U.S. Earnings Dynamics: Inequality, Volatility, and Mobility

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U.S. Census Bureau
September 5, 2019
LED Annual Workshop 2019

Acknowledgements and Disclaimer

- This research was conducted while the authors were supported by the U.S. Census Bureau. Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the Census Bureau or any other research sponsor. All results have been reviewed to ensure that no confidential information is disclosed (release number: CBDRB-FY19-CED001-B0026).
- This research uses data from the Census Bureau's Longitudinal Employer-Household Dynamics Program, which was partially supported by NSF Grants SES-9978093, SES-0339191, and ITR-0427889; NIA Grant AG018854; and grants from the Sloan Foundation.

Background

- There are several existing sources of statistics on income inequality (two are highlighted below)
  - Census Bureau's Annual Report on Poverty and Income
  - IRS Statistics of Income reports and studies
- Most statistics are household based, use all income, and do not focus on labor earnings
- Information on the income distribution is available at the national level, while measures of the center of the distribution are available at the local level.
- We would like to release local area (county/MSA) estimates of individual real labor earnings inequality.

Background (continued)

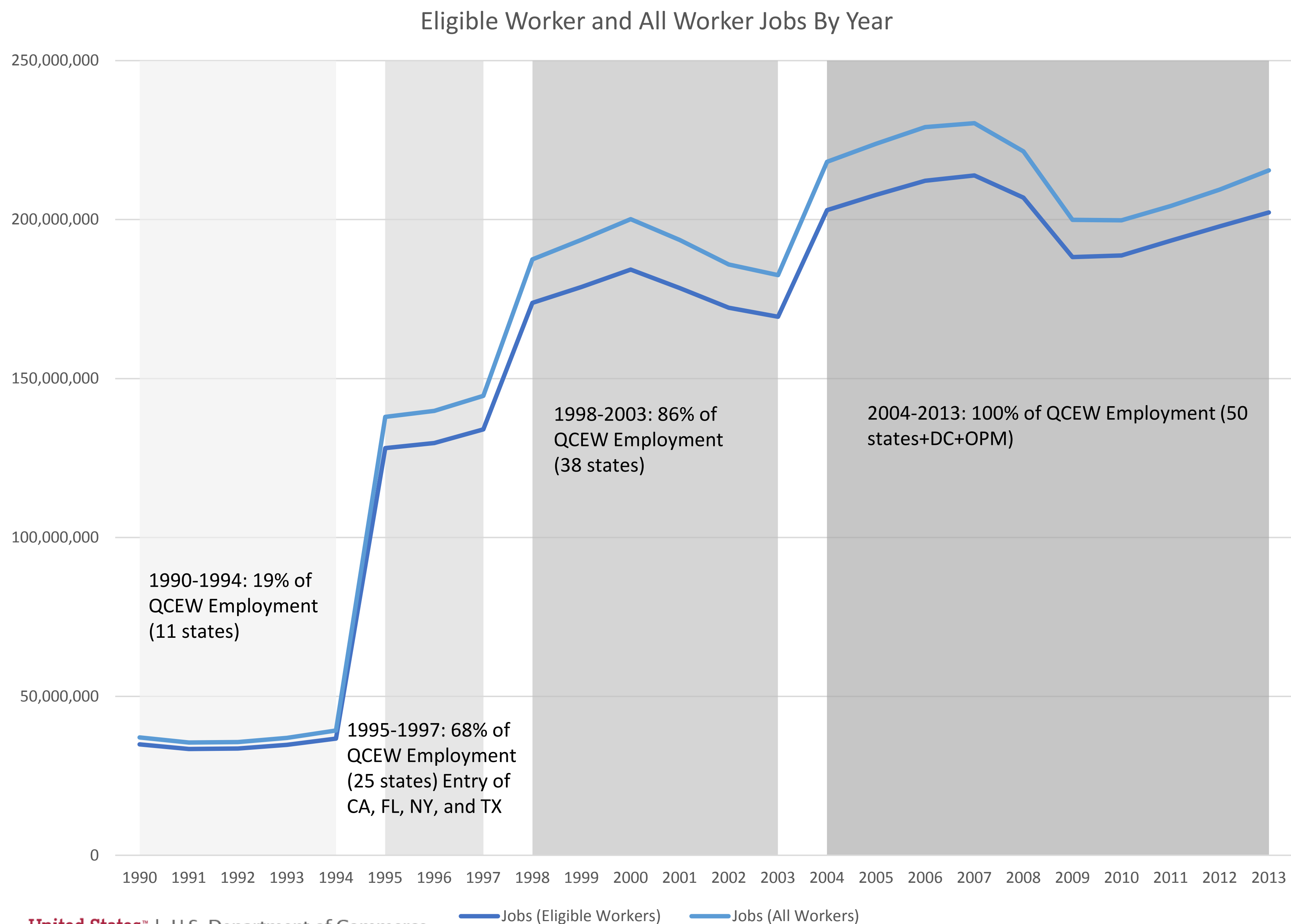
- National earnings dynamics trends (past 20 years)
  - Increasing earnings inequality
    - Increase in the point in time distribution of annual earnings
  - Reduced worker earnings mobility
    - Reduced large changes in annual earnings across time (except during recessions)
  - Reduced worker earnings volatility
    - Reduced dispersion in the changes in annual earnings across time

LEHD Data is "Found"

- Although a reliable national jobs frame, LEHD data is not designed to be a reliable worker frame
- A job should appear in LEHD data if the firm is covered by the state Unemployment Insurance system, except:
  - Not all firms are covered (about 90% of NIPA W&S data)
  - State entry occurs sporadically over 15 years
  - Earnings are filed using inconsistent/incorrect person identifiers
- For the purpose of measuring individual earnings inequality, jobs must be assigned to a worker
- We create a reliable national worker frame by using only jobs associated with an "eligible worker"

What are Eligible Workers?

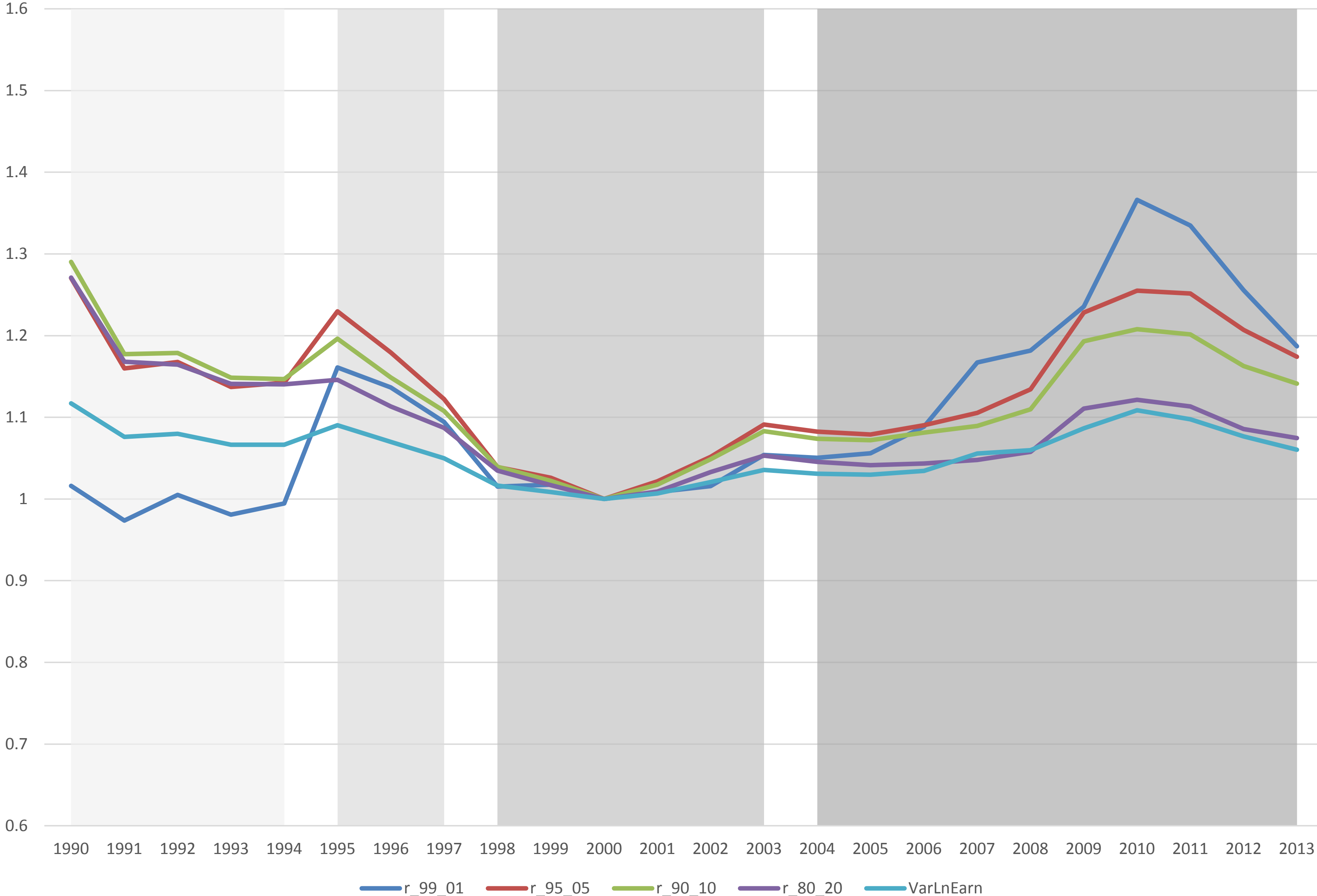
- We use the SSA Numident (list of officially issued SSN's) to create a consistent frame of persons eligible to work every year
- Combine the annual list of eligible workers with the same year LEHD jobs data to determine active status
  - Include earnings from all jobs during the year if fewer than 12 jobs are reported, zero otherwise
- Workers ("immigrant candidates") on the LEHD jobs data that do not match to the SSA Numident or matches with more than 12 jobs per year are removed

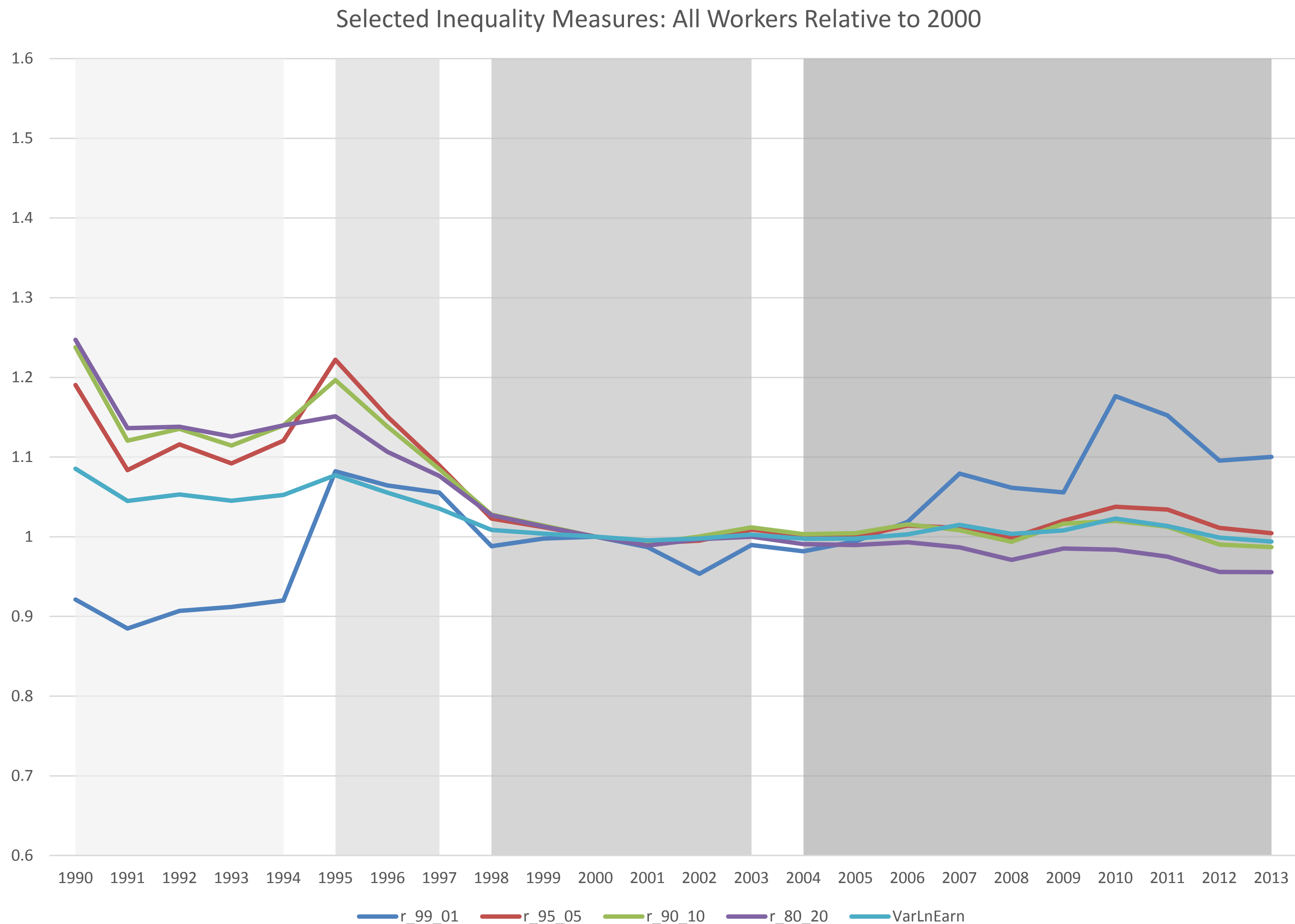

Eligible Worker and All Worker Jobs By Year
250,000,000
200,000,000
150,000,000
100,000,000
50,000,000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
1990-1994: 19% of QCEW Employment (11 states)
1995-1997: 68% of QCEW Employment (25 states) Entry of CA, FL, NY, and TX
1998-2003: 86% of QCEW Employment (38 states)
2004-2013: 100% of QCEW Employment (50 states+DC+OPM)
Jobs (Eligible Workers)
Jobs (All Workers)

Comparison of Earnings Inequality Trends

- Statistics for the Eligible Workers and the All Workers Samples
  - Ratio of the 99^{th} and the 1^{st} percentiles
  - Ratio of the 95^{th} and the 5^{th} percentiles
  - Ratio of the 90^{th} and the 10^{th} percentiles
  - Ratio of the 80^{th} and the 20^{th} percentiles
  - Variance of Log Annual Earnings

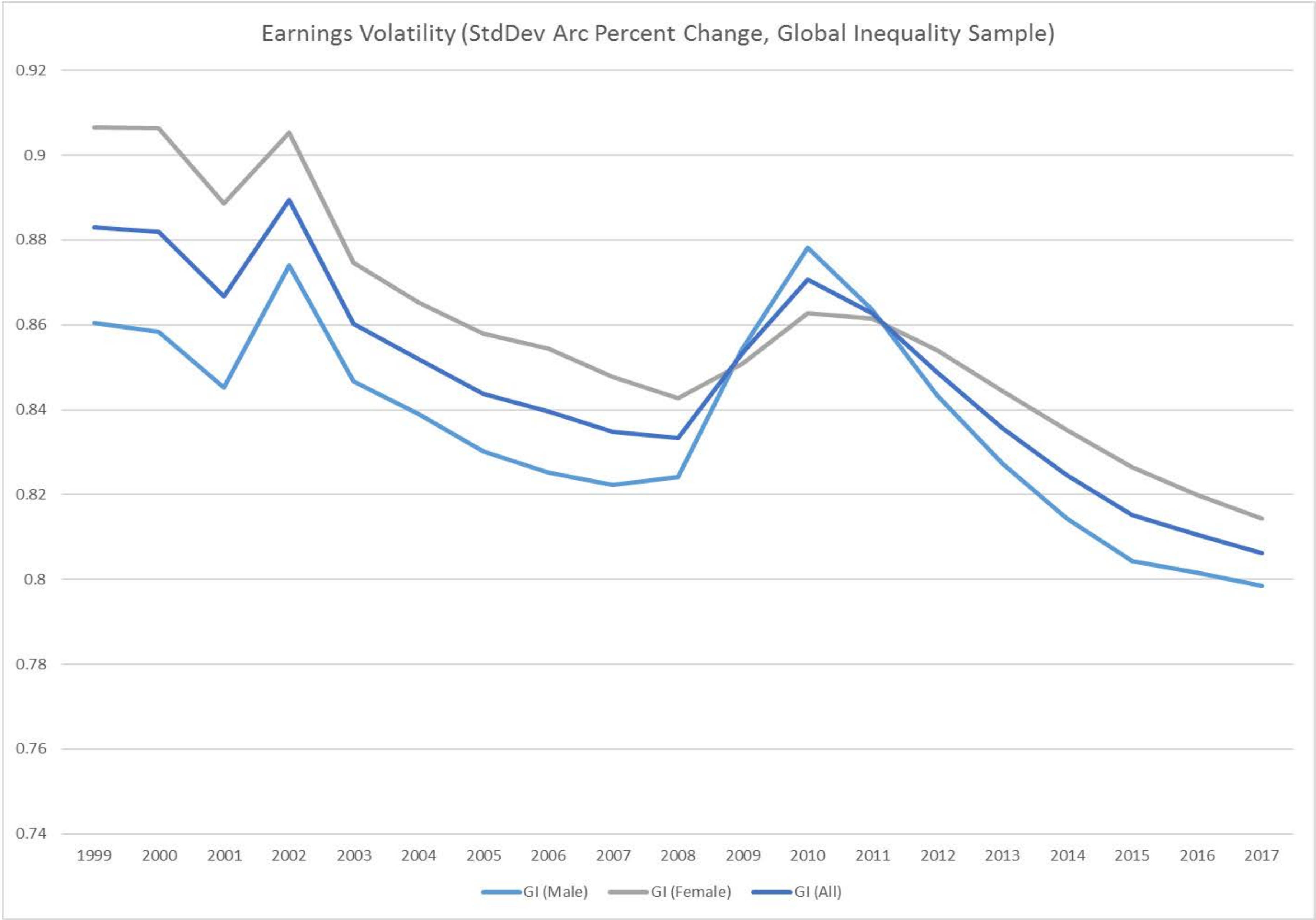
Selected Inequality Measures: Eligible Workers Relative to 2000




Selected Inequality Measures: All Workers Relative to 2000
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
r_99_01
r_95_05
r_90_10
r_80_20
VarLnEarn

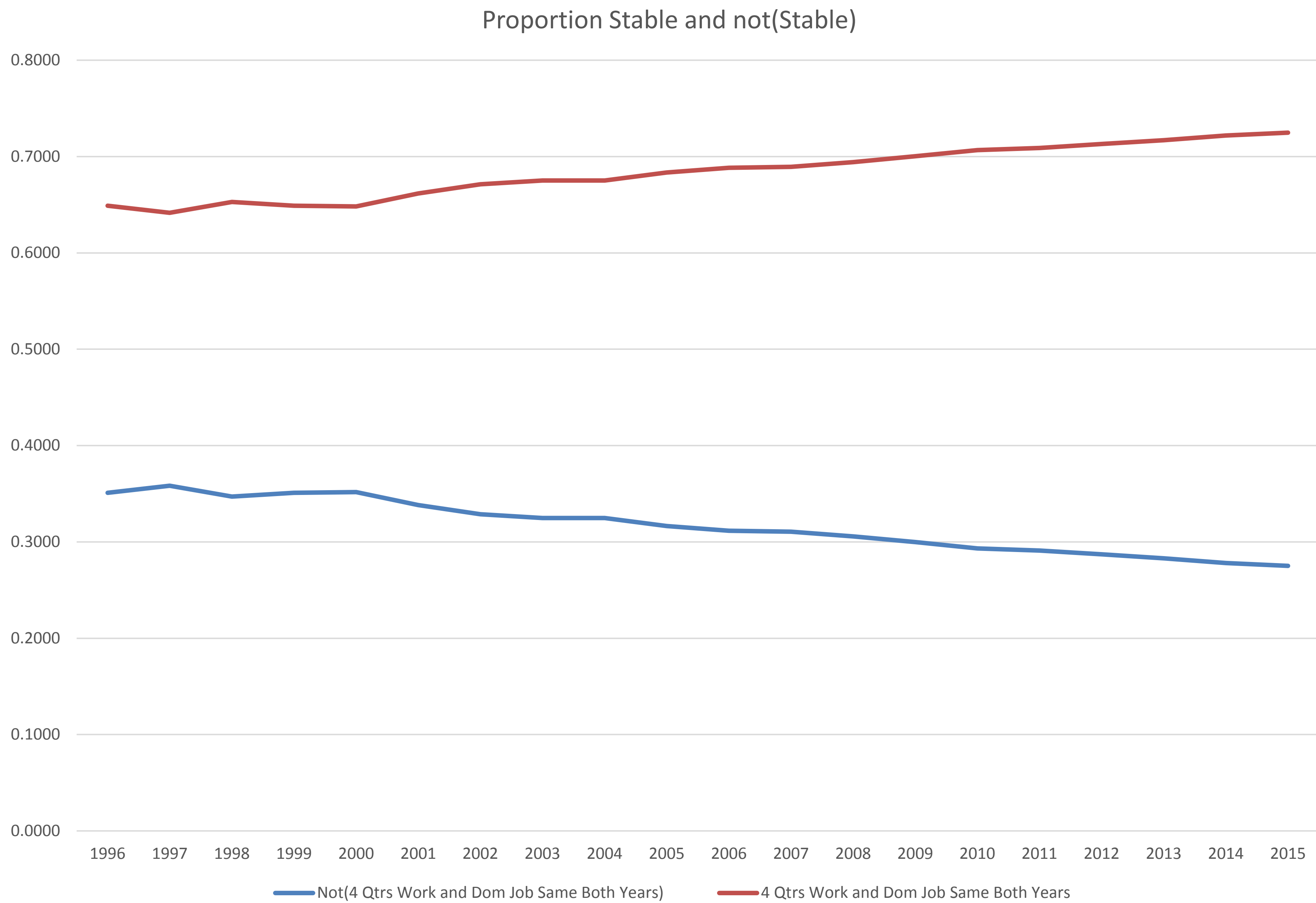
Is Earnings Volatility Declining?

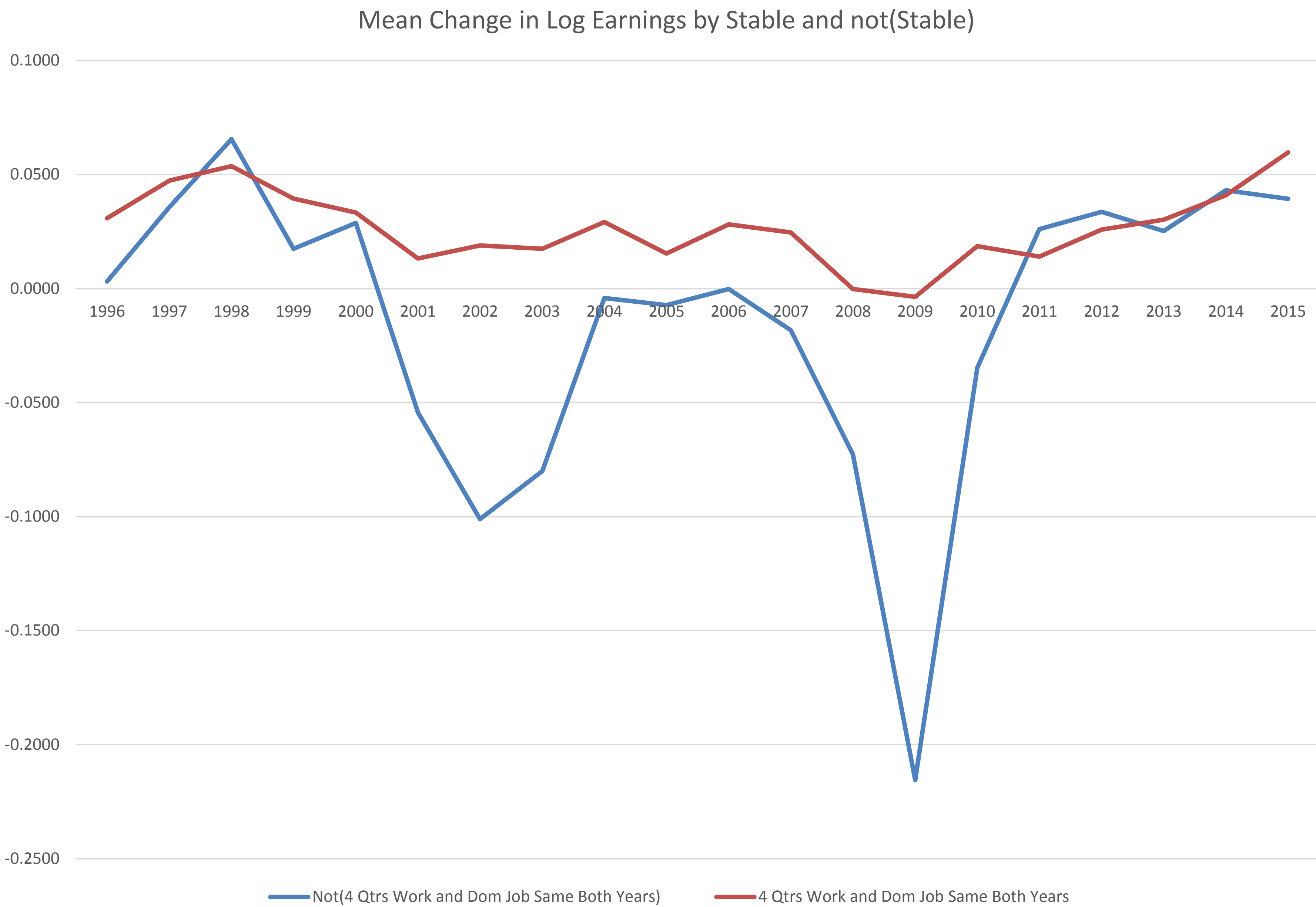
- Volatility is the variance or standard deviation of the percentage change in real annual earnings between the previous and the current year.
  - $v_{it} = sd\left((e_{it} - e_{it-1})/\frac{e_{it}+e_{it-1}}{2}\right)$ or
  - $v_{it} = sd(\ln(e_{it}) - \ln(e_{it-1}))$
- Volatility measures how clustered the changes in annual earnings are around the mean.
- The trend in volatility is declining (except during recessions), but there is substantial across worker heterogeneity.


Earnings Volatility (StdDev Arc Percent Change, Global Inequality Sample)
0.92
0.9
0.88
0.86
0.84
0.82
0.8
0.78
0.76
0.74
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
GI (Male)
GI (Female)
GI (All)

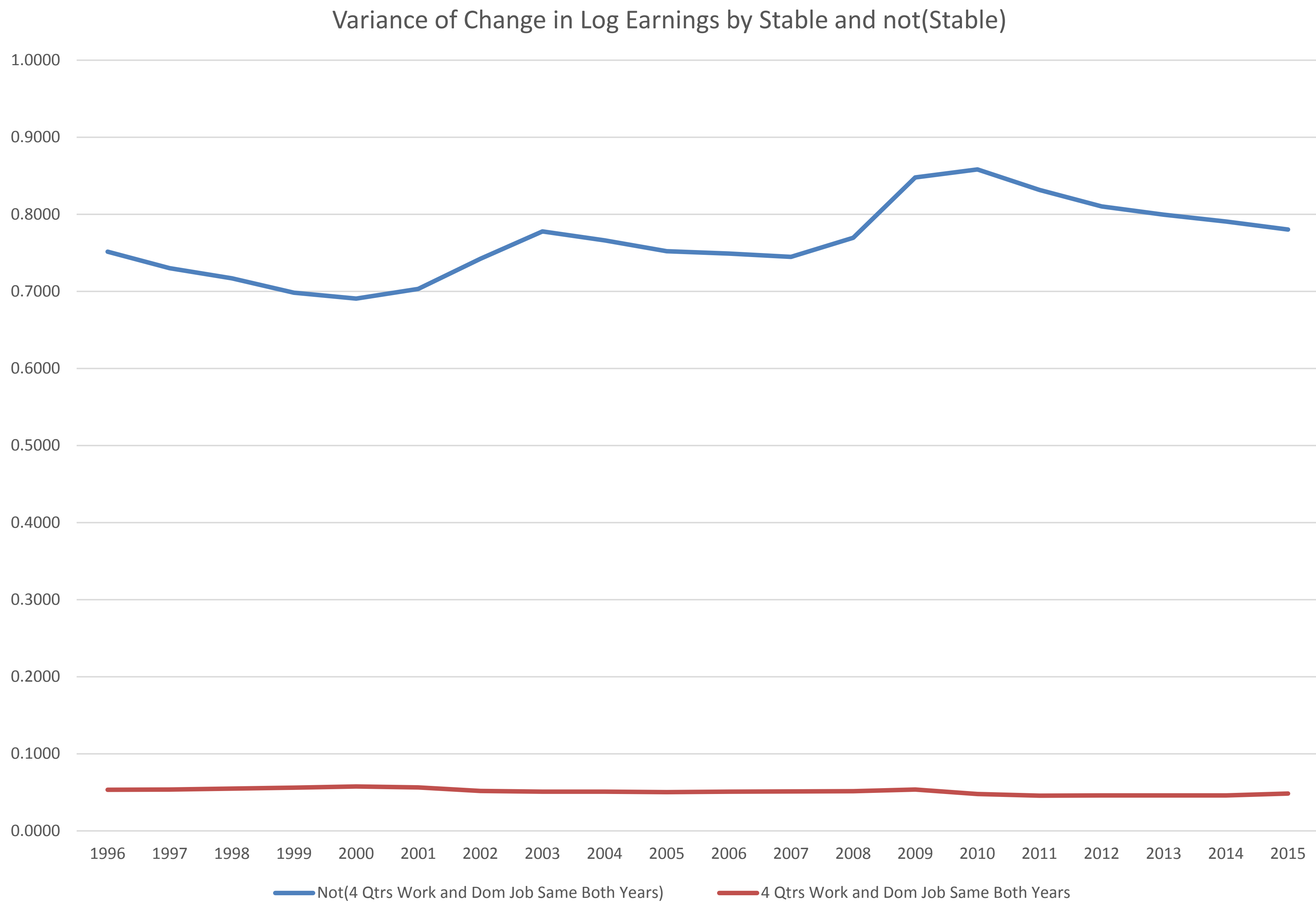
Stable vs not(Stable) Workers

- Stable Workers – Active all 4 qtrs in both years and dominant job (highest earning) the same in both years
- Not(Stable) Workers – Active at least 1 qtr each year (but not all 8) with possible dominant job change


Proportion Stable and not(Stable)
0.8000
0.7000
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Not(4 Qtrs Work and Dom Job Same Both Years)
4 Qtrs Work and Dom Job Same Both Years

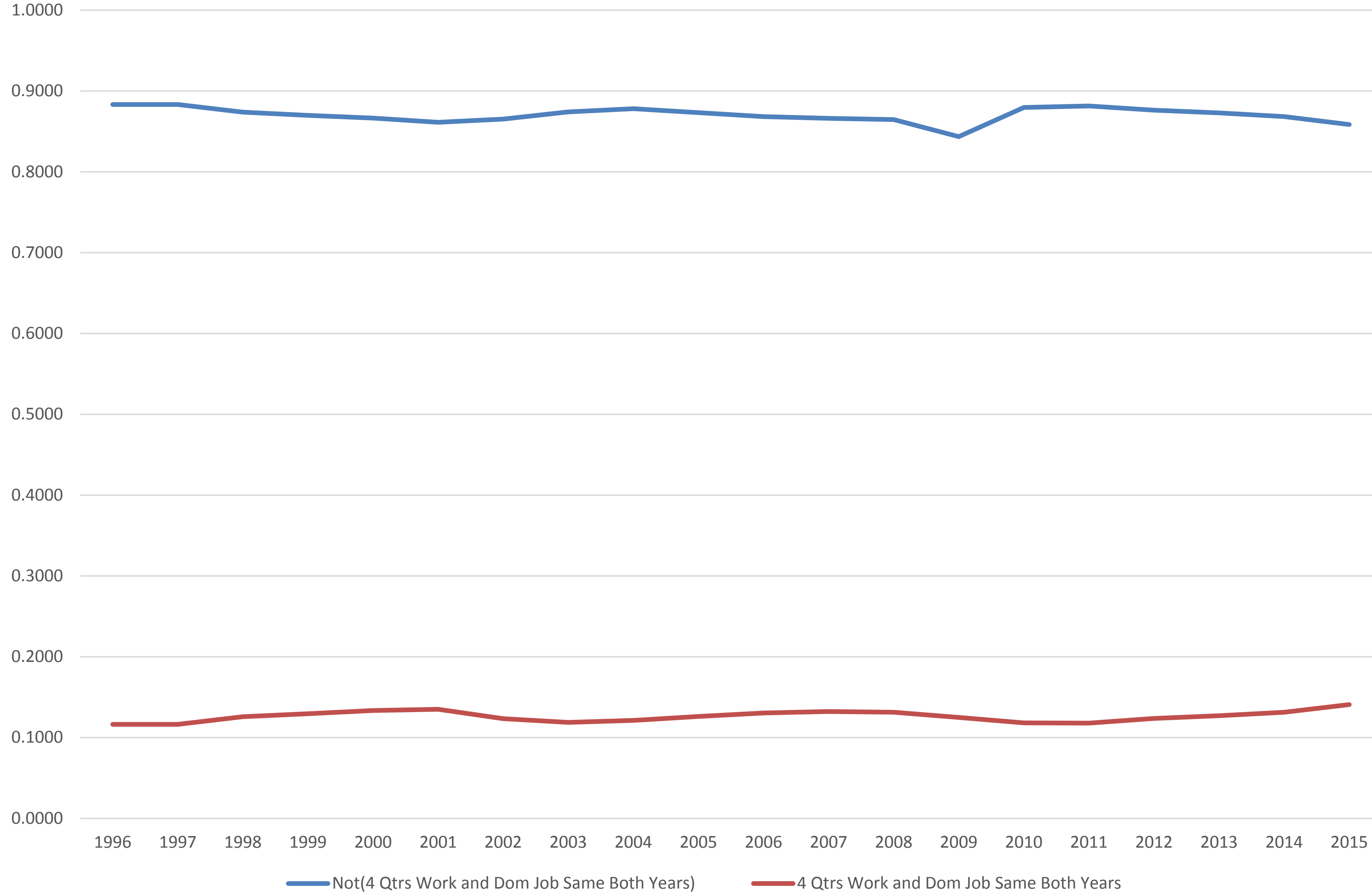


Mean Change in Log Earnings by Stable and not(Stable)
0.1000
0.0500
0.0000
-0.0500
-0.1000
-0.1500
-0.2000
-0.2500
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Not(4 Qtrs Work and Dom Job Same Both Years)
4 Qtrs Work and Dom Job Same Both Years



Variance of Change in Log Earnings by Stable and not(Stable)
1.0000
0.9000
0.8000
0.7000
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Not(4 Qtrs Work and Dom Job Same Both Years)
4 Qtrs Work and Dom Job Same Both Years

Share of Total Variance in Log Earnings by Stable and not(Stable)

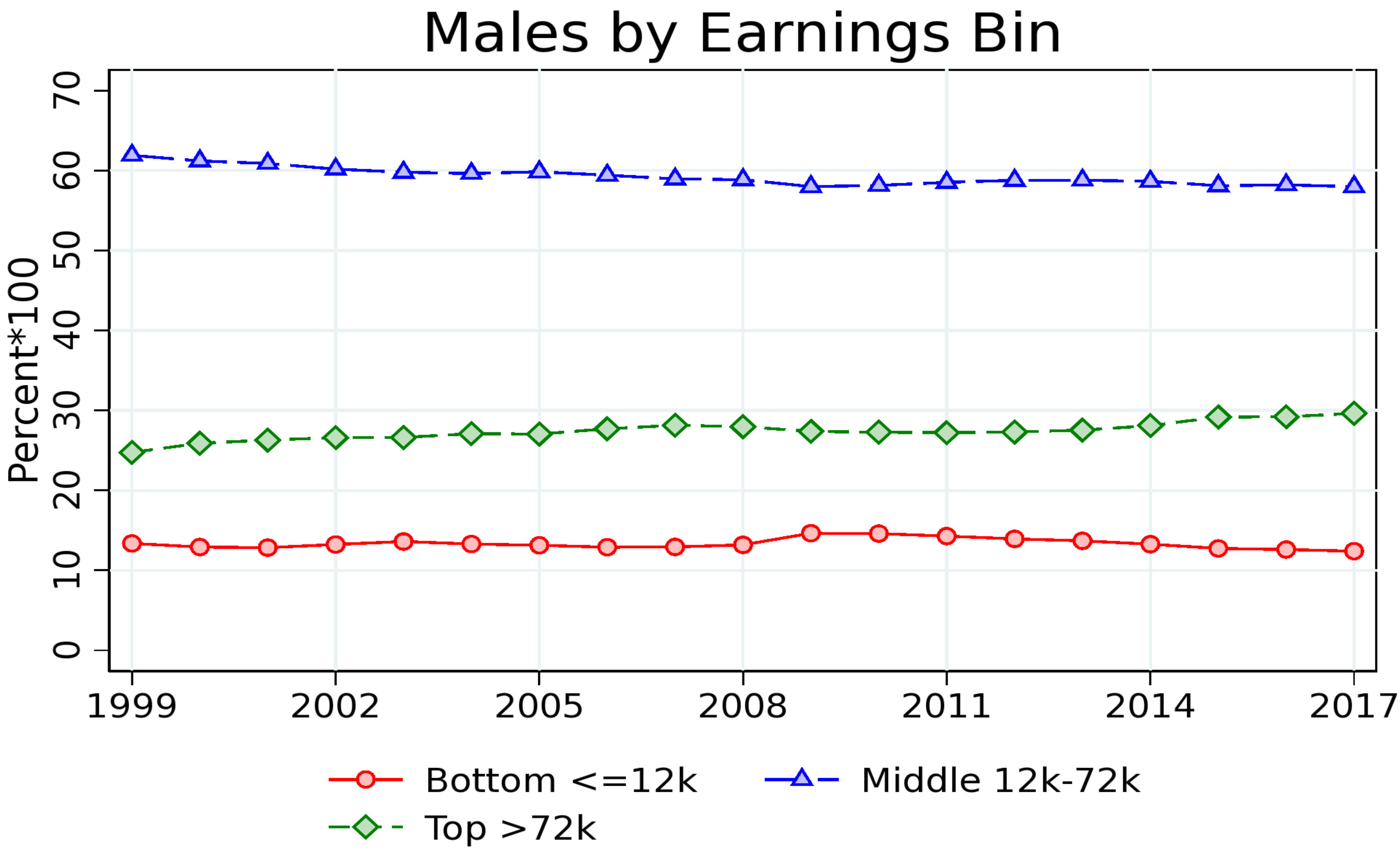


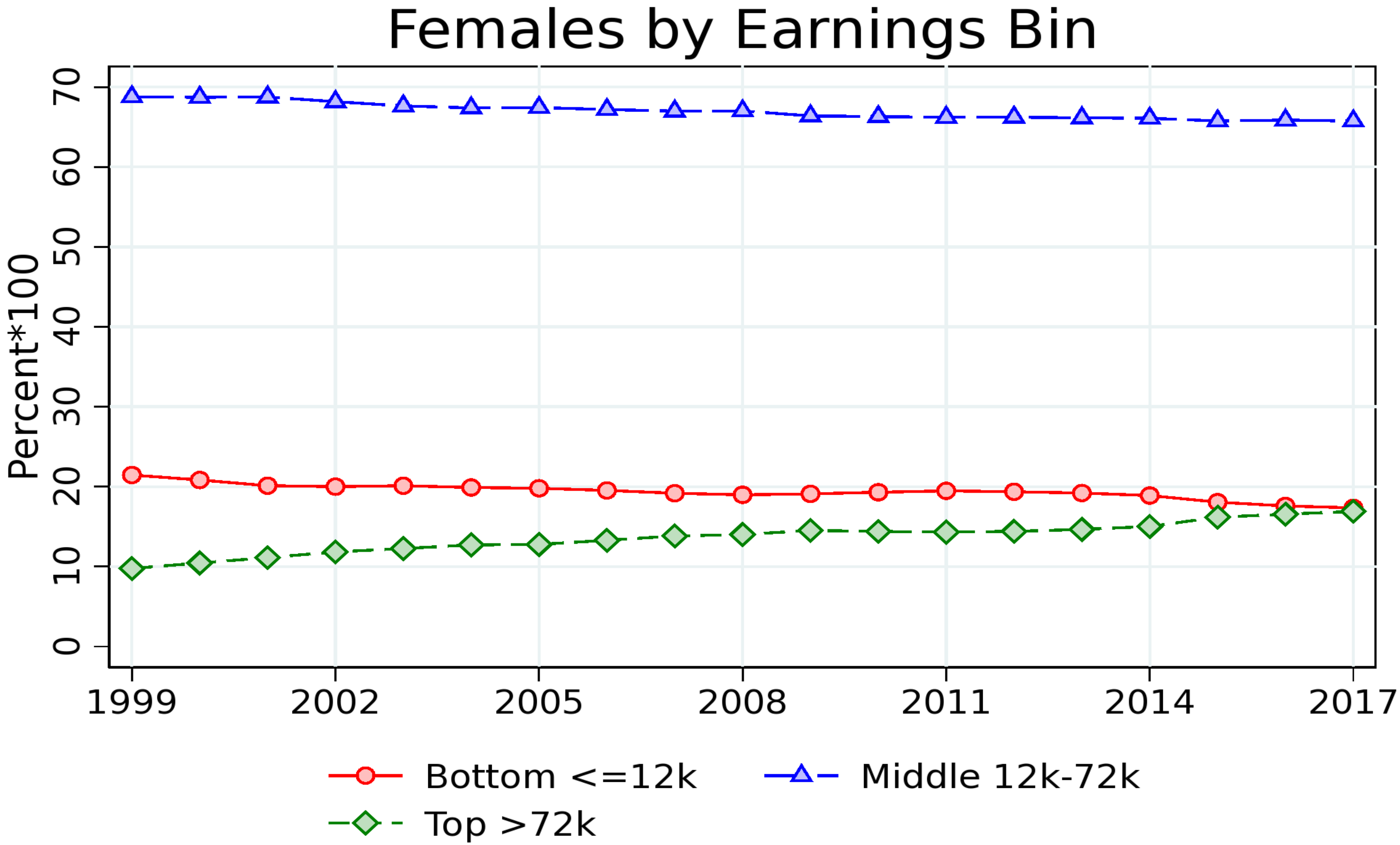
Summary

- Stable worker population increases almost every year from a low of 64% in 1997 to a high of 72% in 2015, muting the impact of rising not(Stable) earnings variance
- Stable workers typically have positive earnings growth (2.7%) and very low earnings volatility (0.05)
- Not(Stable) workers typically have negative earnings growth (-1.4%) and very high earnings volatility (0.77)

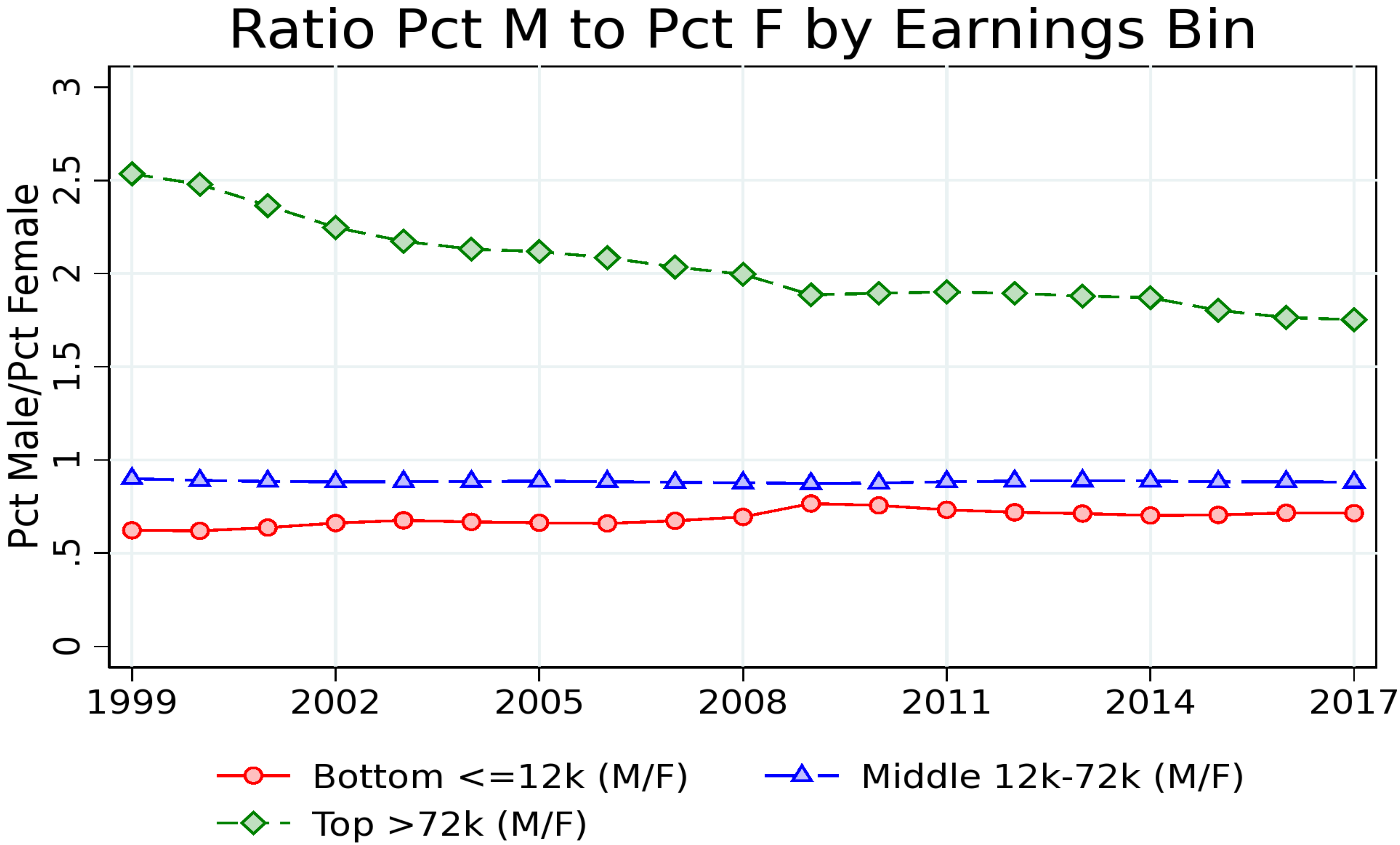
Earnings Bins

- A single volatility measure overstates the impact for the typical worker in the middle or top of the earnings distribution
  - Workers in the middle or top of the distribution are more likely to be “stable” than those at the bottom.
- Instead of removing workers at the tails of the earnings distribution, we divide the annual earnings distribution into three constant real earnings bins plus one inactive worker bin
  - Bin 0 (inactive) – No reported earnings
  - Bin 1 (~bottom 20%) – Real Earnings <= 12k
  - Bin 2 (~middle 60%) – Real Earnings (12k-72k]
  - Bin 3 (~top 20%) – Real Earnings > 72k

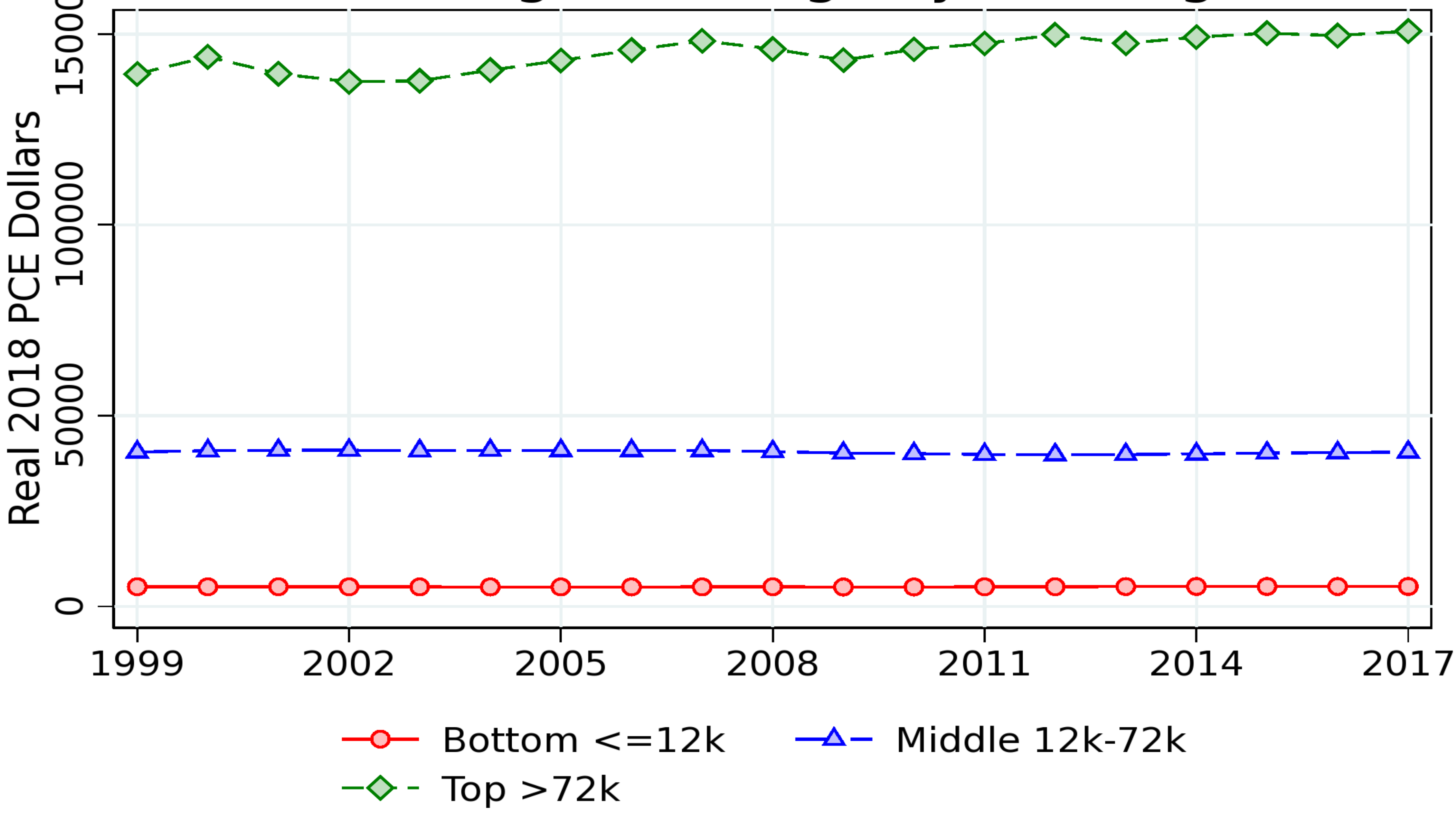

Males by Earnings Bin
Percent*100
0
10
20
30
40
50
60
70
1999
2002
2005
2008
2011
2014
2017
Bottom <=12k
Middle 12k-72k
Top >72k

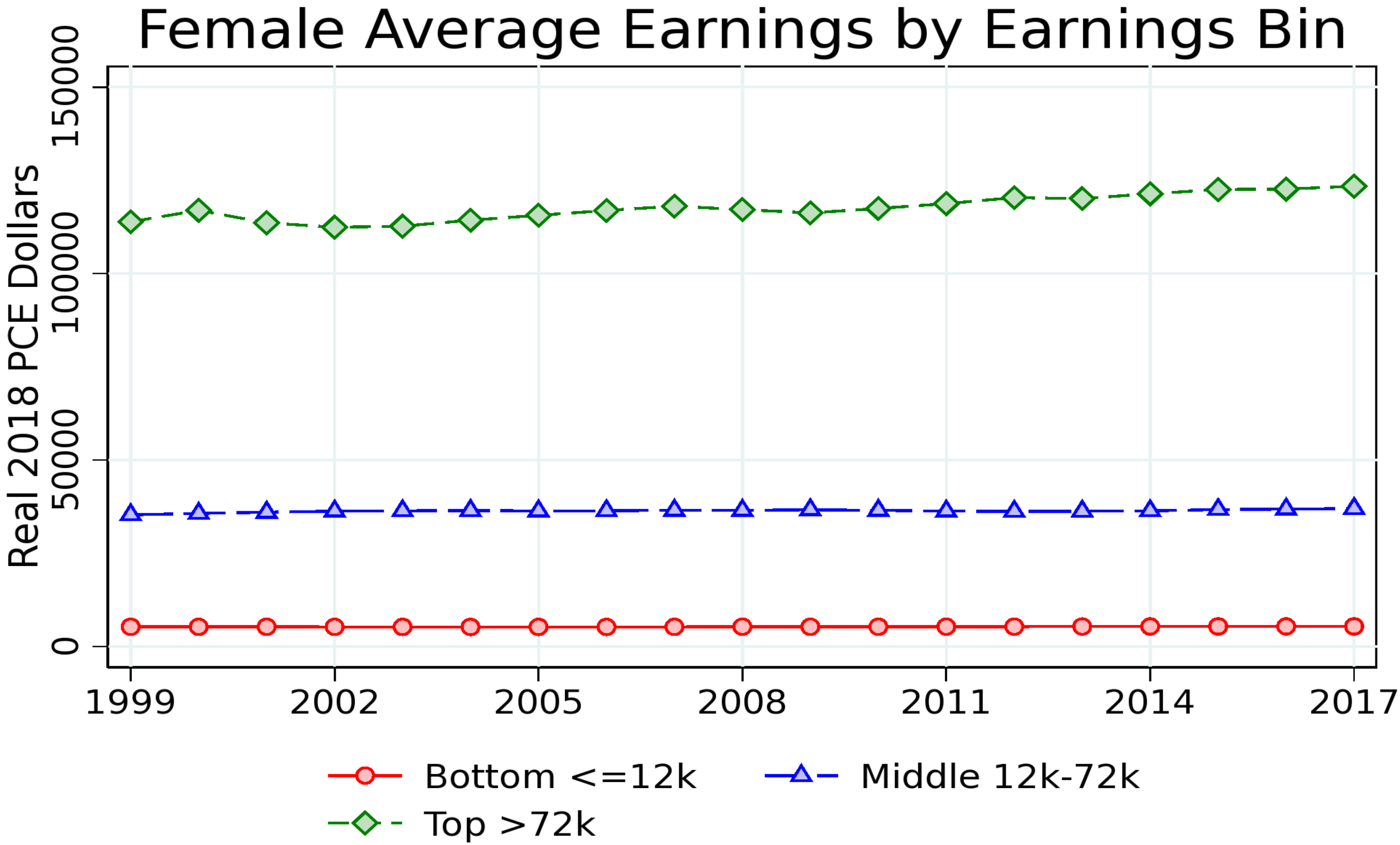


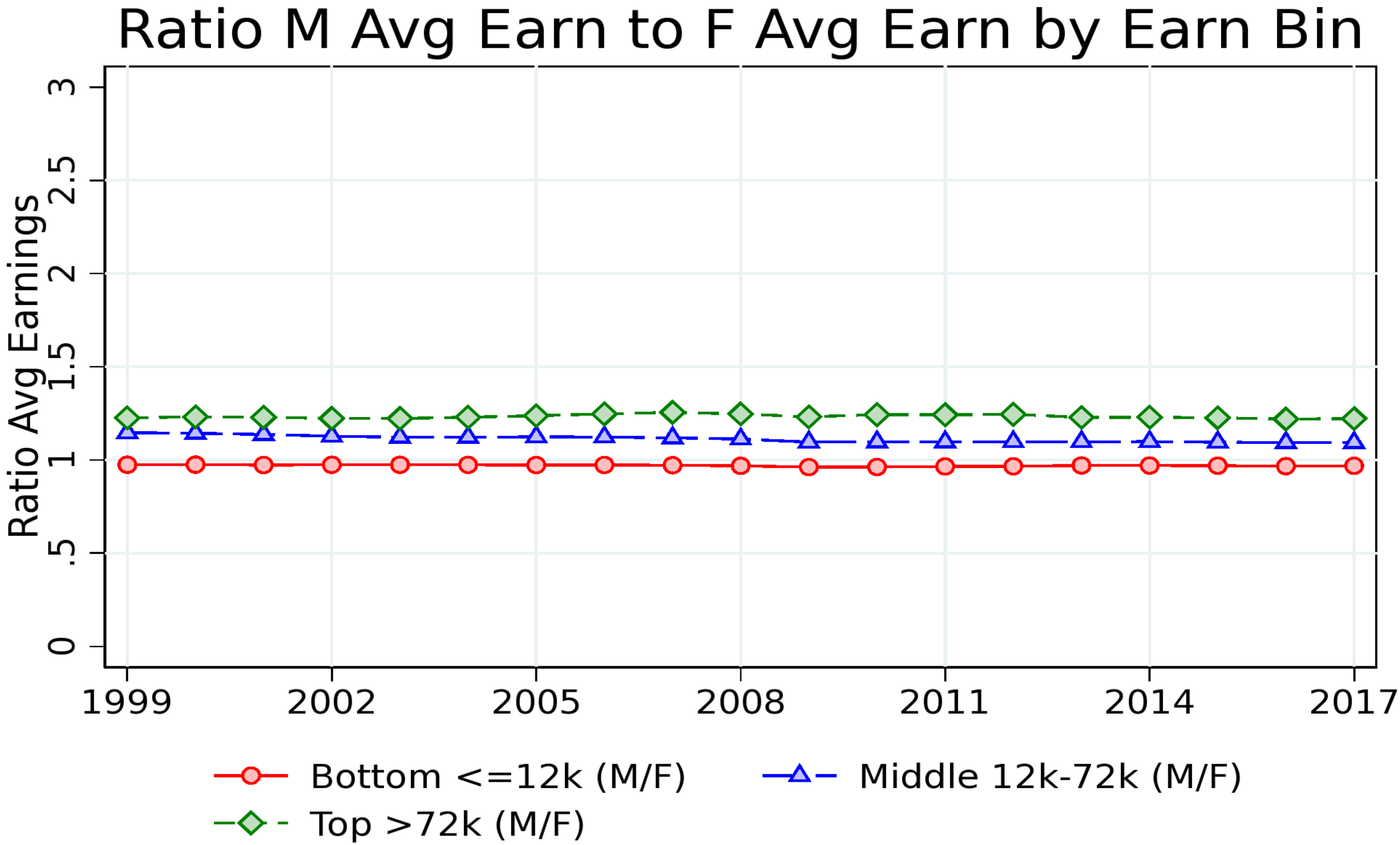
Females by Earnings Bin
Percent*100
0
10
20
30
40
50
60
70
1999
2002
2005
2008
2011
2014
2017
Bottom <=12k
Middle 12k-72k
Top >72k


Ratio Pct M to Pct F by Earnings Bin
Pct Male/Pct Female
0
.5
1
1.5
2
2.5
3
1999
2002
2005
2008
2011
2014
2017
Bottom <=12k (M/F)
Middle 12k-72k (M/F)
Top >72k (M/F)

Male Average Earnings by Earnings Bin




Female Average Earnings by Earnings Bin
Real 2018 PCE Dollars
0
50000
100000
150000
1999
2002
2005
2008
2011
2014
2017
Bottom <=12k
Middle 12k-72k
Top >72k



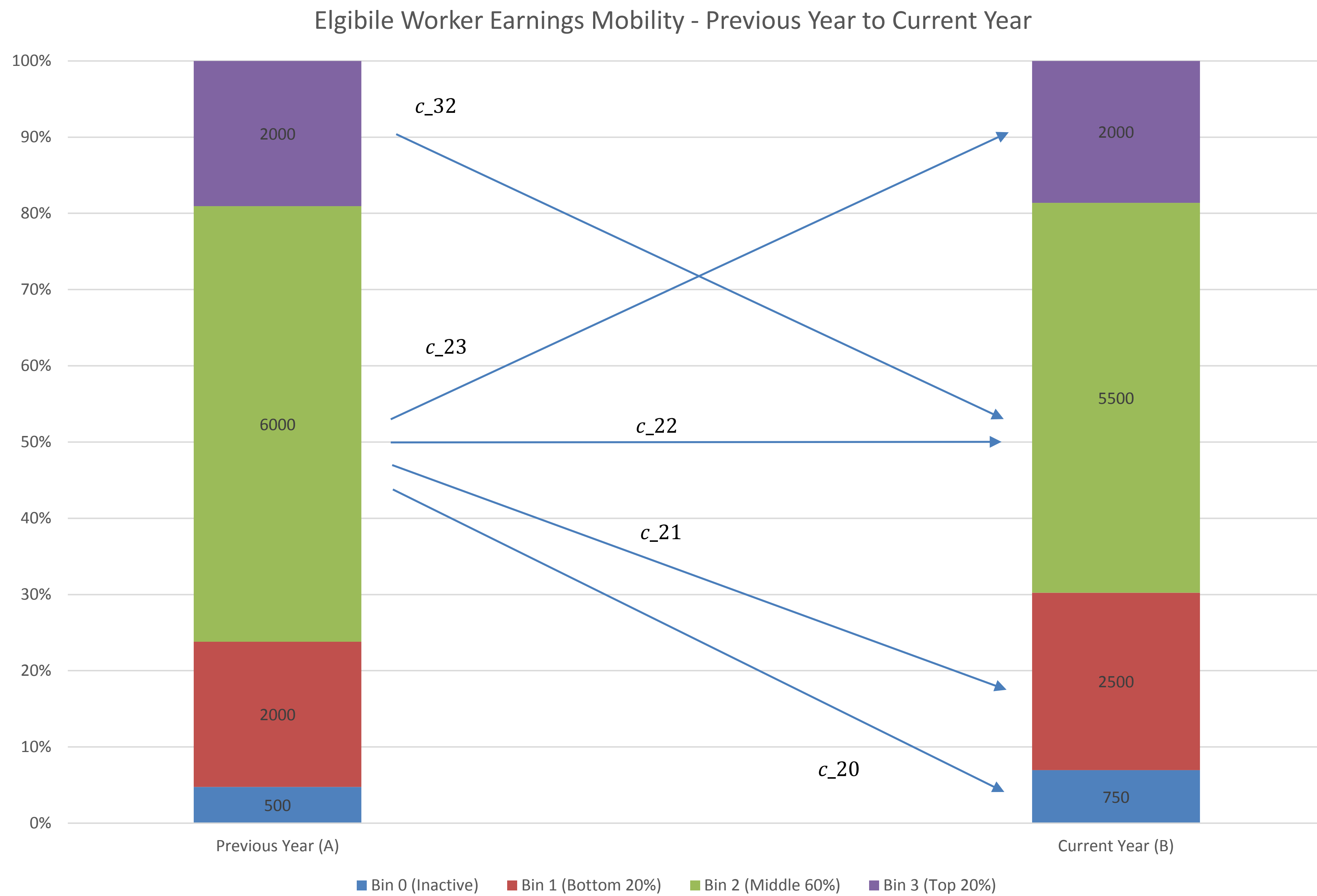
Ratio M Avg Earn to F Avg Earn by Earn Bin
Ratio Avg Earnings
0
.5
1
1.5
2
2.5
3
1999
2002
2005
2008
2011
2014
2017
Bottom <=12k (M/F)
Middle 12k-72k (M/F)
Top >72k (M/F)

Summary

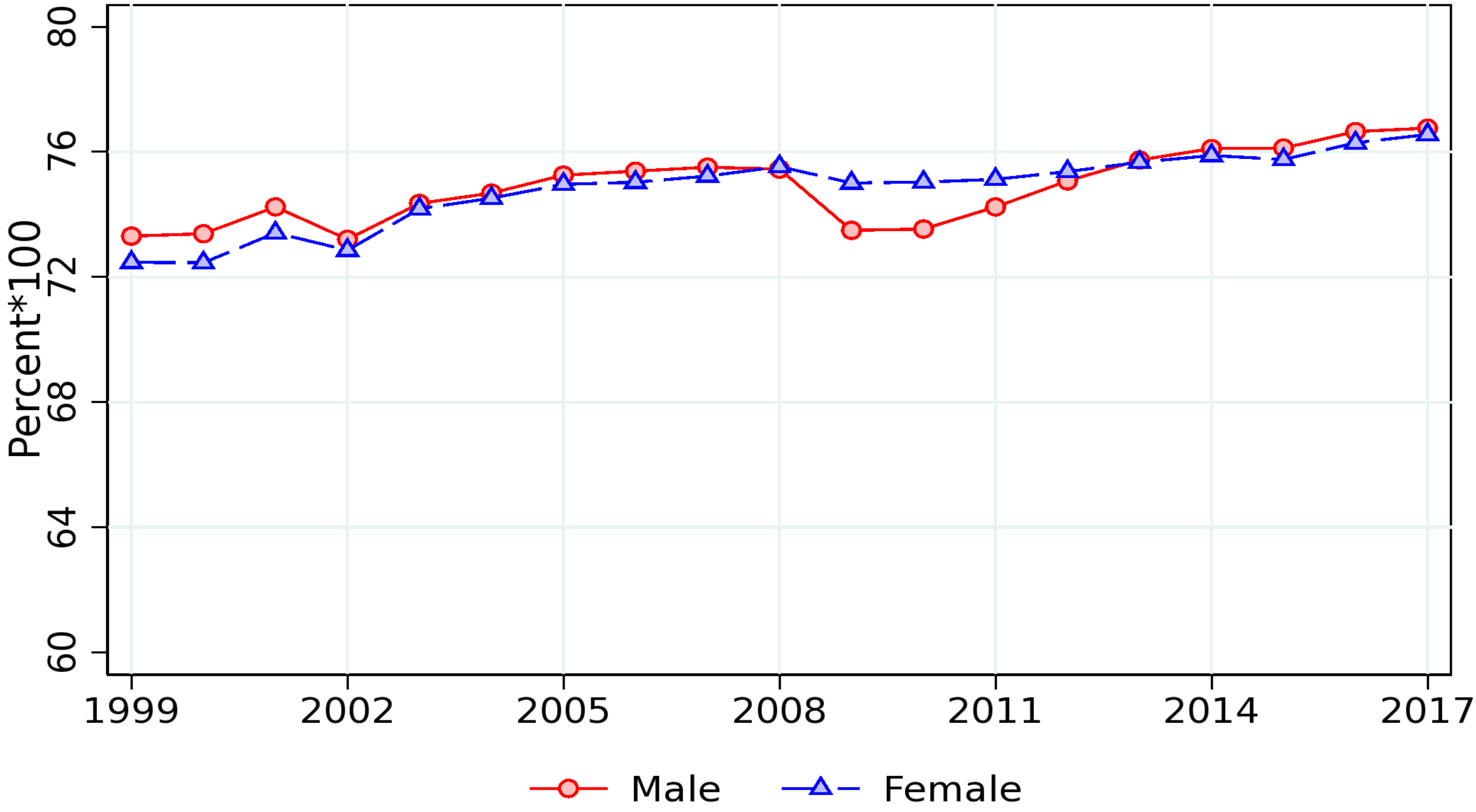
- The male earnings distribution is more unequal than the female earnings distribution
- The proportion of workers at the top is increasing, while the proportion in the middle and the bottom is decreasing.
- Average earnings within the bottom and middle bins are constant, but average earnings is increasing at the top.
- Average earnings is increasing due to both an increasing share of workers at the top and an increase in average earnings at the top.
- The typical worker in the bottom and the middle has only a small amount of growth in average earnings.

Earnings Mobility

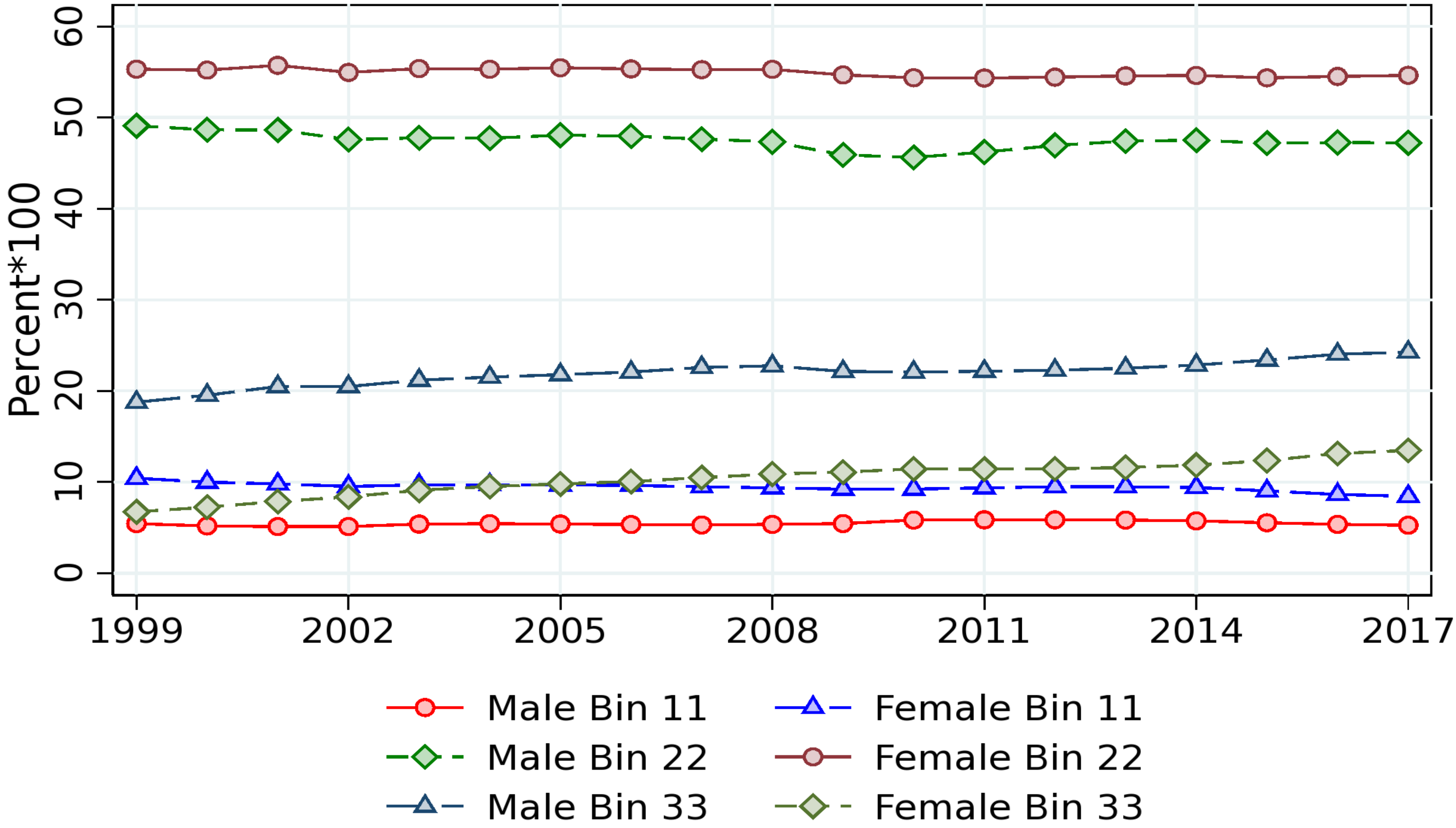
Movement of workers across and within earnings bins from the previous to the current year

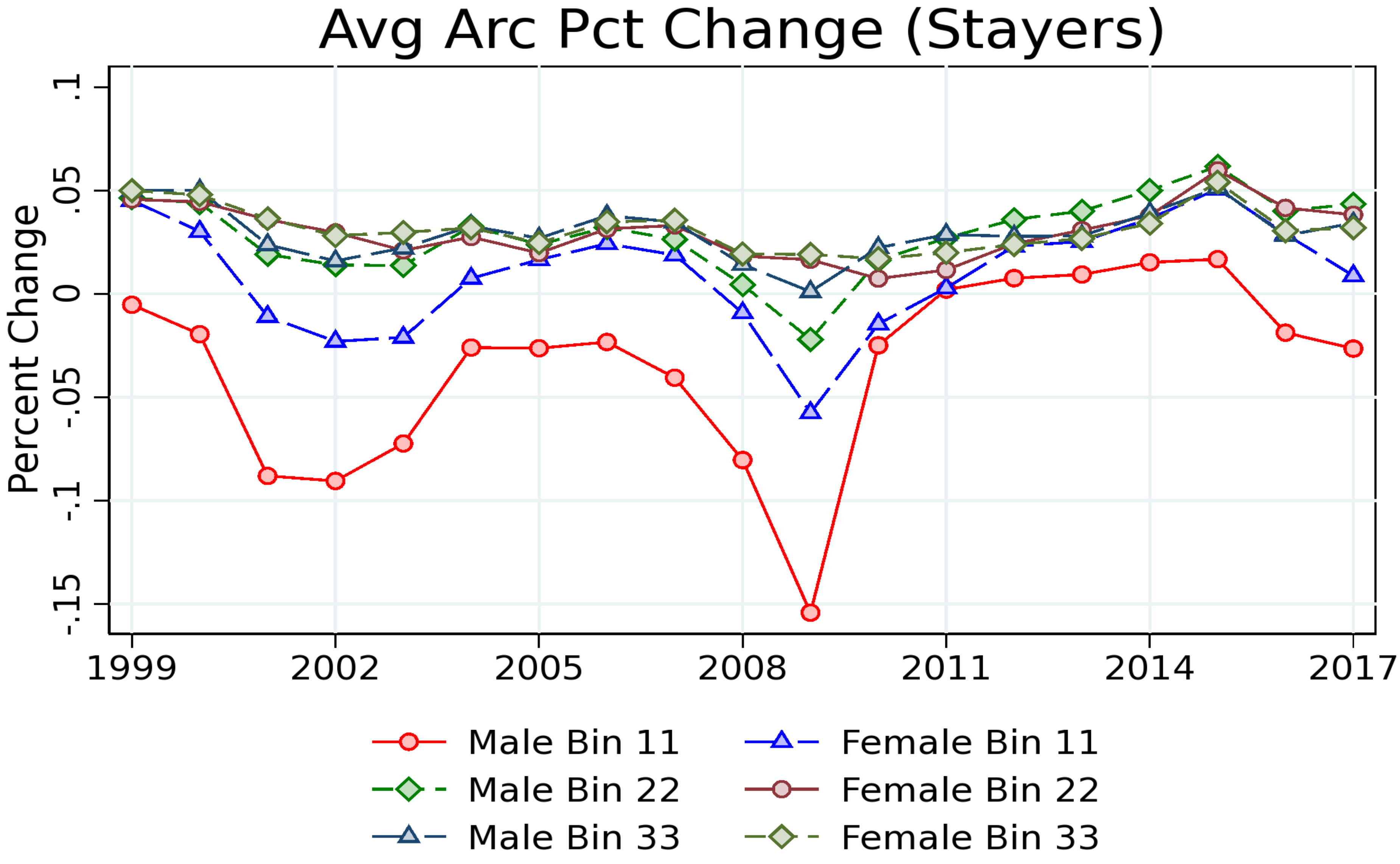

Elgibile Worker Earnings Mobility - Previous Year to Current Year
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2000
6000
2000
500
2000
5500
2500
750
c_32
c_23
c_22
c_21
c_20
Previous Year (A)
Current Year (B)
Bin 0 (Inactive)
Bin 1 (Bottom 20%)
Bin 2 (Middle 60%)
Bin 3 (Top 20%)

Active Worker Stayers (11,22,33) by Gender

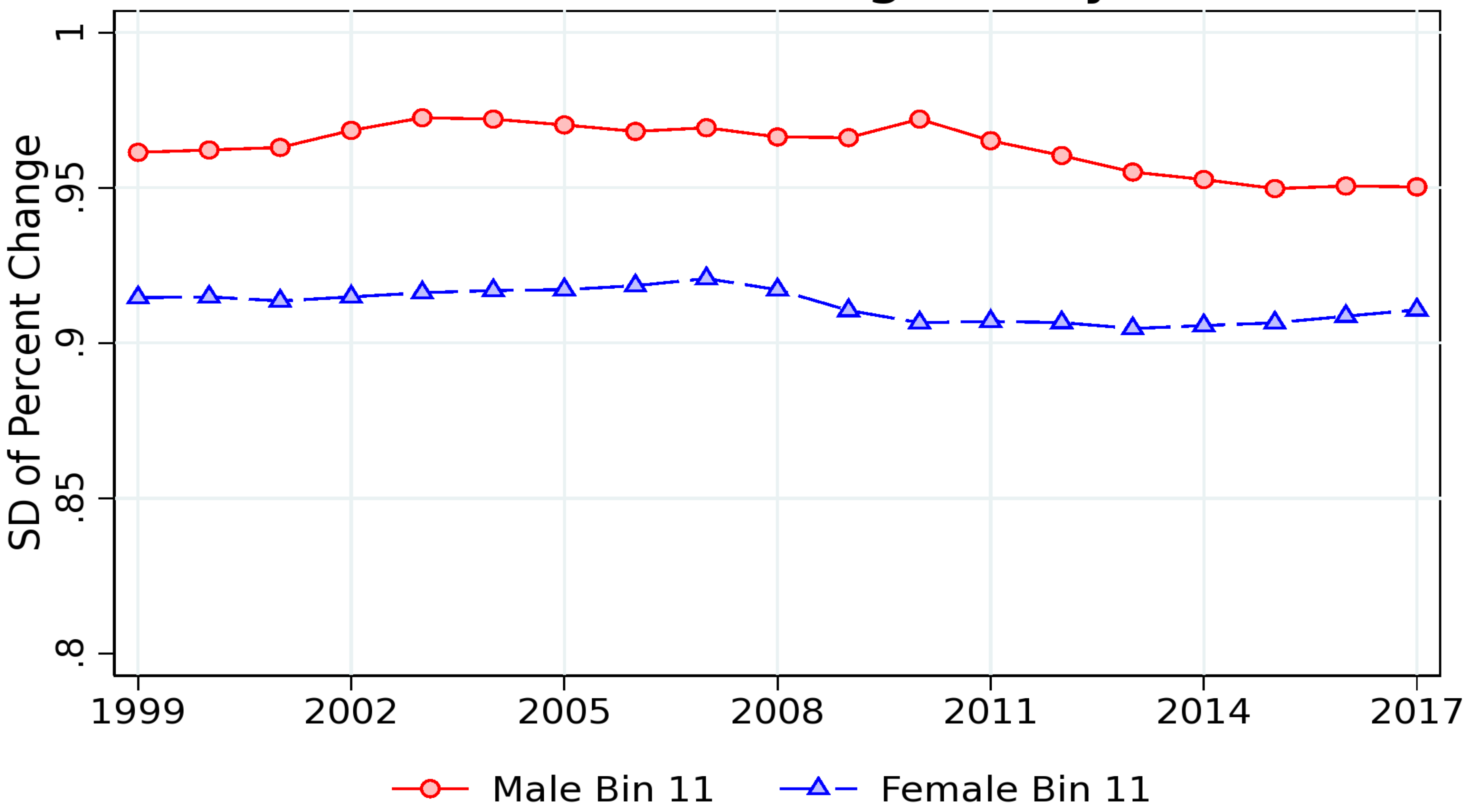


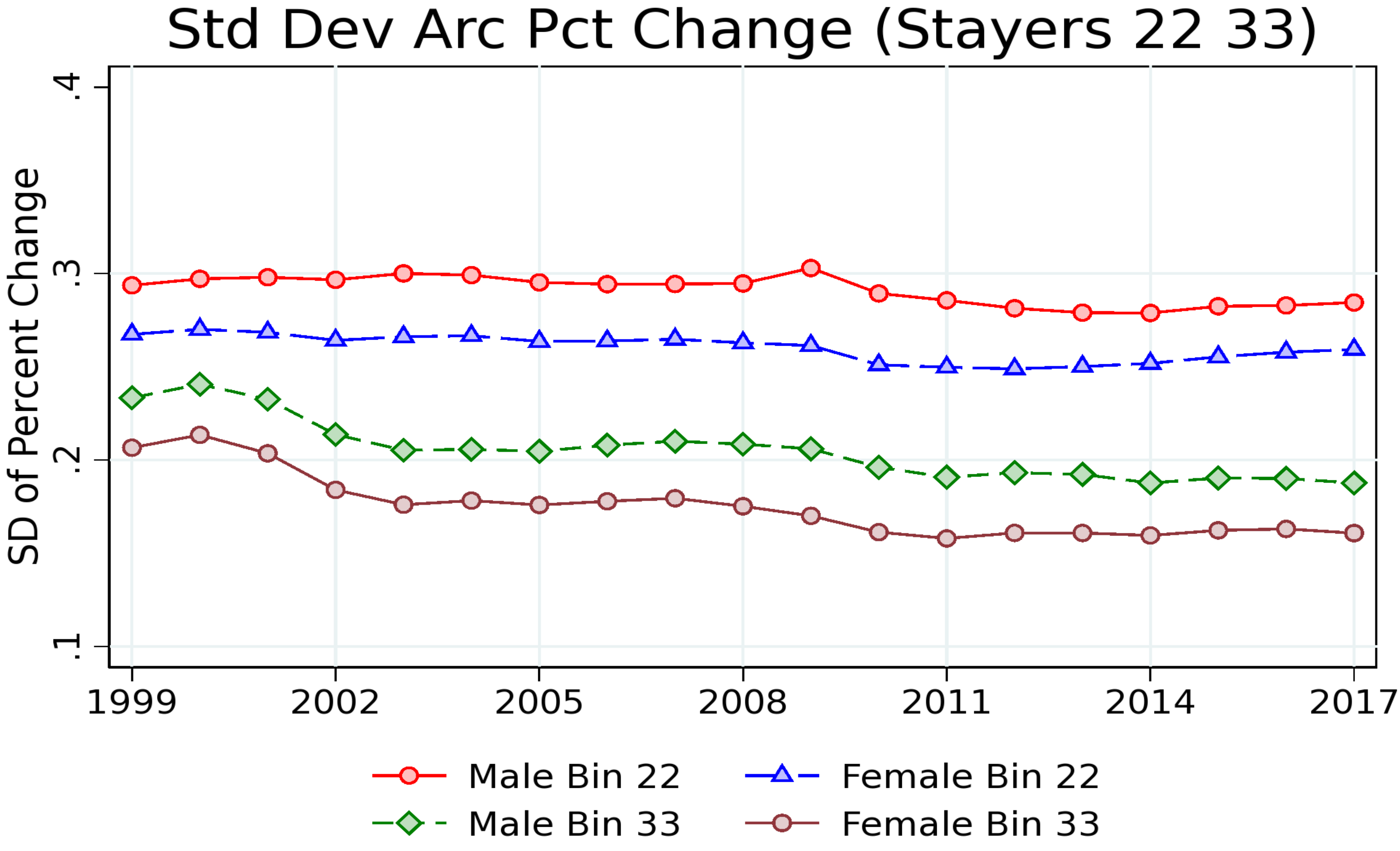
Active Worker Stayers by Gender and Bin




Avg Arc Pct Change (Stayers)
Percent Change
.1
.05
0
-.05
-.1
-.15
1999
2002
2005
2008
2011
2014
2017
Male Bin 11
Female Bin 11
Male Bin 22
Female Bin 22
Male Bin 33
Female Bin 33

Std Dev Arc Pct Change (Stayers 11)





Std Dev Arc Pct Change (Stayers 22 33)
SD of Percent Change
.1
.2
.3
.4
1999
2002
2005
2008
2011
2014
2017
Male Bin 22
Female Bin 22
Male Bin 33
Female Bin 33

Summary

- Decreasing earnings mobility. More workers are staying in the same earnings bin between $t-1$ and t. More stayers implies less mobility.
- Decreasing earnings volatility for stayers (especially workers at the top) combined with more stayers is primarily responsible for the decrease in volatility.
- Stayers are doing well in the middle and above, but lower mobility makes it harder to recover from a negative shock.
- Workers at the bottom have consistently negative changes in earnings on average and high volatility.

Future Plans

- Regularly release national and local estimates of earnings inequality, mobility, and volatility
- Produce statistics for workers at the bottom, middle, and top of the earnings distribution.
- Account for local worker entry and exit
  - Both age and geographic mobility
- Geography: place of work vs place of residence

Conclusion

- A framework is in place for producing new local statistics on earnings dynamics
- Challenges
  - Disclosure avoidance for small cells
  - Graphical interface development
  - Computing resources (although releasing the product annually will reduce the processing burden)
- Feedback welcome!