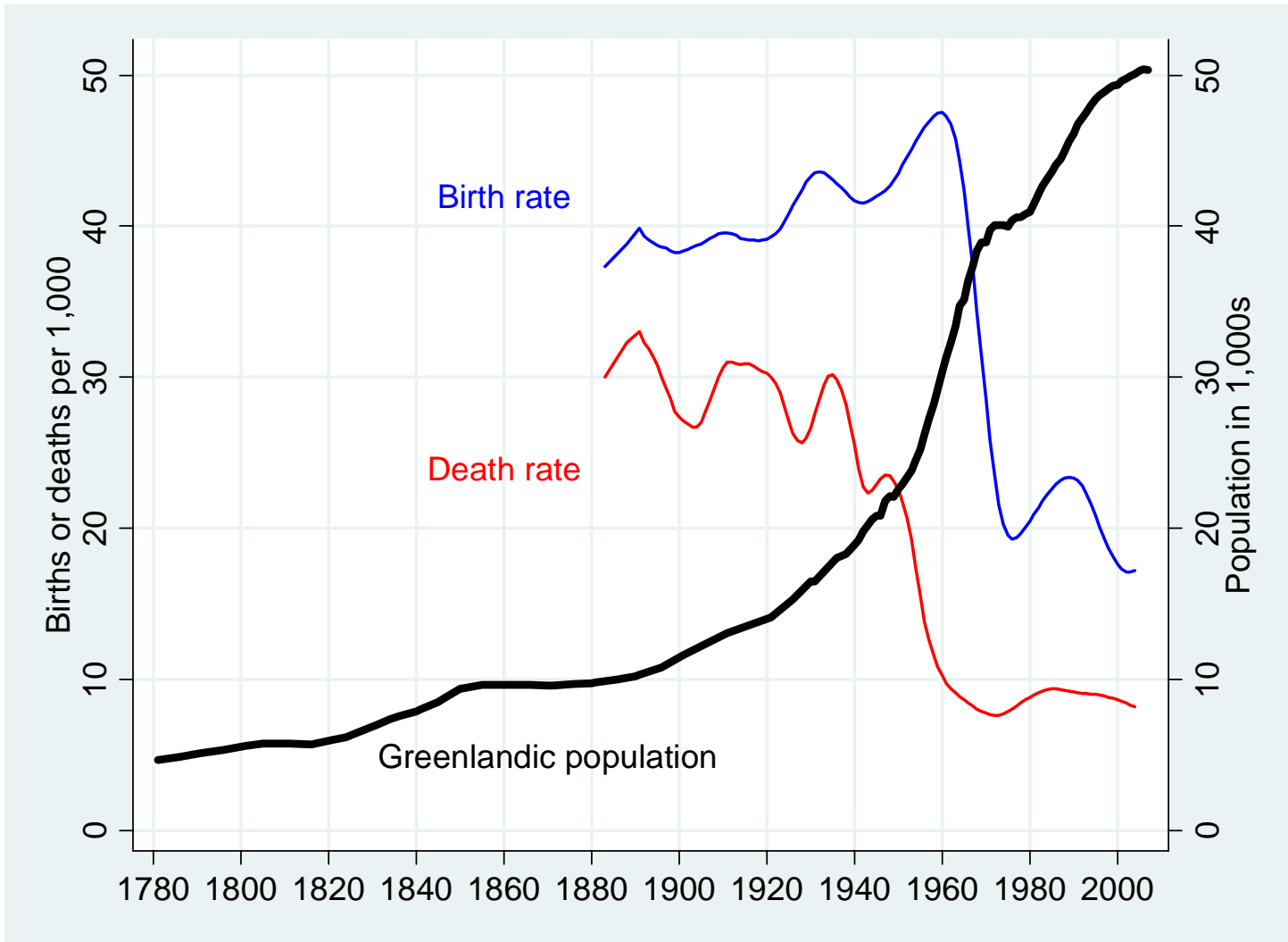
Hamilton et al. (2004) “Migration from resource depletion: The case of the Faroe Islands.” *Society and Natural Resources*.



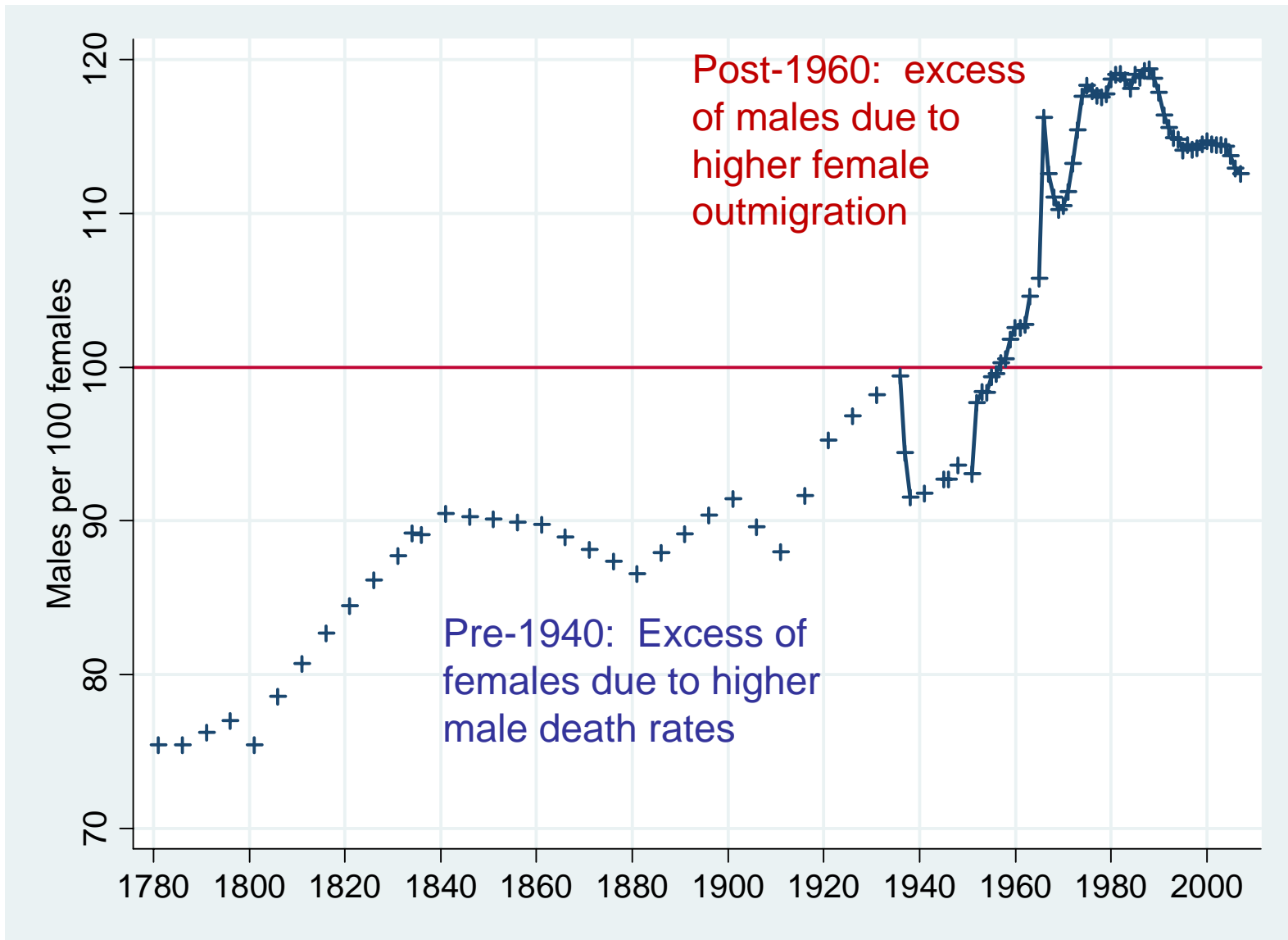
Greenland's transitions from seal hunting to cod (1920–1980), and from cod fishing to shrimp (1980–2000)



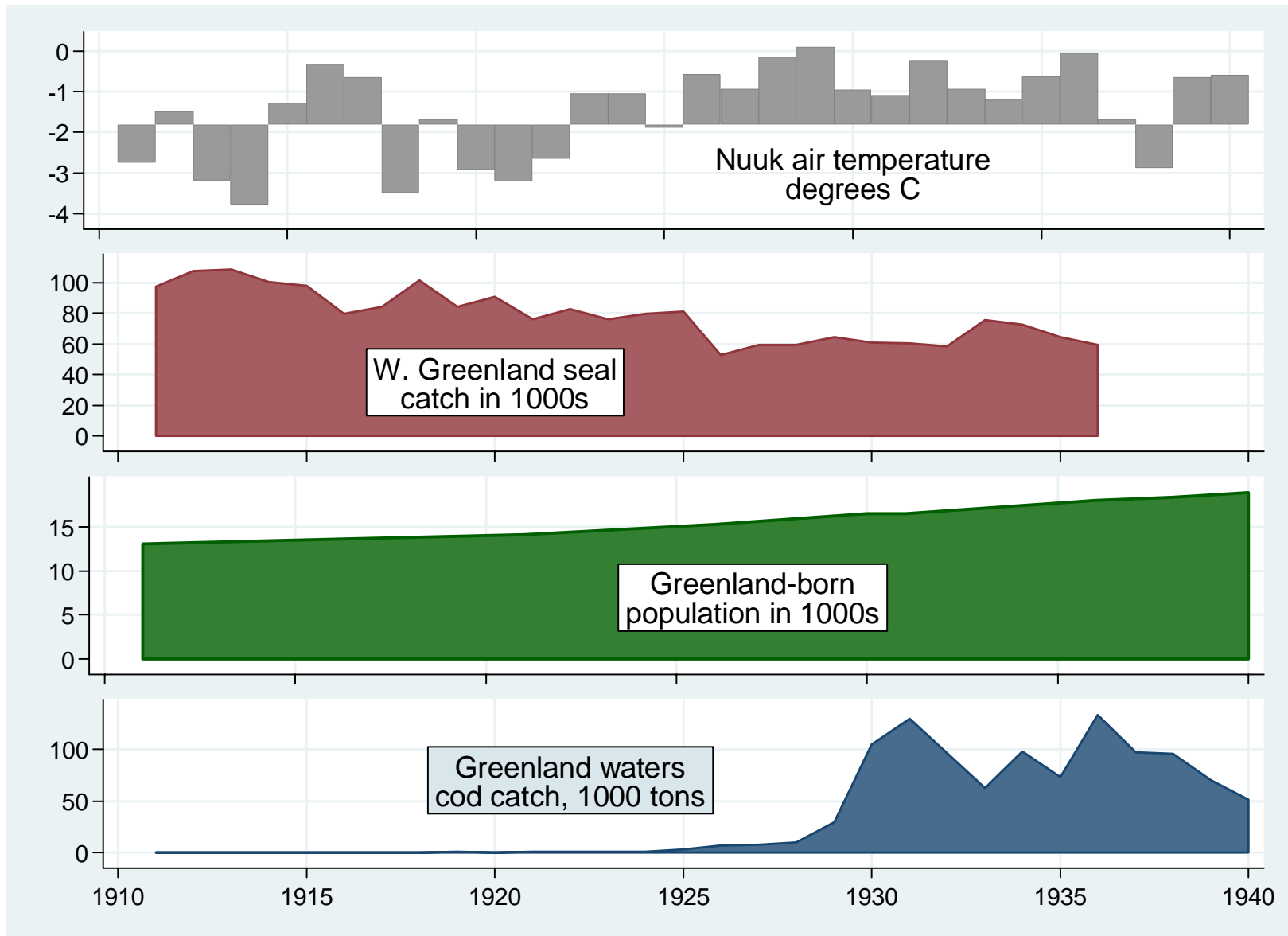
Greenland's *Demographic Transition*: high birth/high death rates to lower birth/low death rates—and outmigration



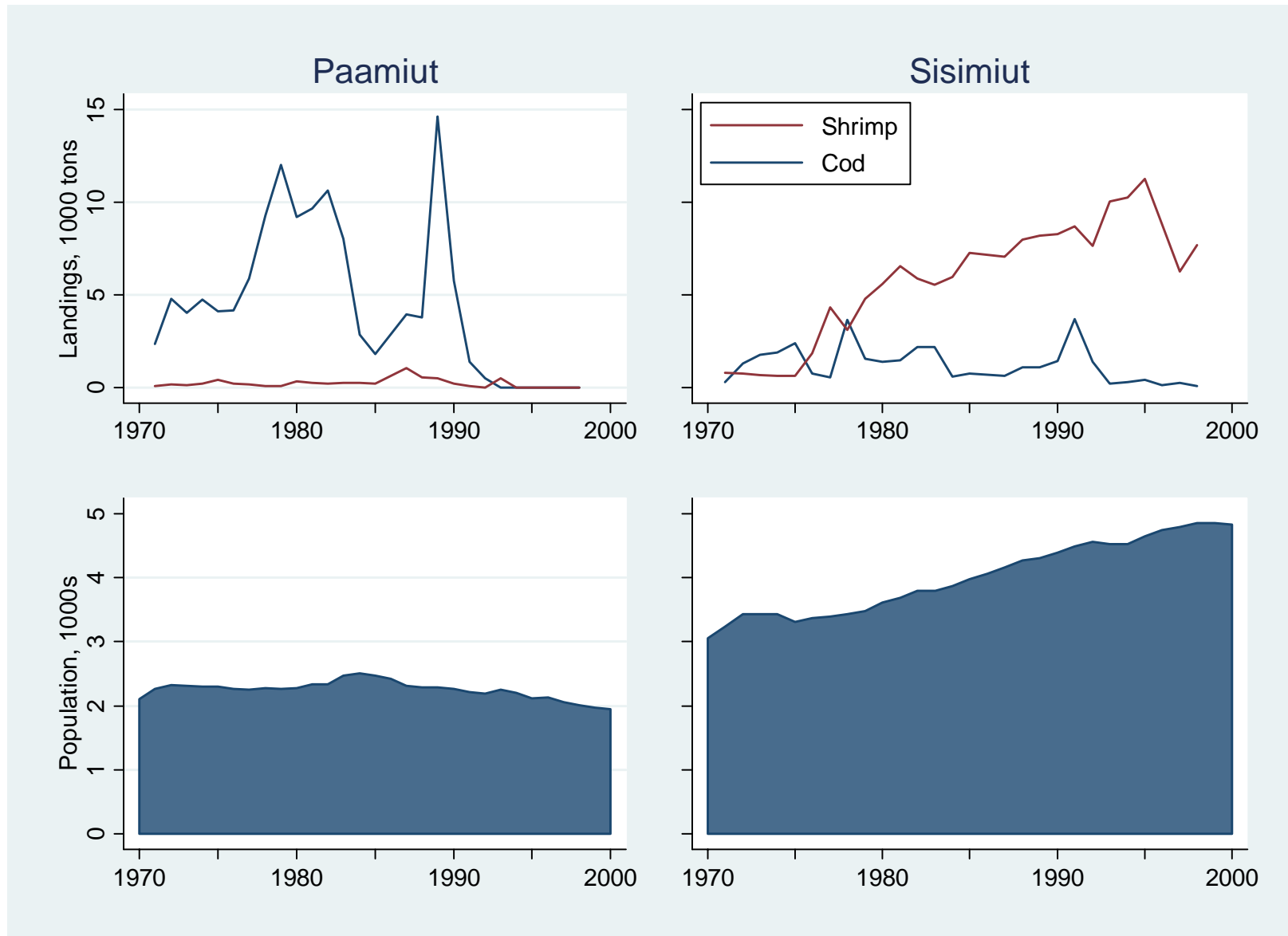
Shifting *sex ratios* reflect changing Greenland livelihoods, from hunting to post-industrial.

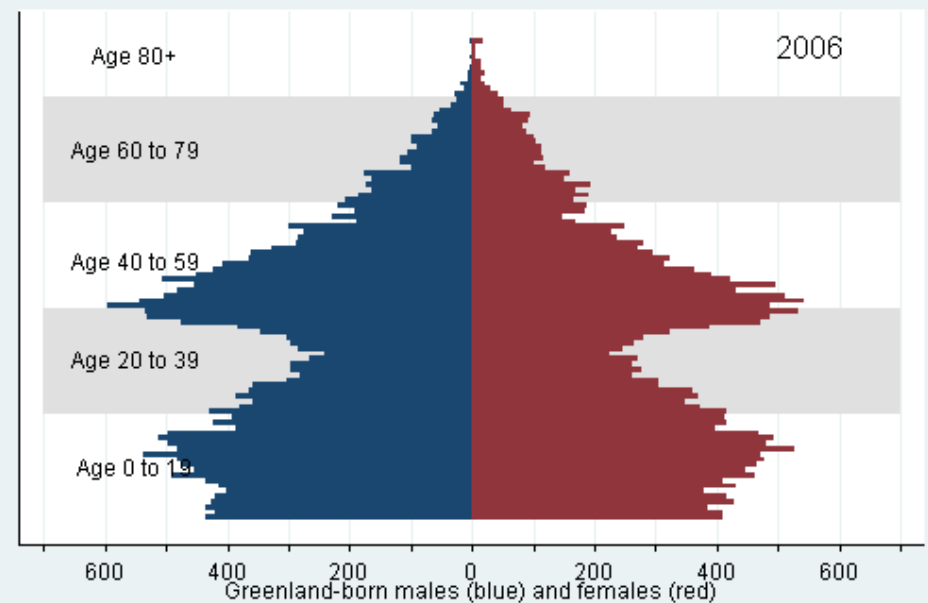
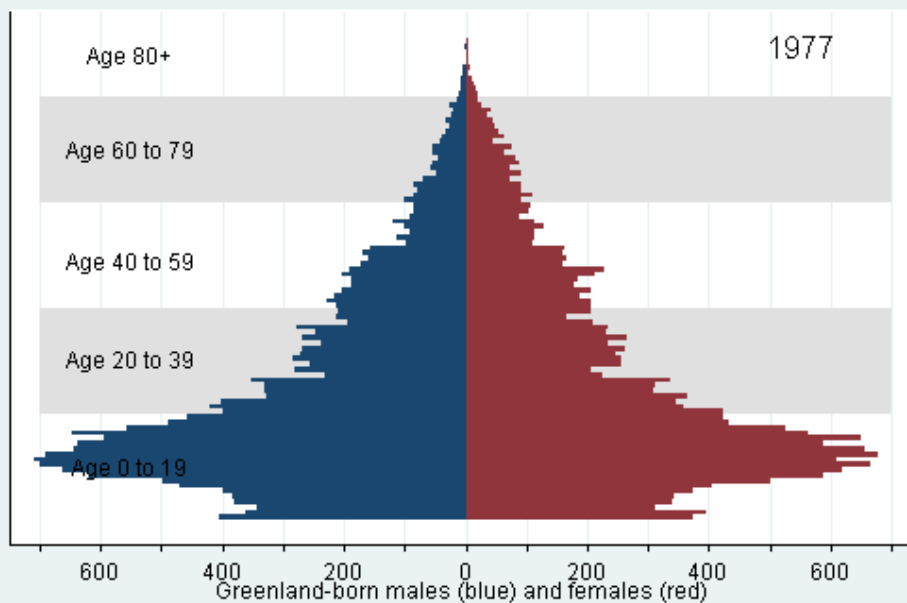


Environment, resources and society through Greenland's seal hunting to cod fishing transition, 1910–1940.



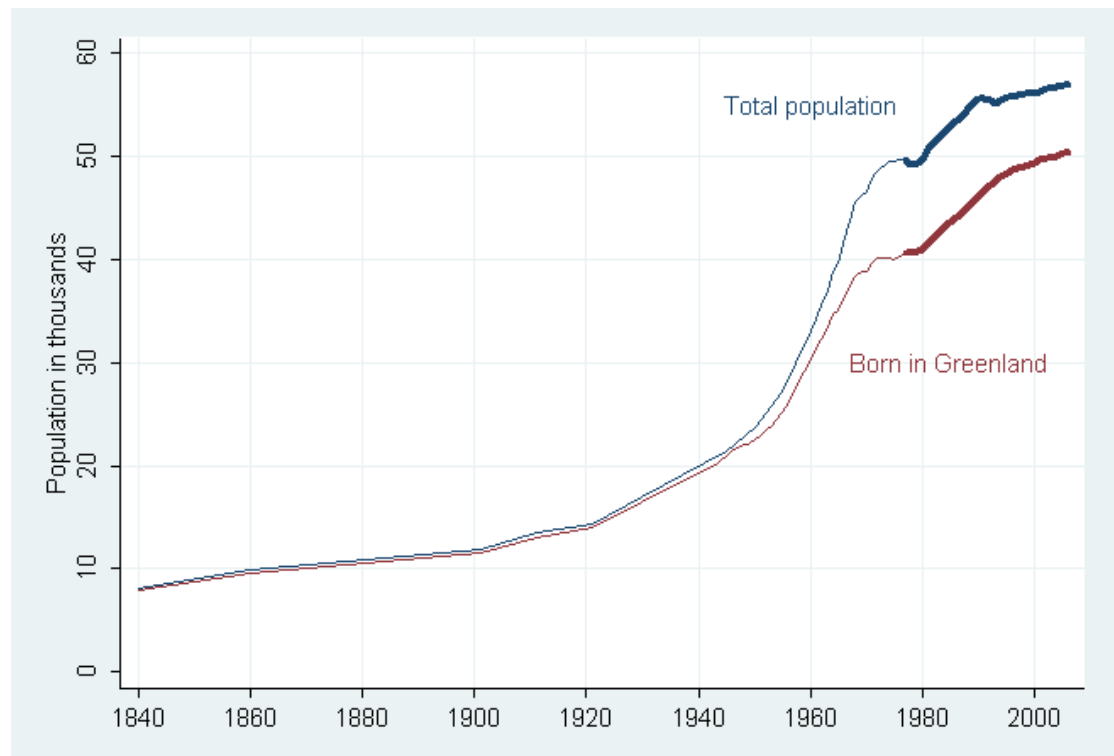
A tale of two cities: winners and losers through Greenland's cod to shrimp fishing transition, 1970–2000.

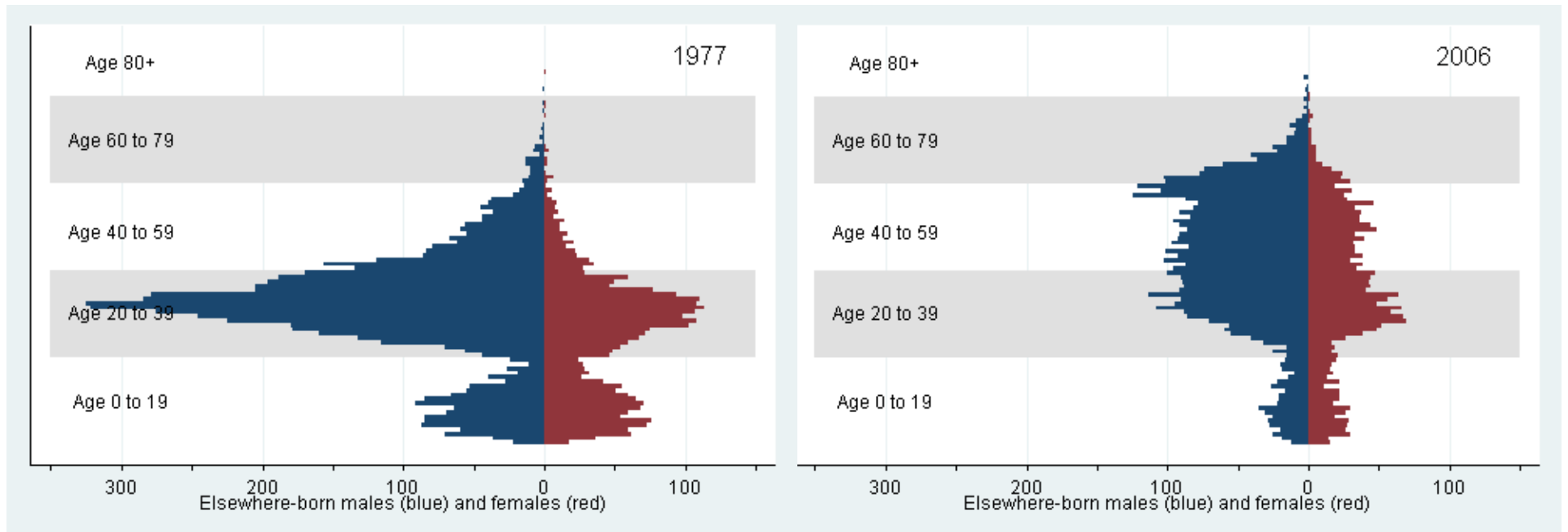




1977–2006 transition
from high-birth rate,
young structure with
relatively few elders to
a lower-birthrate,
postindustrial society.

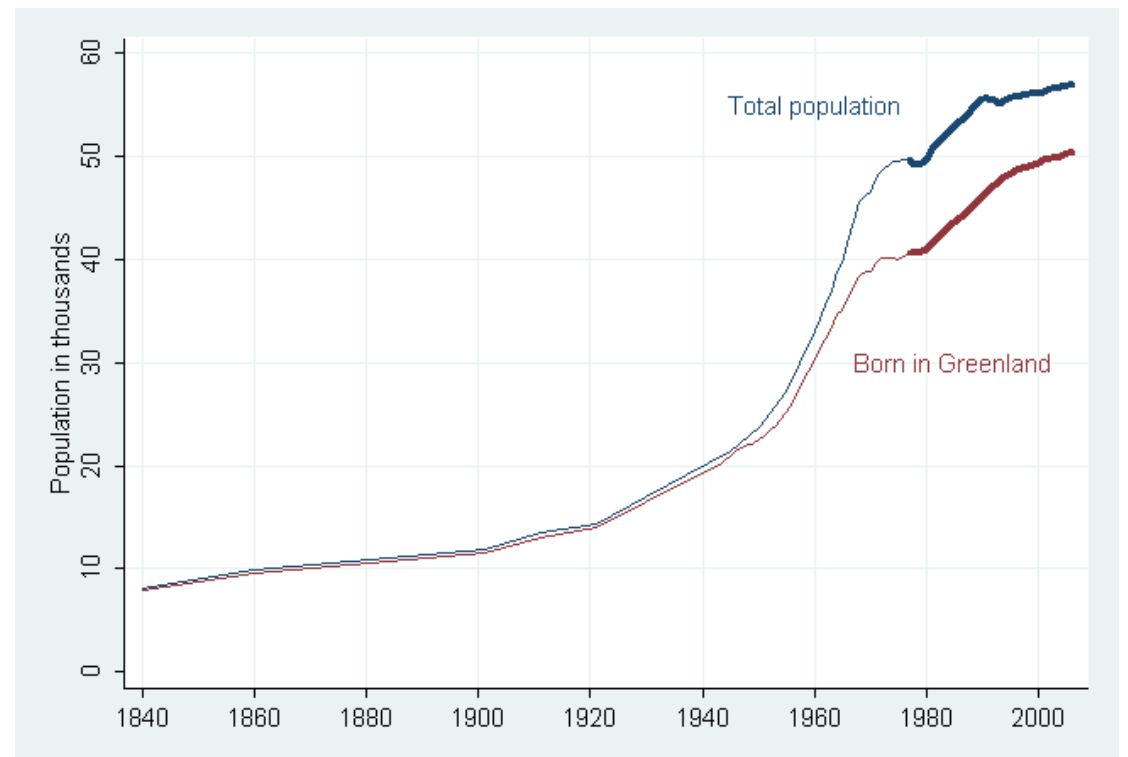
1960s birth cohort is
dominant.





In the 1970s,
Greenland's elsewhere-
born population
consisted largely of
young men.

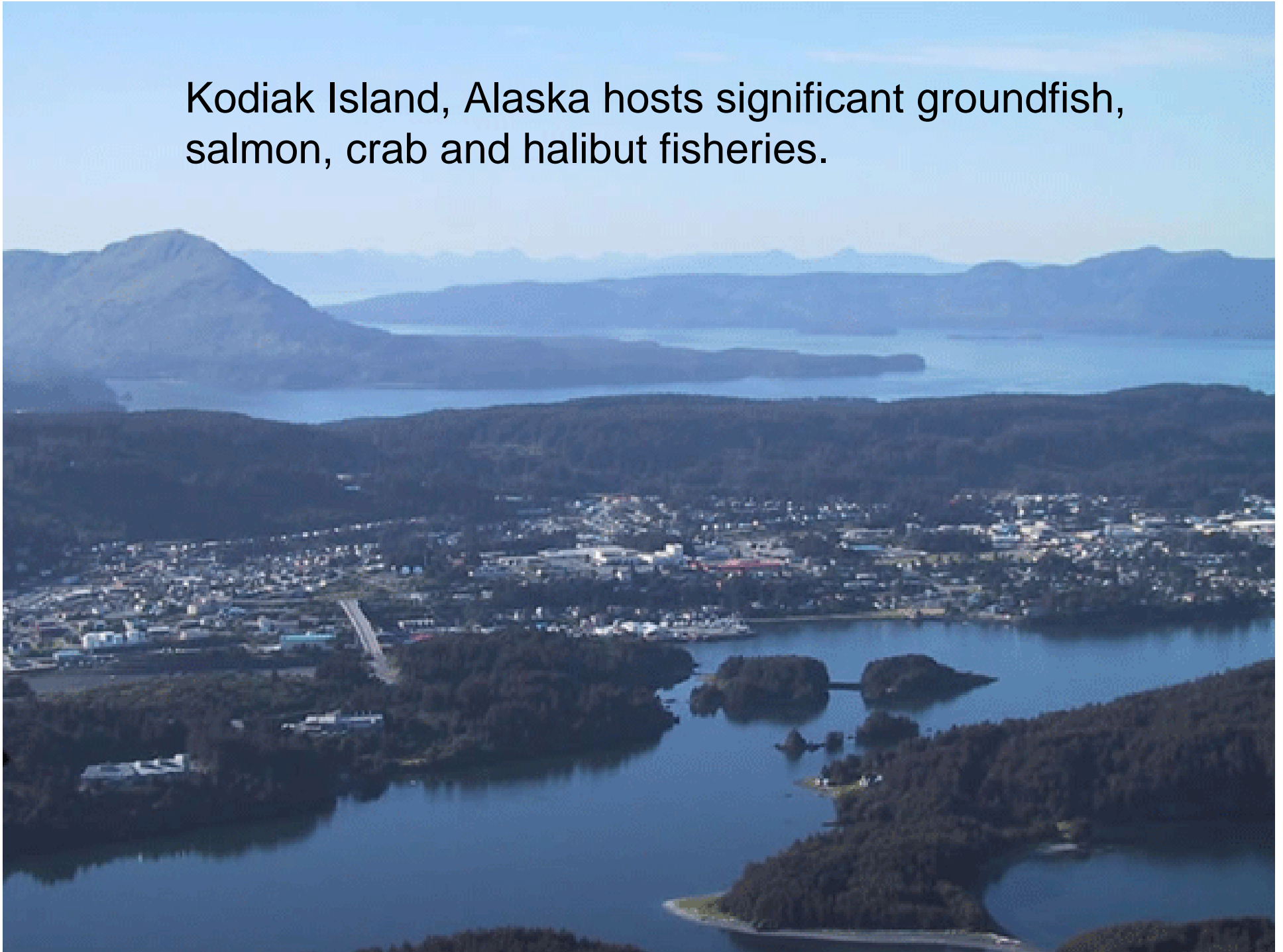
By 2006 the profile had
changed dramatically.



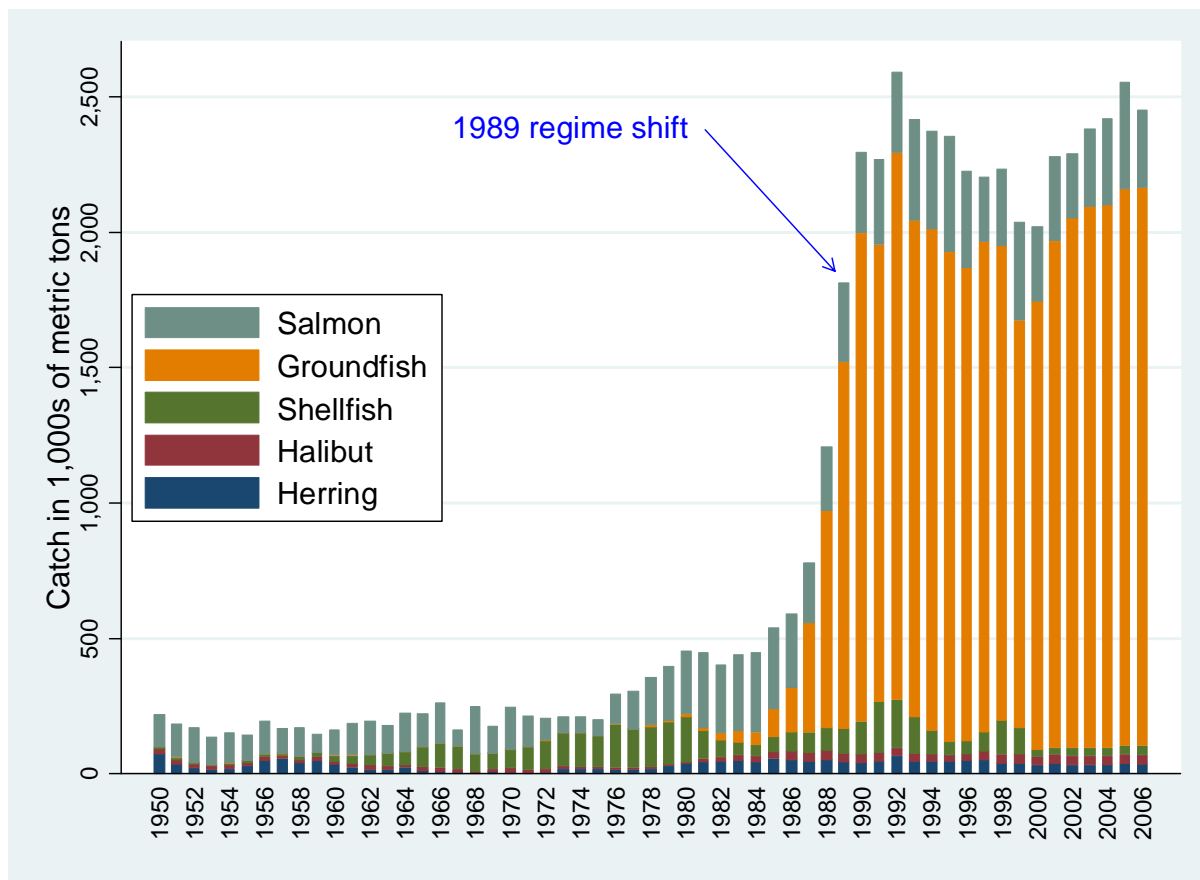
Hamilton et al. (2003) “West Greenland’s cod-to-shrimp transition: Local dimensions of climate change.” *Arctic*.
http://pubpages.unh.edu/~lch/Greenland_Arctic.pdf



Kodiak Island, Alaska hosts significant groundfish, salmon, crab and halibut fisheries.

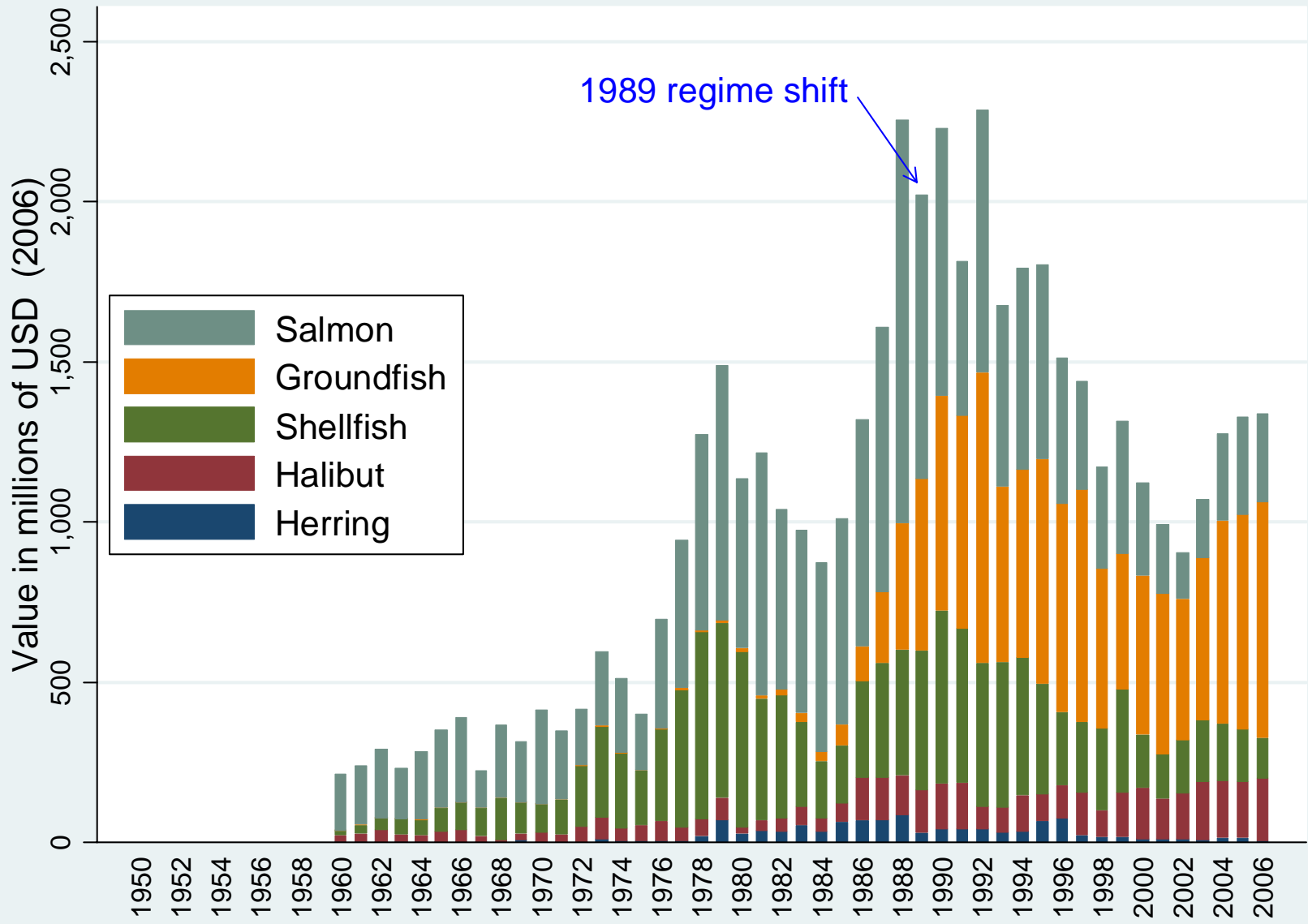


Alaska fisheries catch (tons) by type, 1950–2006

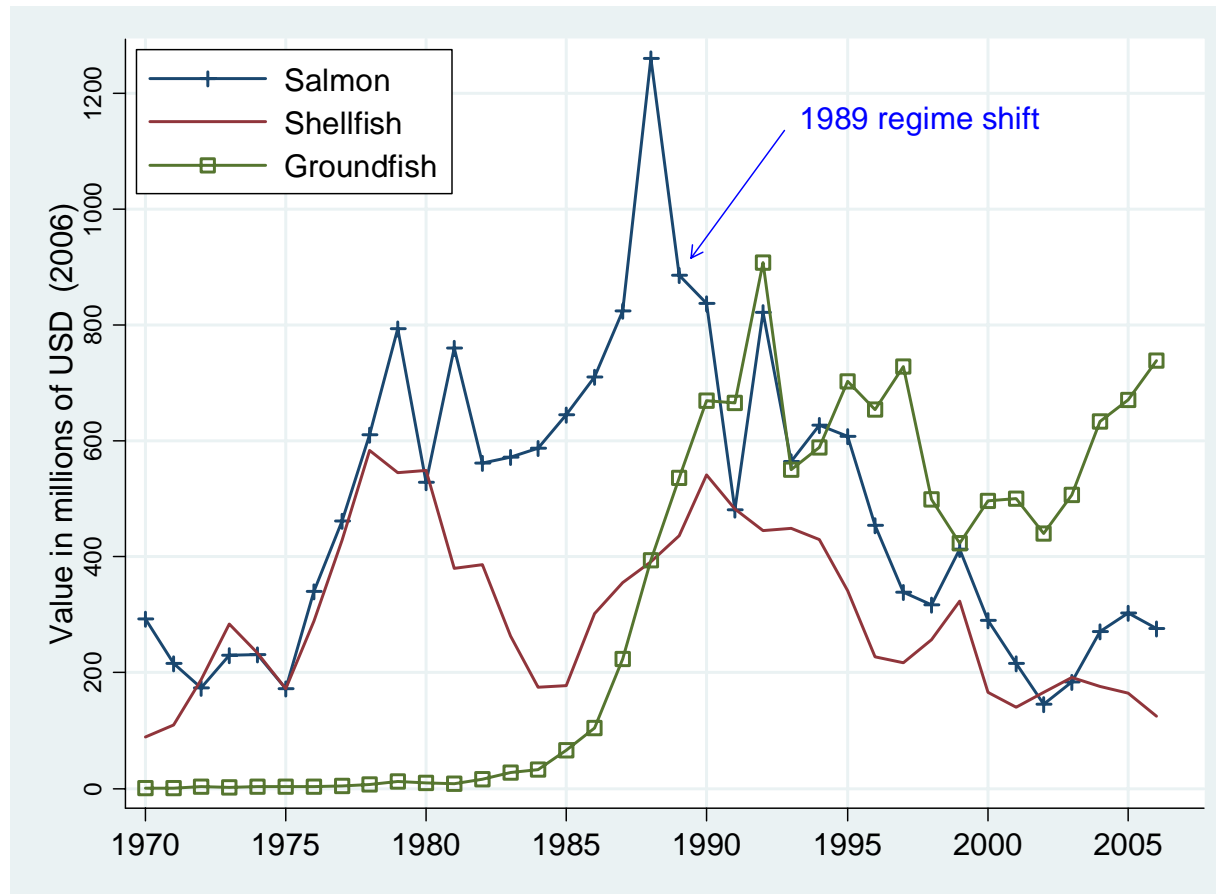


In the late 1970s a climatic “regime shift” occurred in the northern Pacific and Bering Sea. A second regime shift, marked biologically by a greater abundance of groundfish, occurred around 1989.

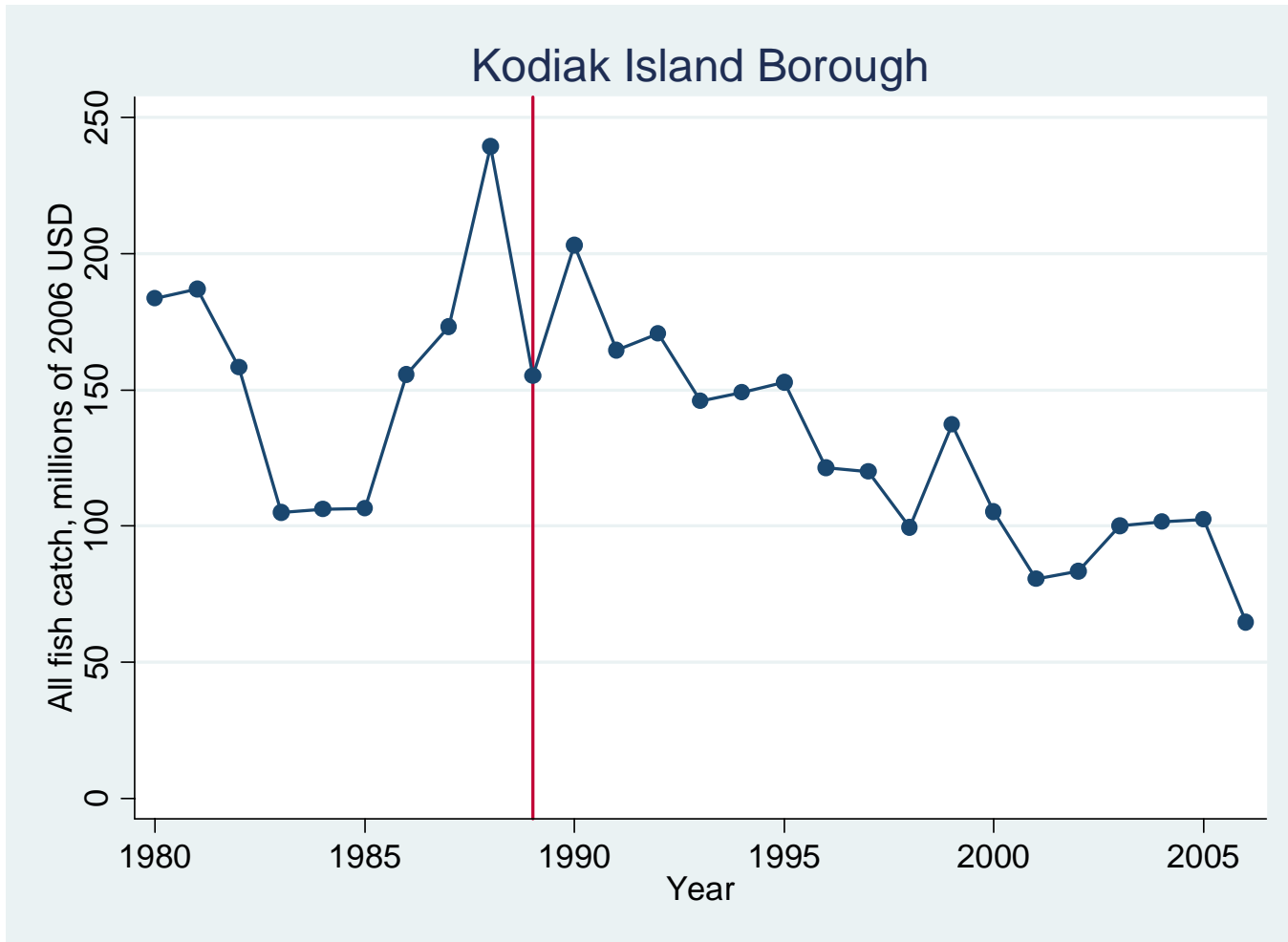
Alaska fisheries value (adjusted USD) by type, 1950–2006



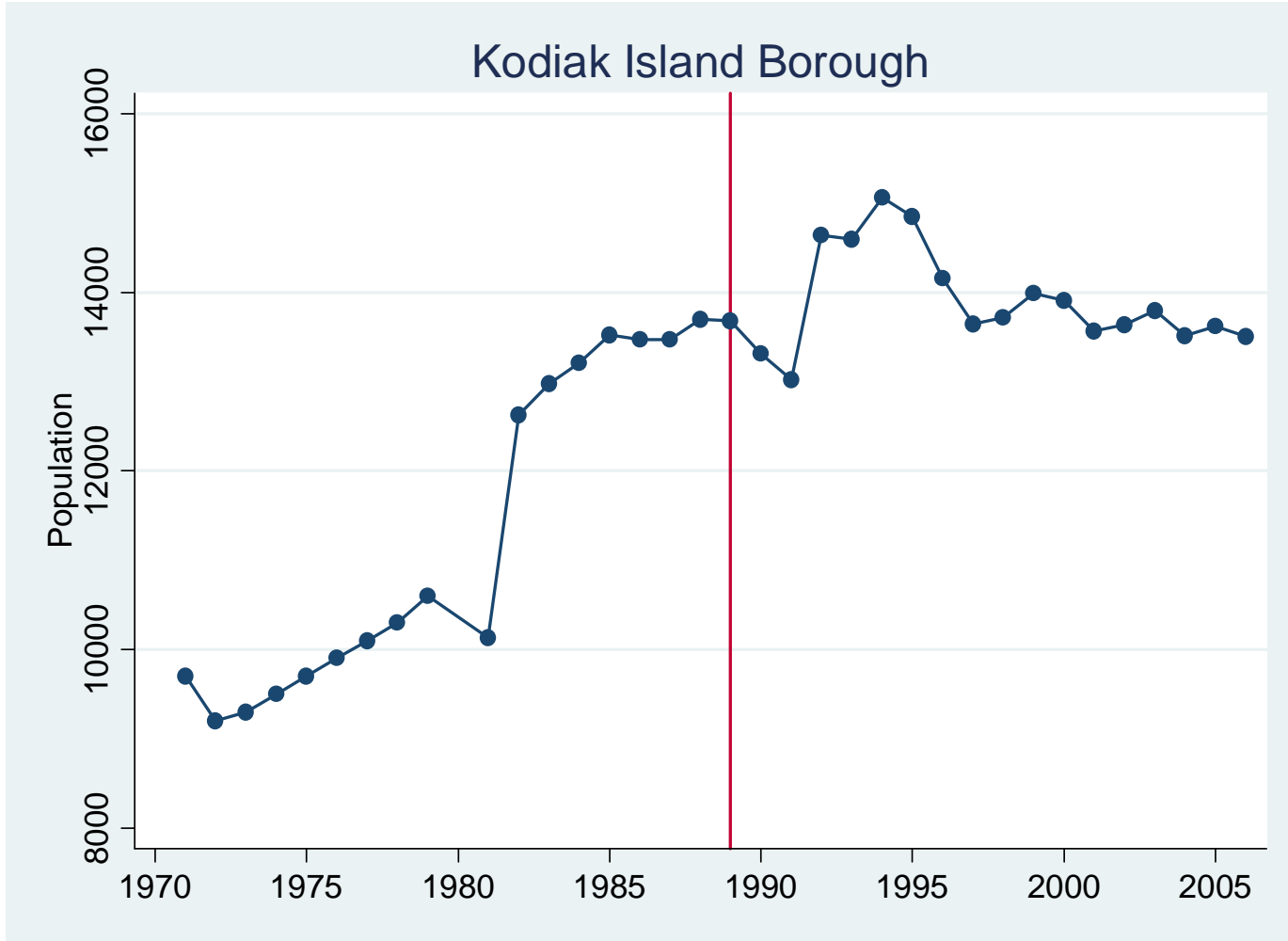
Alaska fisheries value (USD) by type, 1970–2006



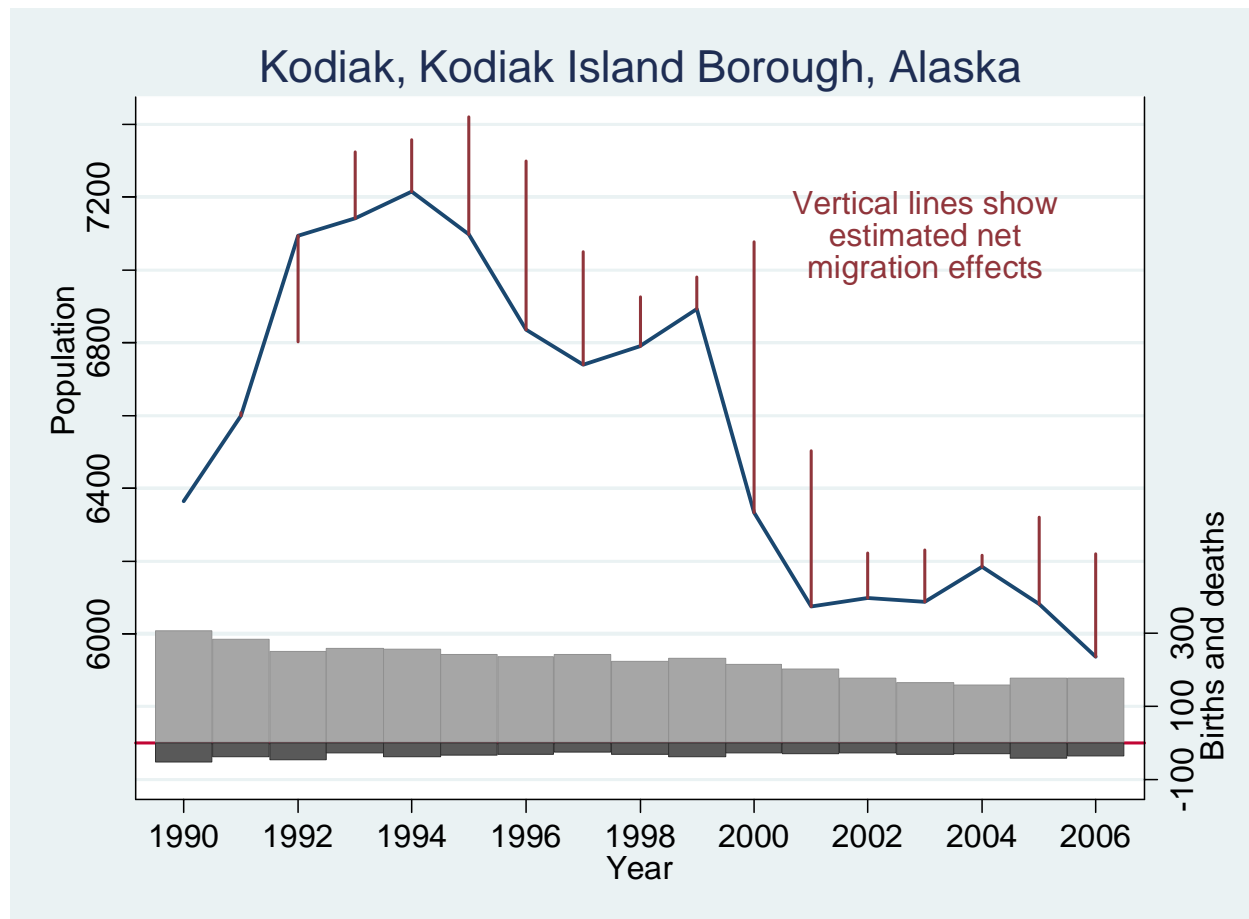
After 1989, market and ecological shifts caused a steep decline in the value of Alaska salmon catch. Shellfish value declined after 1990, and groundfish after about 1992 (in adjusted dollars).



Kodiak Island-based fisheries, including groundfish, salmon, halibut and crab fisheries, have been losing value since 1989.



The population of Kodiak Island Borough has declined due to net outmigration after 1995.



Kodiak City, the main port of Kodiak Island, has lost population since 1994 despite a strong pressures for natural increase (an excess of births over deaths).

From “Population dynamics of Arctic Alaska” website:

<http://www.carseyinstitute.unh.edu/alaska-indicators.htm>

Questions?

