Spatial Modeling

Geog 490/590

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https://blogs.uoregon.edu/spatialmodeling/

Lecture 1

Introduction to Complexity Science

Geog 490/590
Spatial Modeling
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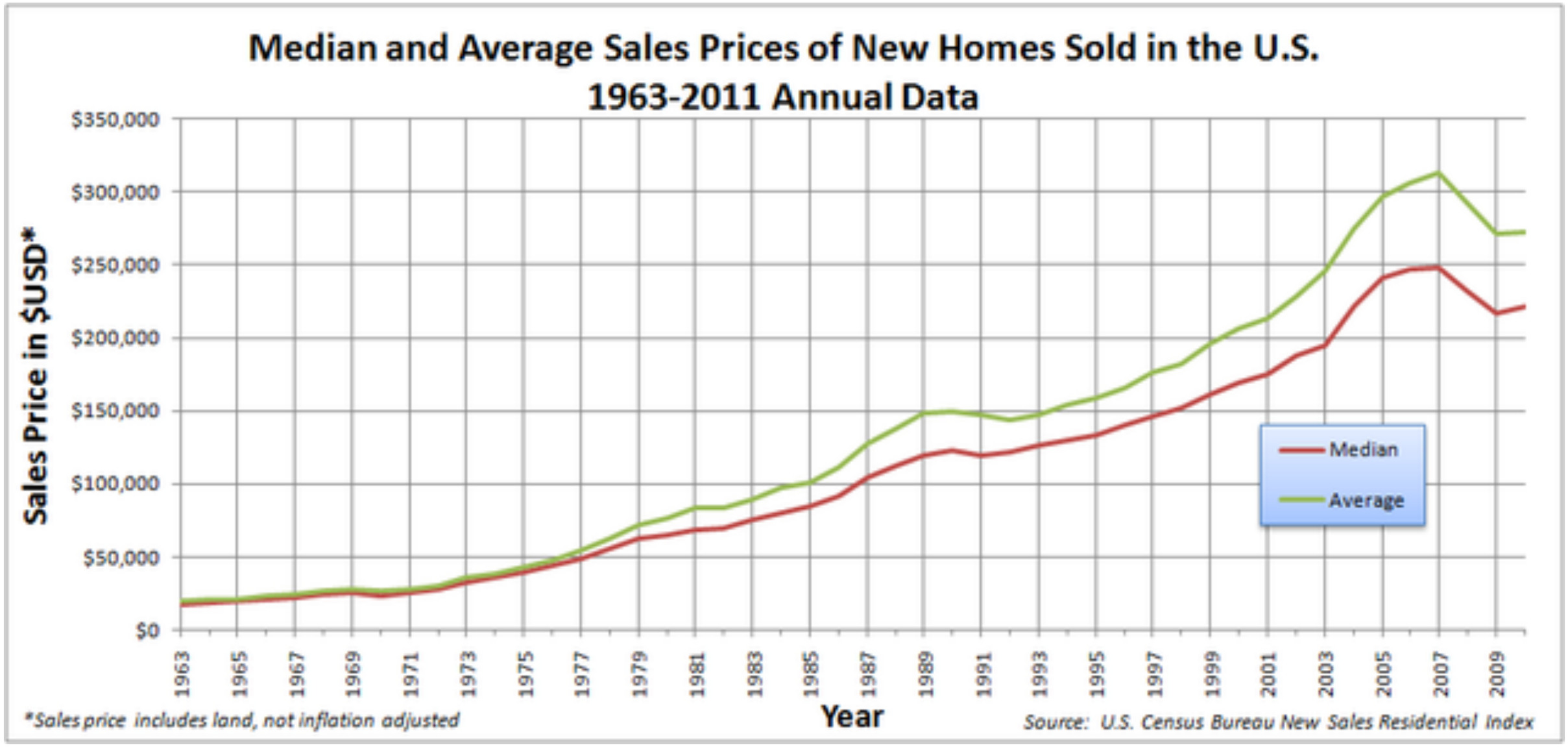
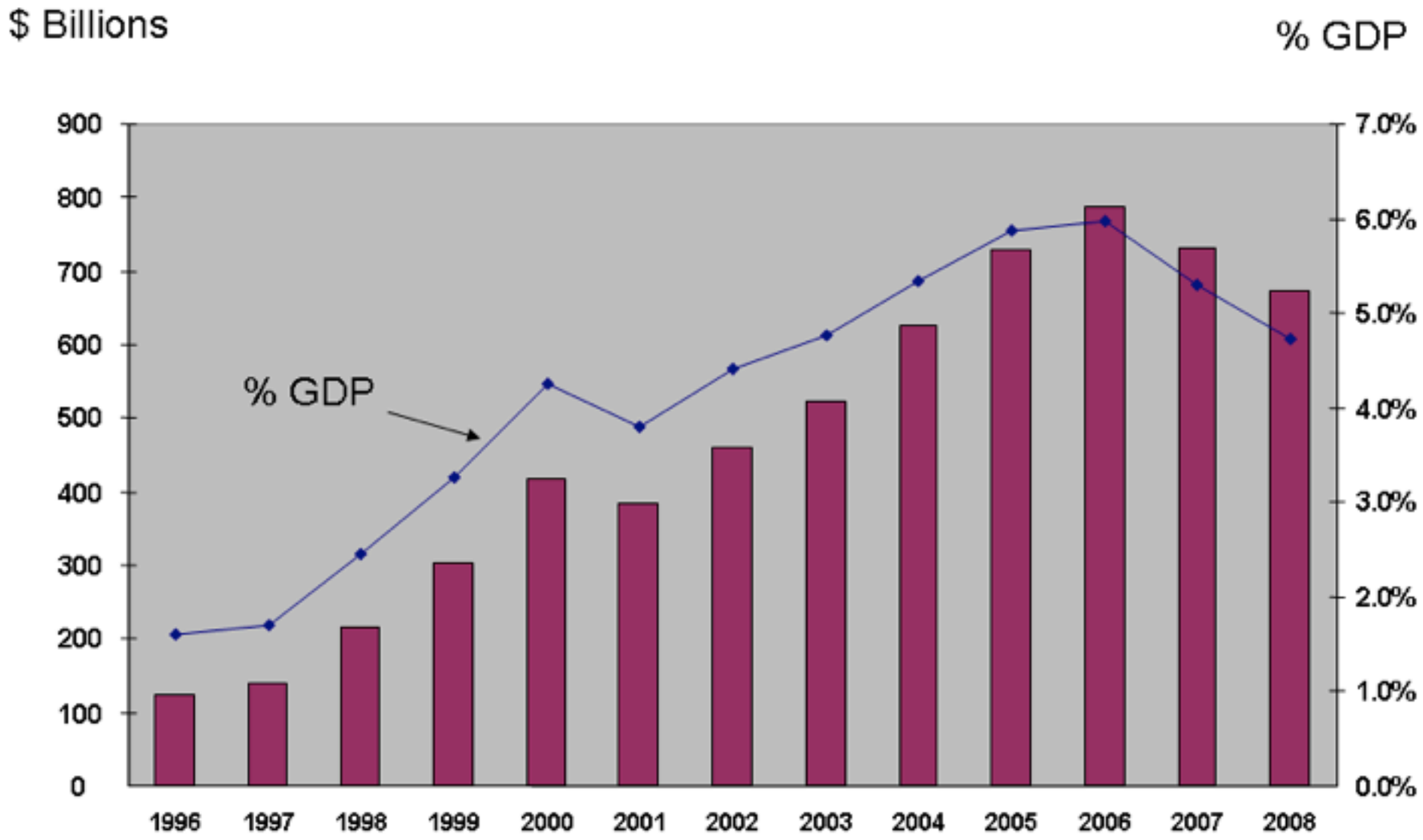
what led to the great recession?

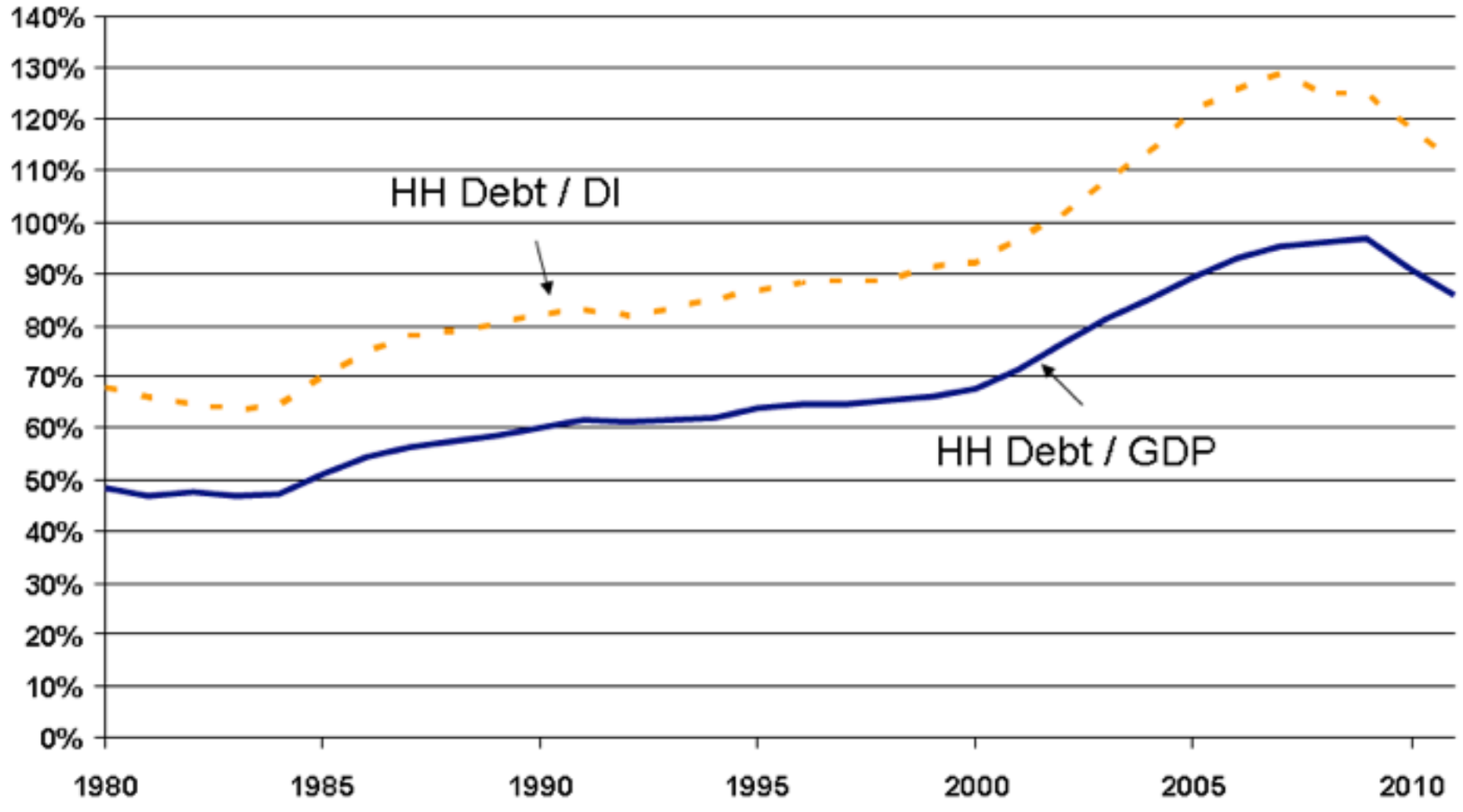

Median and Average Sales Prices of New Homes Sold in the U.S.
1963-2011 Annual Data
Sales Price in $USD*
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Year
Median
Average
*Sales price includes land, not inflation adjusted
Source: U.S. Census Bureau New Sales Residential Index

U.S. Current Account or Trade Deficit: Dollars and % GDP



Source Data: U.S. Bureau of Economic Analysis (BEA)

U.S. Household Debt vs. Disposable Income (DI) and GDP



Sources: U.S. Federal Reserve (FRED), BEA
Note: HH Debt is FRED "CMDEBT" variable


US Dollars per Metric Ton
10.37K
9.46K
8.55K
7.63K
6.72K
5.81K
4.89K
3.98K
3.07K
2.15K
1.24K
Feb-1986
Feb-1987
Feb-1988
Feb-1989
Feb-1990
Feb-1991
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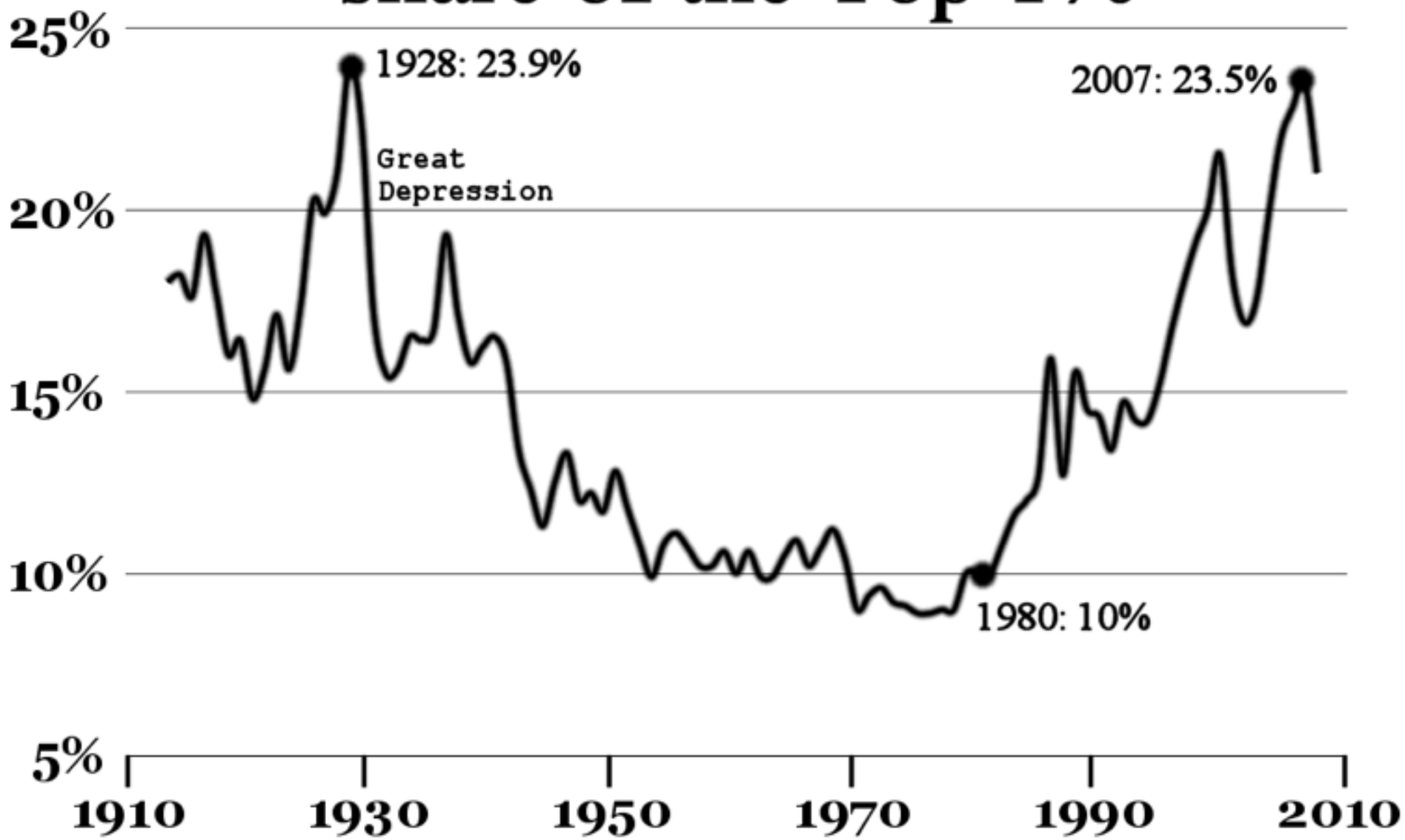
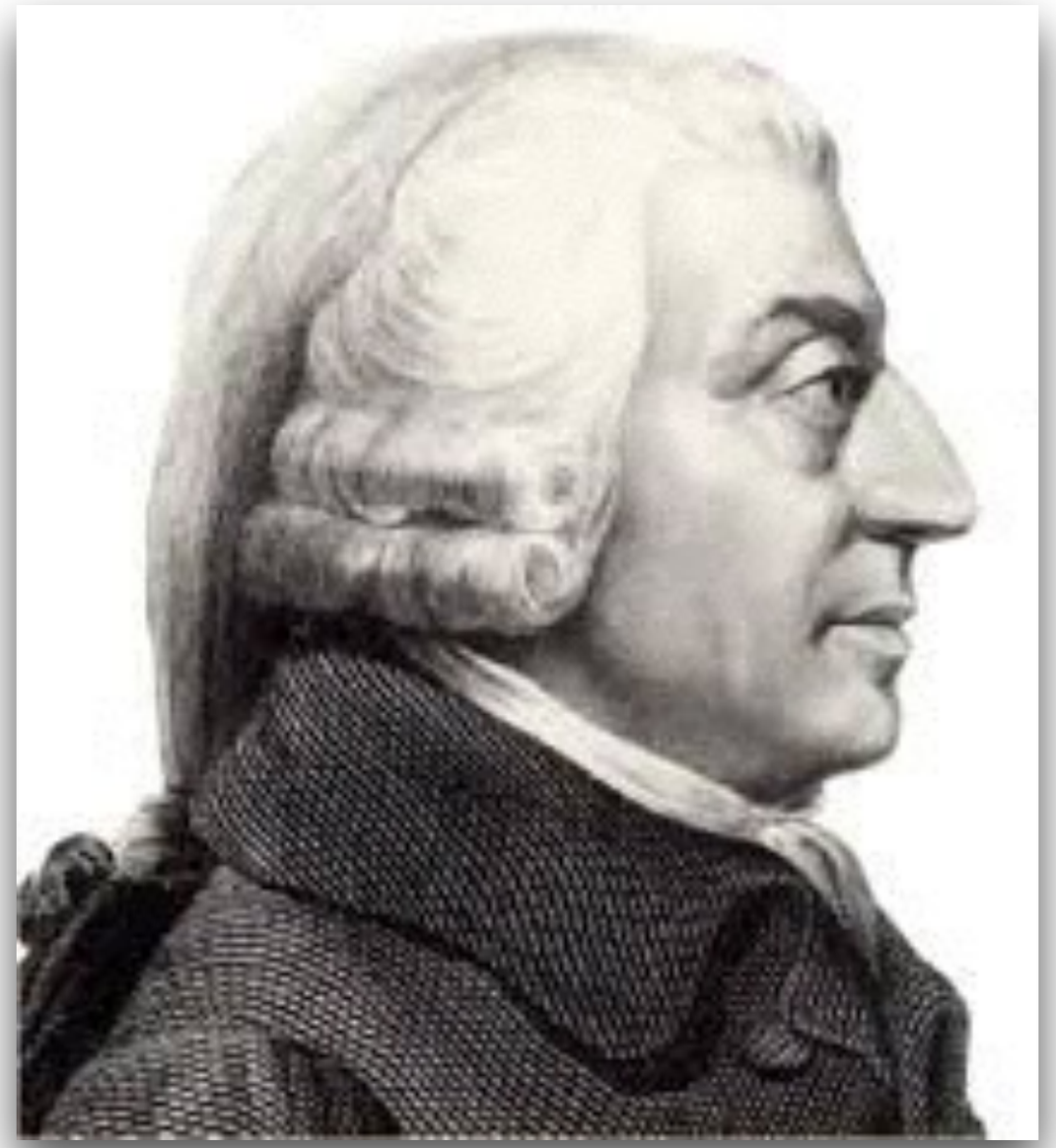
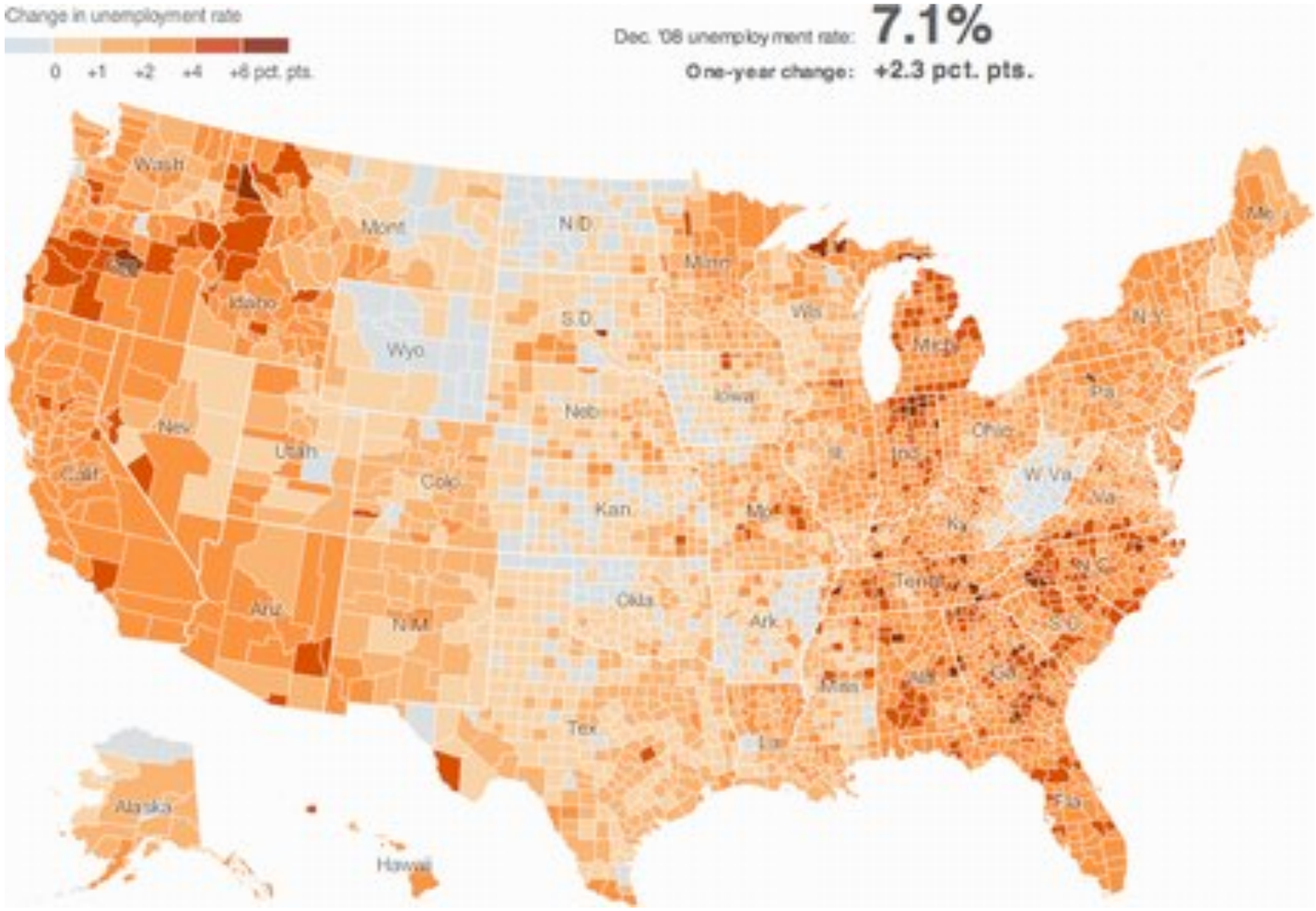
Feb-2005
Feb-2006
Feb-2007
Feb-2008
Feb-2009
Feb-2010
Feb-2011

Annual U.S. income share of the Top 1%






Change in unemployment rate
0
+1
+2
+4
+6 pct. pts.
Dec. '08 unemployment rate: 7.1%
One-year change: +2.3 pct. pts.
Wash.
Mont.
N.D.
Minn.
Idaho
S.D.
Wis.
Mich.
N.Y.
Me.
Wyo.
Iowa
Pa.
Nev.
Neb.
Ohio
Utah
Ill.
Ind.
W. Va.
Calif.
Colo.
Va.
Kan.
Md.
Ky.
Tenn.
N.C.
Okla.
S.C.
Ariz.
N.M.
Ark.
Miss.
Ala.
Ga.
Tex.
La.
Fla.
Alaska
Hawaii

so what is complexity?

complexity

anything we do not understand because there exists a large number of interacting parts

Emory Roe 1998

complexity

embrace it by understanding different subsets of interactions

Emory Roe 1998

complexity

embrace it by understanding
different subsets of interactions

Emory Roe 1998

complexity

simple actions produce
complex emergent patterns

complexity

complex adaptive systems

complexity

complex adaptive systems

complex systems science

complexity

autonomous agents

complexity

autonomous agents

interaction based on simple rules

complexity

autonomous agents

interaction based on simple rules

feedbacks

complexity

autonomous agents

interaction based on simple rules

feedbacks

non-linearities

complexity

autonomous agents

interaction based on simple rules

feedbacks

non-linearities

path dependence

complexity

autonomous agents

interaction based on simple rules

feedbacks

non-linearities

path dependence

adaptation

complexity

autonomous agents

interaction based on simple rules

feedbacks

non-linearities

path dependence

adaptation

emergence

complexity

interactions/feedbacks/non-linearities/
path dependence/adaptation

from processes to patterns

emergence

Homework for Lecture 2

1. Download NetLogo

2. Open “Flocking Model”

3. Answer the following:

   i) A flock, once together, is not guaranteed to keep all of its members. Why do you think this is?

   ii) After running the model for a while, all of the birds have approximately the same heading. Why?

   iii) Sometimes a bird breaks away from its flock. How does this happen?

4. Complete the assigned reading and determine how complexity is present in how cities are developed