

# Online Appendix for Did Timing Matter? Life Cycle Differences in Effects of Exposure to the Great Recession

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## Appendix A Additional Data Details and Analyses

### A.1 Pre-recession Trends in the Current Population Survey

Because I do not have access to W-2 data prior to 2005, I cannot directly assess pre-recession trends in my exact outcomes of interest using the same data I use in my main analysis. Public data from the Current Population Survey, however, is encouraging as to the validity of the parallel trends assumption for young workers. Figure A1 shows trends since 1994 in the unemployment rate, employment/population ratio, and earnings among workers under 25 years of age for population-weighted terciles of 2007-2009 unemployment shock exposure. (This exercise uses a state-based unemployment shock because the data do not contain sufficiently detailed geographic identifiers to construct commuting zone-based measures.) These outcomes are conceptually similar to those considered in the paper. Similarly to the analysis presented in the paper, each series is pegged to zero in 2006. Though these survey-based measures are somewhat noisier than the measures based on administrative data used in the main analysis, trends for the three exposure groups generally track each other throughout the period prior to the Great Recession, suggesting that more- and

less-intensely treated places were not diverging significantly in terms of either the main shock in question or the outcomes of interest prior to the onset of the recession.

## A.2 Differences from Yagan (2019)

As discussed above, [Yagan \(2019\)](#) focuses on prime-age workers born between 1957 and 1976. I present estimates based on these cohorts in Figure 2. Even in that figure, though, there are three noteworthy differences between the data and methods used here and in that paper.

First, the [Yagan](#) analysis is limited to US citizens, and my analysis is not. Second, the methods used to assign individuals to commuting zones differ. [Yagan](#) uses ZIP codes listed on tax forms and a ZIP-county crosswalk to place individuals in commuting zones. If location information is not available for an individual in a given year, that person-year observation is assigned to the commuting zone in which the individual was most recently observed in the data. Here, I use location information from a variety of sources to assign individuals to commuting zones. Broadly speaking, these sources include the counties associated with the Master Address File identifiers (MAFIDs) that appear on the Census Bureau's research files in place of exact addresses and ZIP codes from Forms 1040 and 1099.<sup>1</sup> Specifically, I obtain location information from six sources, prioritized as follows:

1. MAFID from Form 1040
2. ZIP code from Form 1040, crosswalked to county
3. MAFID from Form 1099
4. ZIP code from Form 1099, crosswalked to county
5. MAFID from American Community Survey
6. MAFID from Master Address File-Auxiliary Reference File

For individuals who are claimed as dependents on another person's 1040, I assign the geographic information from that 1040 to them as well. Individuals may receive multiple 1099s. I use the modal MAFID (if available) and the modal ZIP code (if MAFID is not available). In cases of

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<sup>1</sup>MAFIDs are assigned by comparing address information on a given file to the Census Bureau's Master Address File. The exact address information is then removed from the version of the file provided to researchers, and the MAFID, as well as commonly used geographic identifiers associated with it (e.g. state, county, tract), are attached.

multiple modes, I select randomly among them. Location information from tax forms is applied to the calendar year that the forms refer to (not the year in which the forms would have been filed). Location information from the American Community Survey is available only for survey respondents and is applied to the calendar year in which the response was provided. The Master Address File-Auxiliary Reference File (MAF-ARF) contains all known MAFIDs associated with each person in each year collected from sources mentioned above as well as data from other federal and state programs.

Finally, the specifications used to produce my estimates are conceptually similar to but technically different from those used in [Yagan \(2019\)](#). Yagan's preferred estimates are based on his equation 4.1:

$$e_{it} = \beta SHOCK_{c(i2007)} + \theta_{gi(2006)} + \epsilon_{it} \quad (\text{A1})$$

In this specification, the  $\theta_{gi(2006)}$  term represents a set of age-earnings-industry fixed effects, measured in 2006. The outcome  $e_{it}$  (whether employment or earnings) is measured relative to its average from 1999 through 2006. For employment, it is defined as

$$e_{it} \equiv EMPLOYED_{it} - \frac{1}{8} \sum_{s=1999}^{2006} EMPLOYED_{is} \quad (\text{A2})$$

The corresponding specification in this paper is provided in Equation 1, reproduced here:

$$y_{it} = \sum_{t=2005}^{2017} \beta_t Shock_{CZ07(i)} \cdot 1[Year = t] + \sum_{a \in ages} \alpha_a \cdot 1[Age_{it} = a] + \gamma_i + \delta_t + \varepsilon_{it}$$

There are three important distinctions between these specifications. First, because I have access to a limited amount of pre-recession data, I cannot effectively measure my dependent variables relative to a longer-term pre-recession mean. As such, my dependent variables are simply individual  $i$ 's value of outcome  $y$  at time  $t$ . Second, the independent variables in Equation A1 are all time-invariant, so estimates of effects of shock exposure on outcomes for different years are produced by using dependent variable values from different years and estimating separate regressions. Here, I produce estimates for all years in a single regression by interacting the shock with year dummies and including year fixed effects in the regression. Finally, and related to the first two differences, my specification uses individual fixed effects rather than 2006 age-earnings-industry fixed effects.

Consequently, my outcomes are implicitly measured relative the individual  $i$ 's full period mean.

### A.3 Replicating Yagan (2019) data

As discussed above, I do not have the capacity to match the preferred specification from [Yagan \(2019\)](#) exactly, but I can produce estimates using my preferred specification (from Equation 1) on data that are constructed as similarly as possible to the data used in that paper. Specifically, this entails using only data on citizens, identifying location using only ZIP codes (and a crosswalk graciously provided by Yagan), and using a different the location imputation strategy. As in Figure 2, analysis is limited to the 1957 through 1976 birth cohorts. As Figure A2 shows, estimates based on this construction of the data are very similar to the estimates in Figure 2.<sup>2</sup>

### A.4 Robustness to Alternative Sample Constructions

My baseline sample requires that individuals have location information available in all 13 years, allowing gaps of up to three consecutive years to be filled in via imputation if observations on both ends of the gap are in the same commuting zone. This requirement represents a relatively high degree of attachment to formal employment or connection to the administrative state, and estimates based on this sample may not be representative of populations that are more frequently disconnected from the tax filing system. At the same time, this sample construction does not eliminate the potential for location to be mismeasured, and my imputation methodology could bias these estimates if it places individuals in the wrong commuting zones in 2007.

To check the sensitivity of my estimates to the requirements for inclusion in my sample, I reproduce my baseline estimates on two alternative samples: one that relaxes the location information availability requirement, and one that intensifies it. The first, broader sample includes individuals with location information available in at least 7 of the 13 years of data used (one of which must be 2007, in order to be assigned an unemployment shock value). The second, more restrictive sample includes only individuals with non-imputed location information available in all 13 years of data.

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<sup>2</sup>Yagan's employment and earnings measures are based on combined W-2 and certain 1099 income. My data do not provide income amounts from 1099s, so my measures are based only on W-2 income. I do have an indicator for receipt of various 1099s, so I can construct a comparable employment measure for the sake of this exercise, but in all other cases, employment is based only on receipt of W-2 income, for the sake of consistency with the earnings estimates.

Figure A3 shows employment and earnings effects for all cohorts estimated using the broader sample, while Figures A4 and A5 report employment and earnings effects, respectively, by generation. Likewise, Figures A6, A7, and A8 present estimates for the narrower sample. All estimates are very similar to the baseline estimates presented in the main text of the paper. Estimates from the broader sample are especially similar to the baseline, alleviating to some extent concerns that the baseline estimates may not reflect the experience of workers who have less consistent interactions with the formal labor market or tax filing system.

## A.5 Labor Market Concentration and the Great Recession

Might recession-related changes in the configuration of local labor markets also have effects on workers subsequent employment and earnings, above and beyond those associated with changes in labor demand? Job creation and destruction fell sharply during the Great Recession, establishment exit increased, and more productive continuing establishments grew faster (Foster et al., 2016). These recession-related dynamics may have combined to change the composition, structure, and degree of employment concentration in local labor markets substantially. Rinz (2018) shows that the local labor market concentration experienced by the average worker increased during the Great Recession. Specifically, the level of local industrial employment concentration experienced by the average worker, measured using an employment-based Herfindahl-Hirschman Index (HHI), increased from about 0.144 to 0.149, an increase of about 3.5 percent. This is a substantially smaller shock than the more than 100 percent increase in unemployment over this period, but it represents a notable departure from decades of fairly consistent decline in this measure.<sup>3</sup>. The increase in concentration during the recession does appear to have been unexpected. Concentration was on a similar pre-recession trajectory in commuting zones that experienced large, medium, and small/negative concentration shocks during the recession, and changes in concentration during the recession do not predict prior changes in concentration. See Appendix Figures A13 and A14 for figures summarizing changes in concentration.

A growing literature documents a negative relationship between local labor market concentration and earnings (e.g. Azar et al. 2017; Benmelech et al. 2018; Rinz 2018; Berger et al. 2019; Qiu and

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<sup>3</sup>This pattern was also documented, roughly contemporaneously, by Lipsius (2018) and Rossi-Hansberg et al. (2018)

Sojourner 2019; Jarosch et al. 2019; Prager and Schmitt 2019; Hershbein et al. 2020; Marinescu et al. 2020), but the relative importance of changes in concentration to the overall effects of exposure to the Great Recession is unknown. These concentration shocks are also a new source of variation in the literature on local labor market concentration; recent studies have tended to utilize leave-one-out mean instruments, highly saturated OLS regressions, mergers, and structural modeling to study the relationship between concentration and earnings.

I construct local concentration shocks in a manner similar to the unemployment shocks used above. I use the HHI to measure local labor market concentration. Specifically, I define  $HHI_n = \sum_f s_f^2$  for each four-digit NAICS industry  $n$  in each commuting zone using each firm  $f$  share of total employment  $s$ . I then define  $HHI_{ct}$  as the employment-weighted average of the industry-level HHIs for commuting zone  $c$  in year  $t$ . My concentration shock measure, then, is  $HHIShock_{CZ07(i)} = \frac{D_{CZ07(i)}}{\sigma_{D_{CZ07(i)}}}$ , where  $D_{CZ07(i)} = HHI_{CZ07(i),2009} - HHI_{CZ07(i),2007}$  and  $CZ07(i)$  gives individual  $i$ 's commuting zone of residence in 2007. In words, this gives the change in HHI (in standard deviation terms) experienced by the average worker in each commuting zone between 2007 and 2009.<sup>4</sup> I then estimate

$$y_{it} = \sum_t \beta_t HHIShock_{CZ07(i)} \cdot 1[Year = t] + \sum_t \zeta_t Shock_{CZ07(i)} \cdot 1[Year = t] + \sum_t \kappa_t Bartik_{CZ07(i)} \cdot 1[Year = t] + \sum_{a \in ages} \alpha_a \cdot 1[Age_{it} = a] + \gamma_i + \delta_t + \varepsilon_{it} \quad (A3)$$

where  $Bartik_{CZ07(i)}$  is an industry-based, Bartik-style measure of predicted employment growth between 2007 and 2009 in individual  $i$ 's commuting zone of residence in 2007. This measure is included here because the concentration shock is based on a local average of within-industry changes in concentration and could conceivably be capturing differences in sector-specific demand shocks across places.<sup>5</sup> Other terms are defined as in Equation 1 above. For all shocks, the 2006 interaction is omitted, and all estimates are relative to that year.

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<sup>4</sup>Unlike the unemployment shock, the concentration shock is in standard deviation terms. I constructed the concentration shock this way because absolute changes in the HHI do not have the same intuitive interpretation as changes in the unemployment rate. This difference in construction should be kept in mind when comparing estimates across shocks.

<sup>5</sup>In practice, the correlation between the concentration shock and the other shocks in this specification is low. The correlation between the concentration shock and the unemployment shock is 0.065. The correlation between the concentration shock and the Bartik shock is 0.058. The unemployment shock and the Bartik shock are more strongly correlated (-0.62), which makes sense given the similarity between the underlying conditions they are measuring.

Both employment and earnings decline following exposure to a concentration shock, though these effects do not follow the same cyclical pattern as the effects of unemployment shocks. Figure A15 shows estimated employment and earnings effects of exposure to concentration shocks for my full sample, estimated using Equation A3. Estimates of the effects of exposure to unemployment shocks from Equation A3 are also provided for reference.<sup>6</sup> The onset of the effects of concentration shocks is slower, especially for earnings, and they are more persistent, showing little sign of recovery in recent years. The persistence of the effects of the shock is likely due in part to the persistence of the shock itself. While the unemployment rate had returned to its pre-recession level by 2017, concentration shocks had reverted only modestly (see Appendix Figure A13).

Employment and earnings are more responsive to unemployment shocks than they are to concentration shocks, as one can see by converting the unemployment rate shock estimates into standard deviation terms. This is an easy conversion; the standard deviation of the unemployment shock across commuting zones is about two percentage points, so doubling the unemployment shock coefficients gives roughly the effect of a one standard deviation increase in unemployment. In 2010, a one standard deviation increase in unemployment reduced the probability of working by 1.2 percentage points and earnings by over \$1,000, while a one standard deviation increase in concentration reduced employment by 0.2 percentage point and earnings by less than \$100 (an effect that is not statistically significant).

Comparing these shocks based on the consequences to the average worker of being exposed to each of them also shows that unemployment shocks had more negative consequences. The average worker was exposed to a 4.6 percentage point unemployment shock and a 0.2 standard deviation concentration shock. Using coefficients from Equation A3, this implies a total post-recession cost of exposure to the average unemployment shock equal to 6.3 percent of the average worker's total

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<sup>6</sup>It is worth noting that the magnitude of the earnings effects of exposure to an unemployment shock is substantially smaller when estimated alongside concentration and Bartik shocks than they are in my main estimates. Aside from this level difference, the pattern of earnings estimates is similar to the baseline specification. The employment effects estimated using Equation A3 are similar in magnitude during the recession and its immediate aftermath to those based on Equation 1, though they exhibit more recovery in more recent years. Given the relatively high correlation between the unemployment shocks and the Bartik shocks, it is unsurprising that including the Bartik shocks would change the estimated effects of the unemployment shocks. Overall, though, these estimates serve as evidence that the effects of exposure to unemployment shocks are robust to the inclusion of additional related shocks in the estimation. When focusing on the effects of unemployment shocks on employment and earnings, I prefer estimates from Equation 1. In Equation A3, the Bartik shock measure is included to alleviate potential concerns about the mechanics of the HHI shock. Both the Bartik shock and the unemployment shock represent labor demand shocks in this equation, so the estimated effect of the unemployment shock is likely attenuated.

earnings. The cost of exposure to the average concentration shock is only about 0.1 percent of the average worker's total earnings. This reinforces the conclusion that the effects of unemployment shocks were felt more intensely during this period. Of course, the increase in local concentration during the recession was proportionally much smaller than the increase in unemployment.

Small full-sample estimates, however, mask the fact that younger workers are more adversely affected by concentration shocks than older workers. Figures A16 and A17 show estimates of the effects of concentration shocks on employment and earnings by generation. For earnings, estimates for Baby Boomers and the Silent Generation are in fact positive for all post-recession years, and they become statistically significant later in the period. Millennials and Gen-X see consistently negative and statistically significant earnings effects that grow in magnitude over time. Over the post-recession period, exposure to concentration shocks cost the average Millennial nearly \$2,000 (0.9 percent of earnings), while the average member of Generation X lost out on nearly \$3,000 (0.6 percent of earnings). In both cases losses due to concentration shocks were not quite one-tenth the magnitude of losses due to unemployment shocks, but still much larger than the full-sample estimate. For employment, effects are again consistently negative for Millennials and Gen-X, while estimates suggest little significant change for older workers.

Together, these estimates indicate that Great Recession-related concentration shocks have been harmful primarily to younger workers. Younger workers change jobs more often than older workers. If these job transitions take place in an environment in which employers have stronger monopsony power due to increased concentration, younger workers may see smaller wage gains at each transition and end up earning less than they would have if concentration had been lower. Older workers may even stand to benefit from greater concentration if they are more likely to be incumbent at firms that become more profitable thanks to increased market power. In light of these differences across generations, it may be more informative to consider total earnings lost due to recession-related concentration shocks by generation. Using the same formulation as in the previous paragraph, Millennials exposed to an average concentration shock lost 0.9 of their 2007 through 2017 earnings, while Gen-X lost 0.6 percent. Baby Boomers' earnings, on the other hand, increased 0.2 percent over this period due to concentration shocks, while Silent Generation workers gained 3.8 percent.<sup>7</sup>

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<sup>7</sup>The corresponding earnings changes due to unemployment shocks in this specification are -9.9 percent for Millennials, -6.0 percent for Gen-X, -6.1 percent for Baby Boomers, and +7.0 percent for the Silent Generation.

These estimates, however, come with the caveat that the effects of concentration shocks have shown little evidence of abating, and the earnings effects appear to be increasing in magnitude over time. If this remains the case over longer horizons, concentration shocks could end up being more harmful to younger workers than the unemployment shocks, though the effects of concentration shocks would need to be very persistent for this to happen.

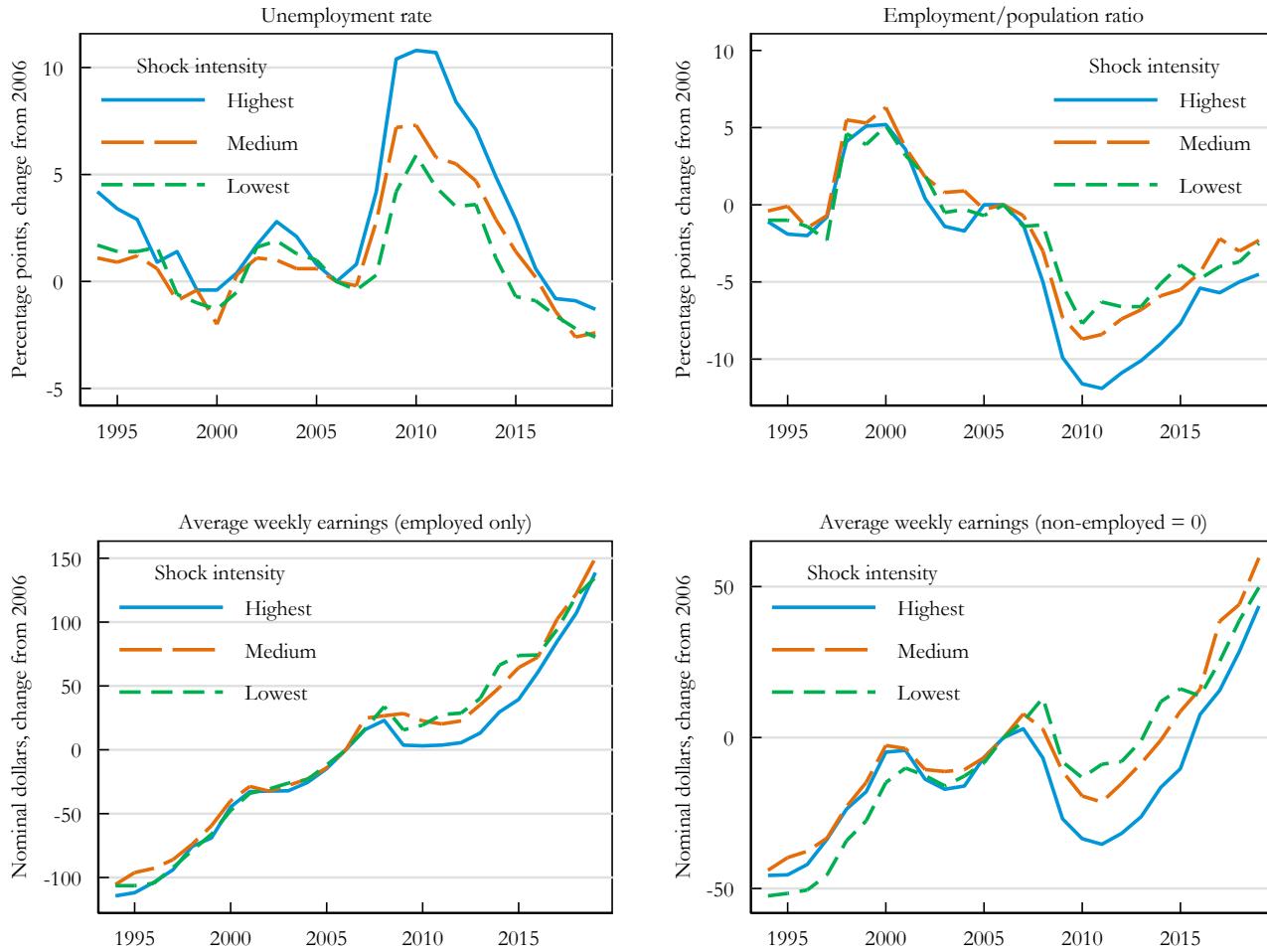
Finally, I consider a variation on this concentration analysis that includes only the concentration shocks. That is, I estimate

$$y_{it} = \sum_t \beta_t HHS_{Shock CZ07(i)} \cdot 1[Year = t] + \sum_{a \in ages} \alpha_a \cdot 1[Age_{it} = a] + \gamma_i + \delta_t + \varepsilon_{it} \quad (\text{A4})$$

with terms defined as above. Estimates are reported in Appendix Figures [A18](#) and [A19](#) and are broadly similar to the estimates discussed above.

## A.6 Figures

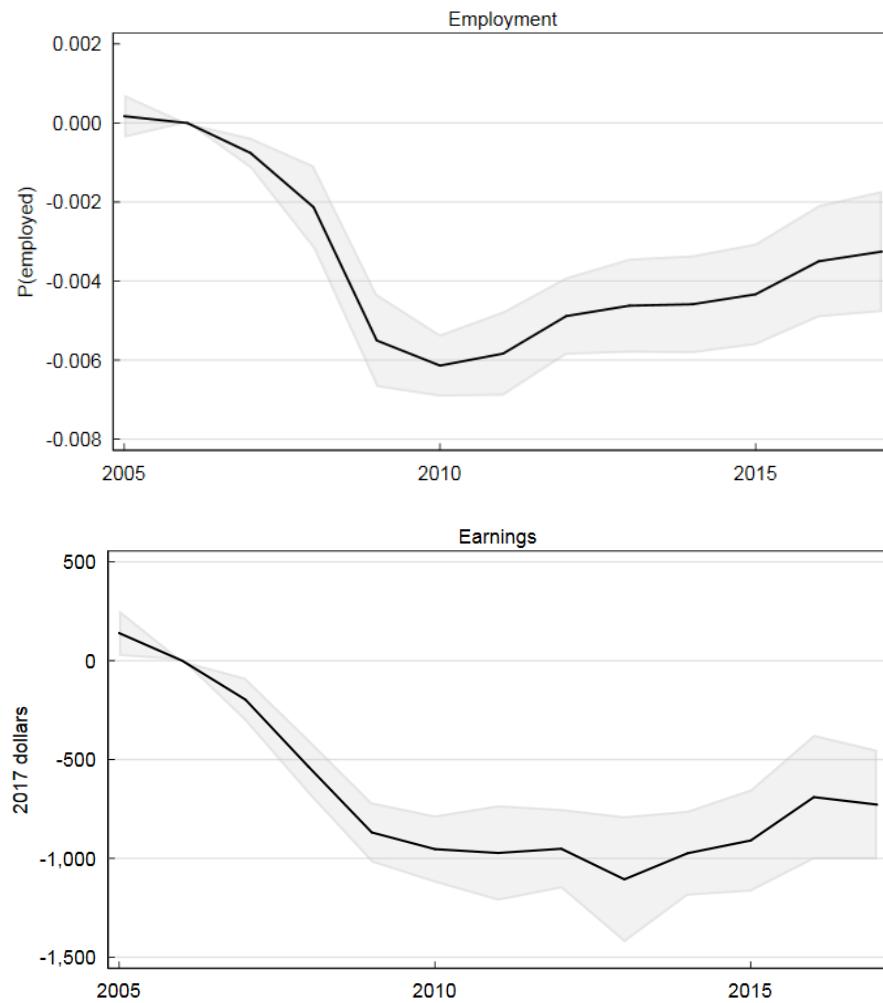
Figure A1: Employment and Earnings Trends Among Young Workers by Exposure to Great Recession Unemployment Shock



Source: Public-use Current Population Survey, Merged Outgoing Rotation Groups

Note: Sample includes workers under 25. Trends are measured relative to the 2006 level of each outcome. Exposure intensity groups are defined using population-weighted terciles of state-level changes in unemployment between 2007 and 2009.

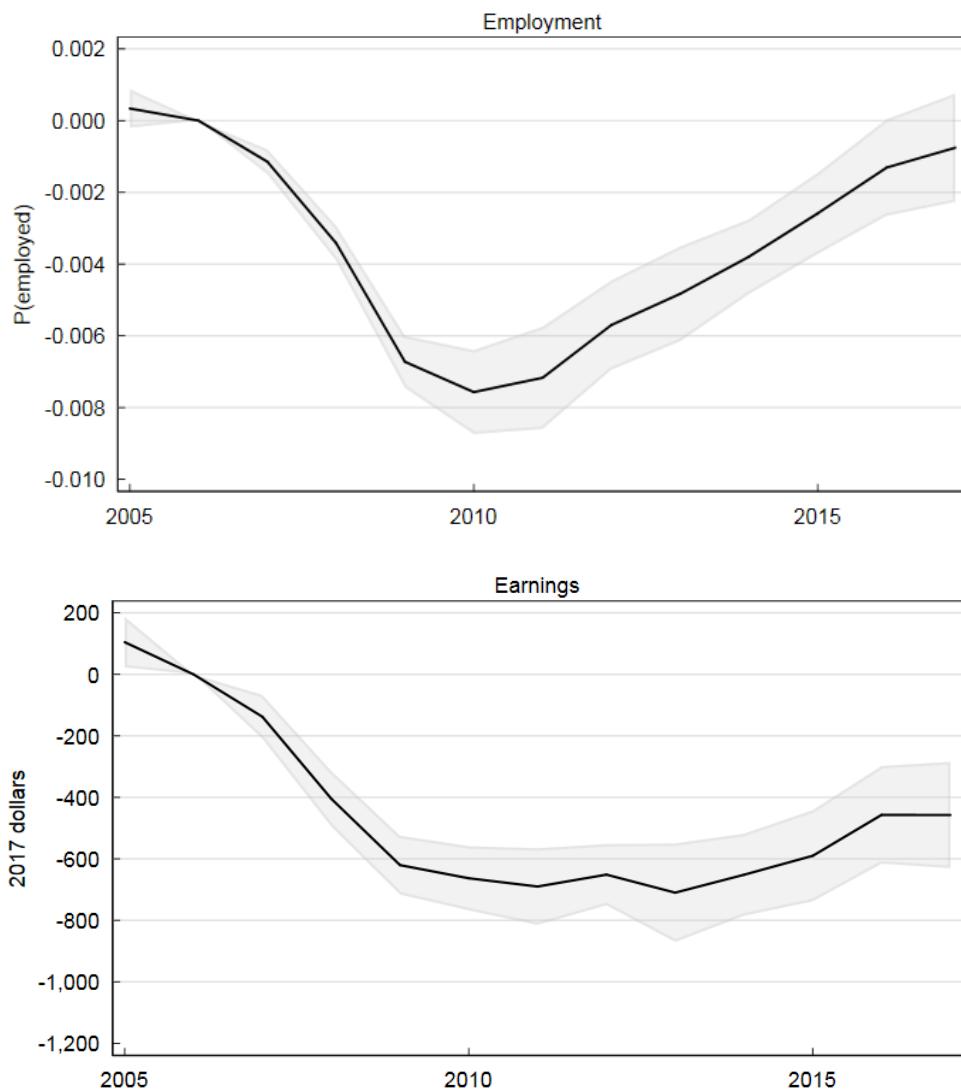
Figure A2: Effects of Local Unemployment Shocks on Employment and Earnings, 1957-1976 Birth Cohorts, Data Constructed as in [Yagan \(2019\)](#)



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

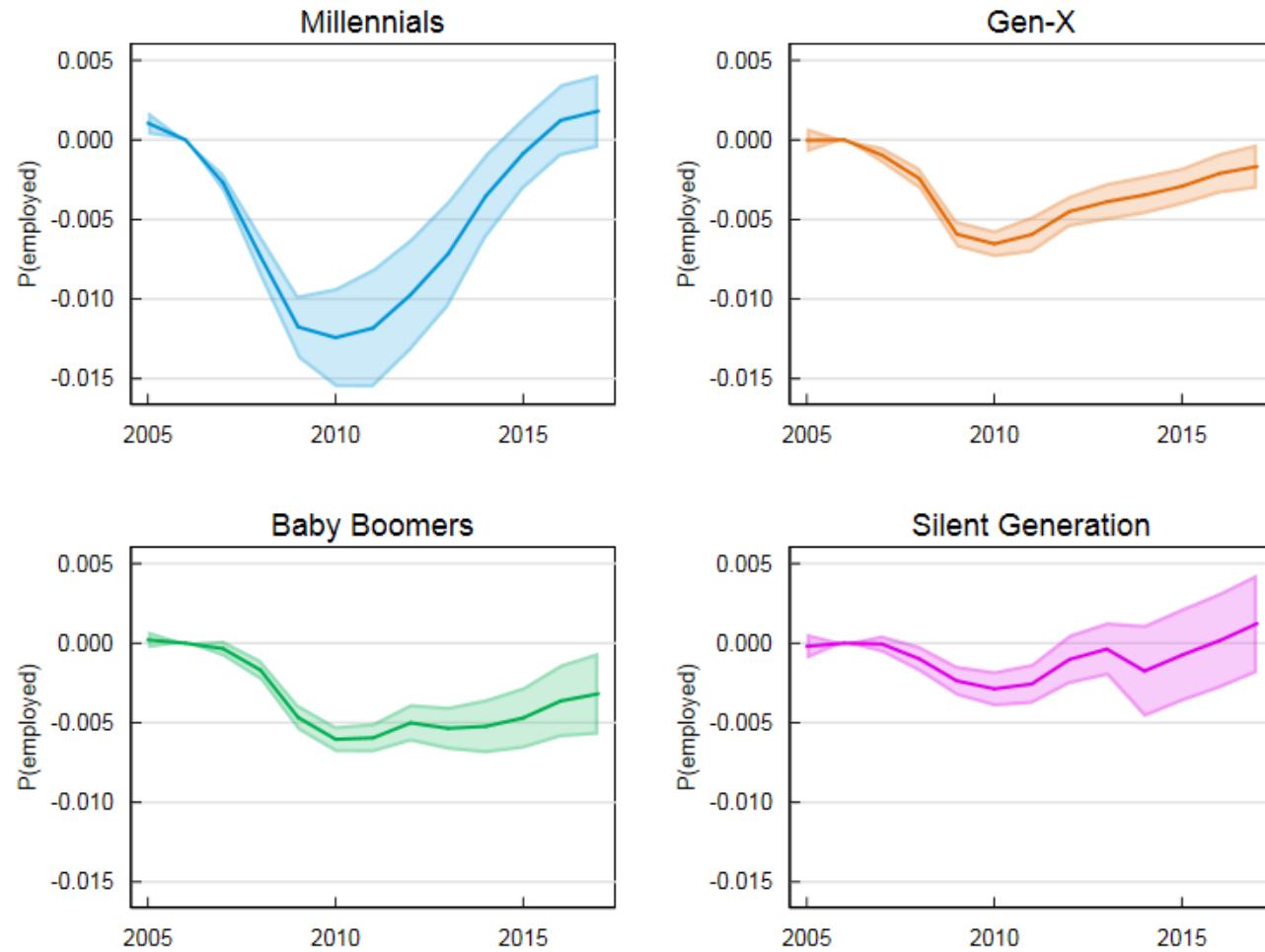
Figure A3: Effects of Local Unemployment Shocks on Employment and Earnings, 1928-1996 Birth Cohorts, Allowing Some Missing Data



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

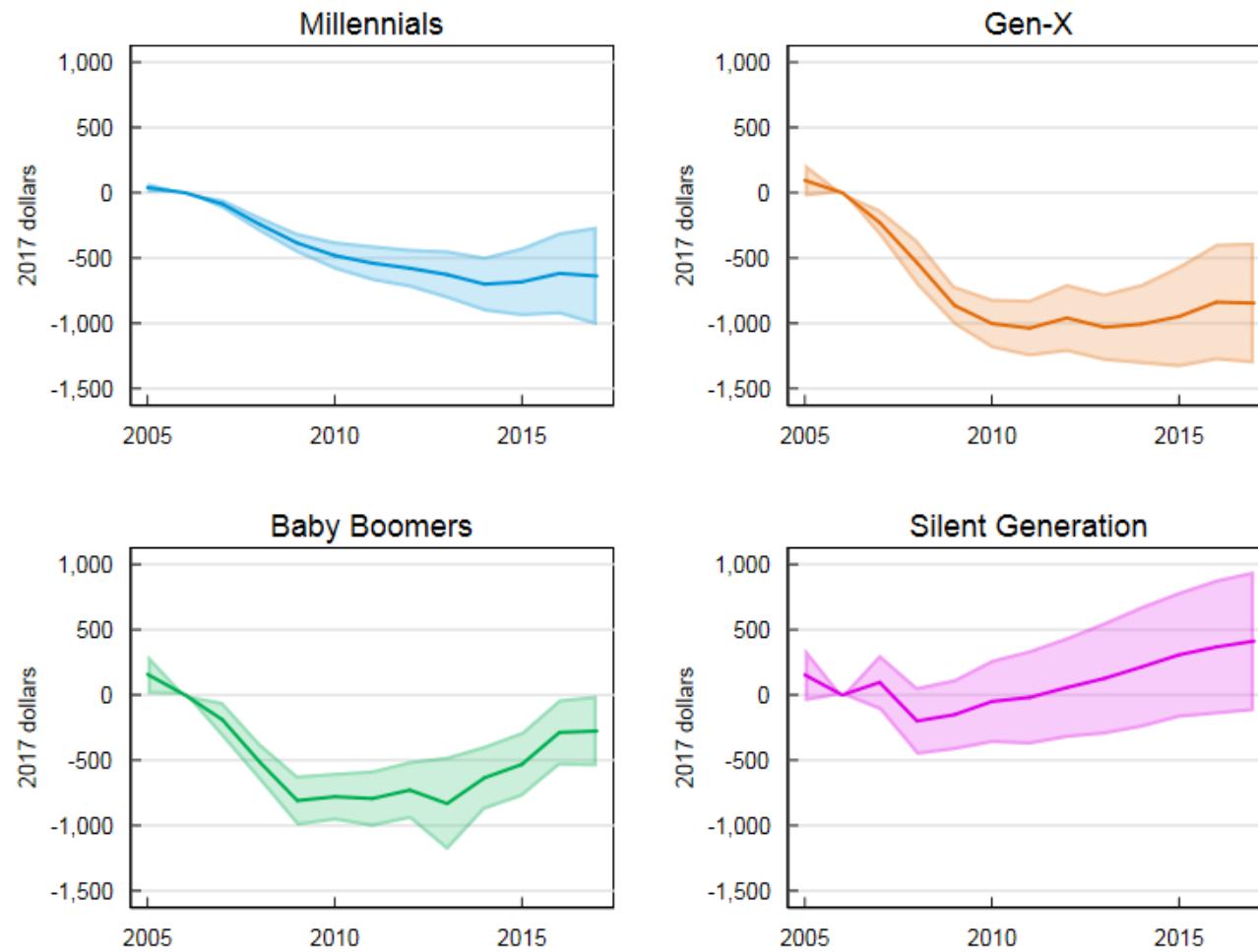
Figure A4: Effects of Local Unemployment Shocks on Employment, by Generation, Allowing Some Missing Data



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

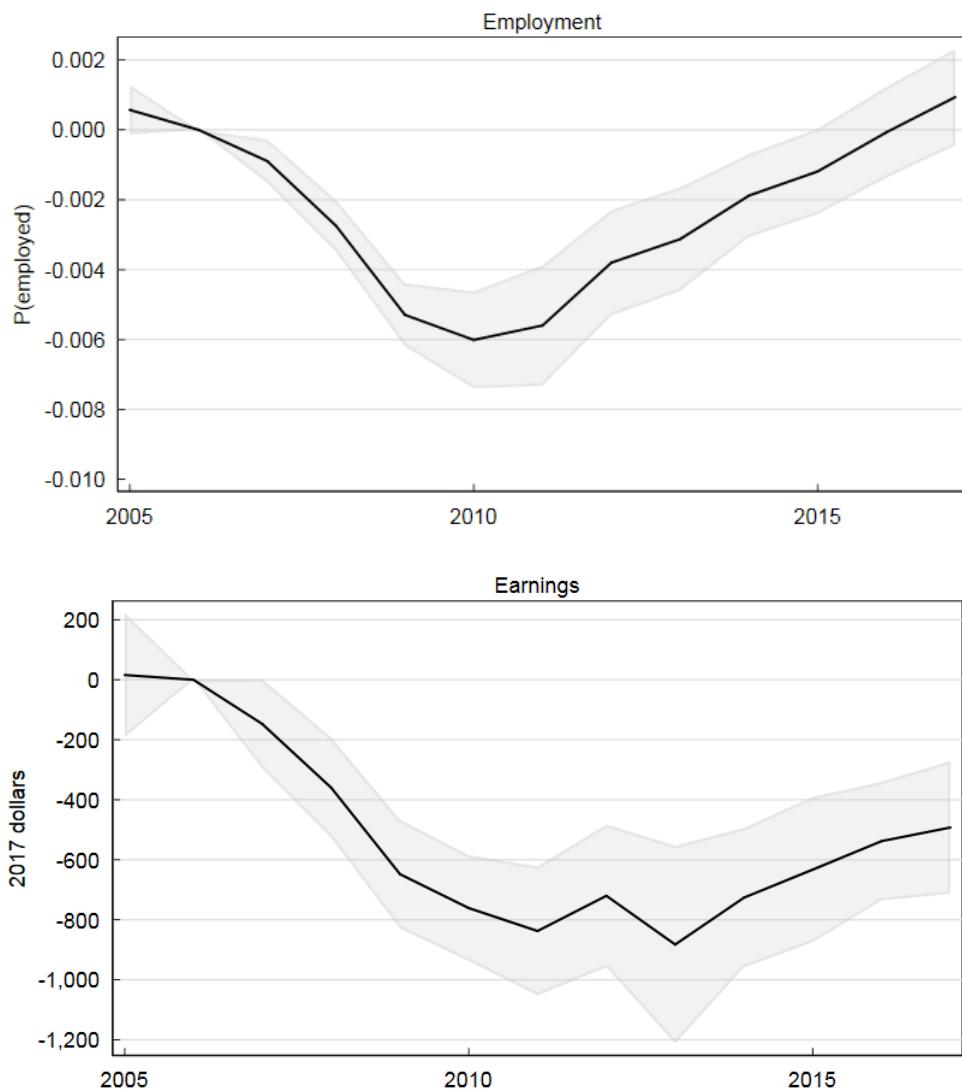
Figure A5: Effects of Local Unemployment Shocks on Earnings, by Generation, Allowing Some Missing Data



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

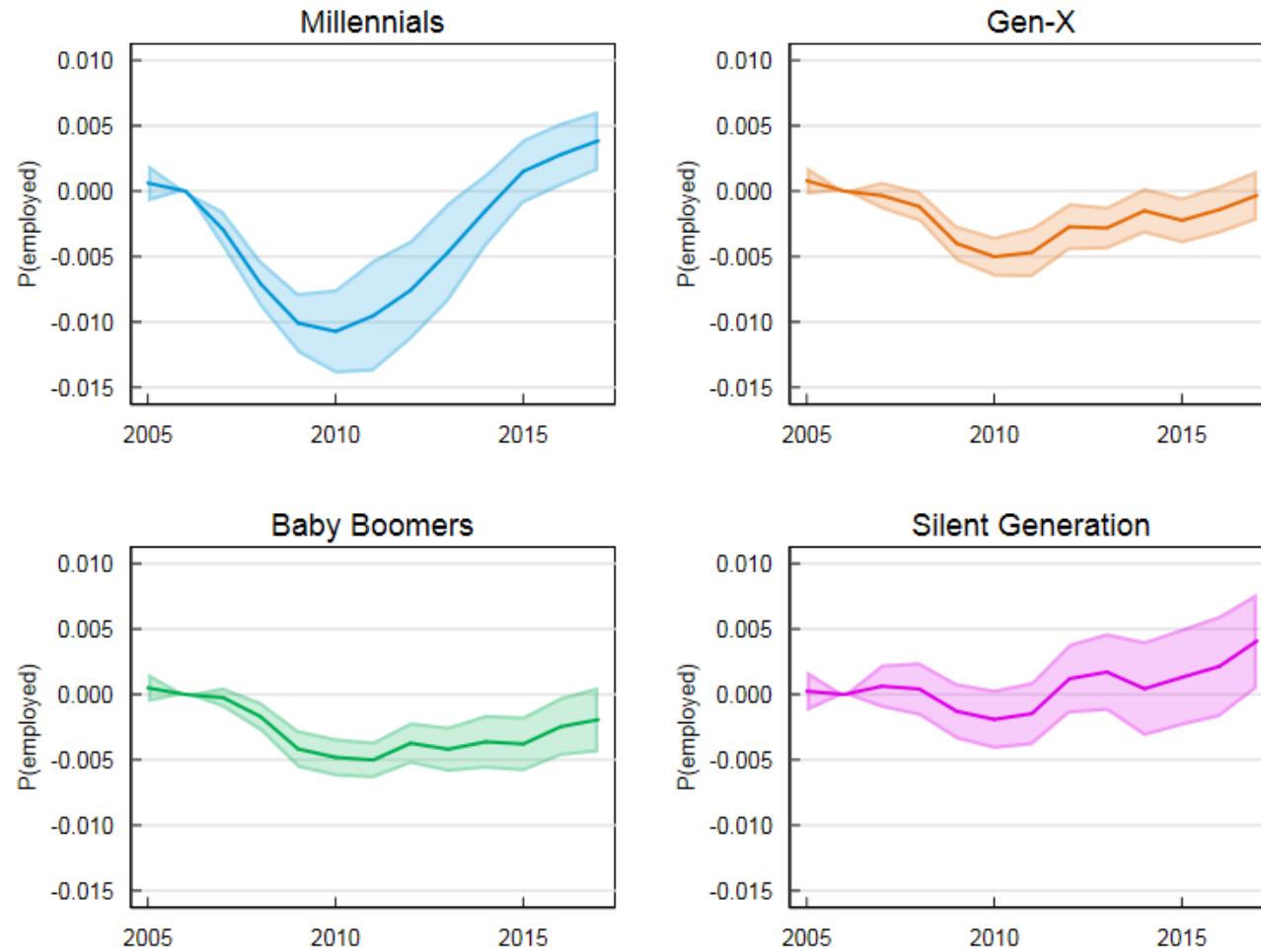
Figure A6: Effects of Local Unemployment Shocks on Employment and Earnings, 1928-1996 Birth Cohorts, Allowing No Missing Data or Imputation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

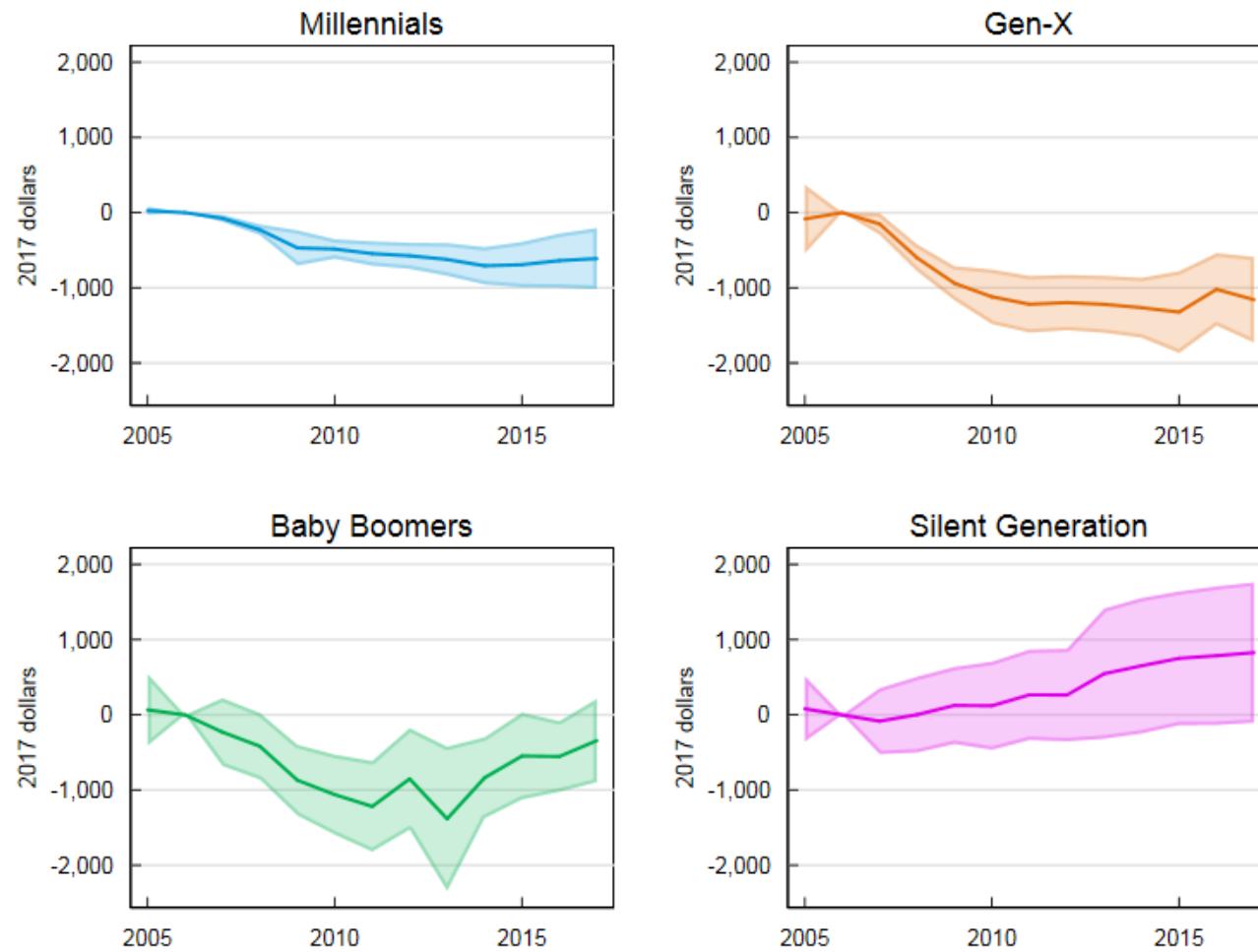
Figure A7: Effects of Local Unemployment Shocks on Employment, by Generation, Allowing No Missing Data or Imputation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

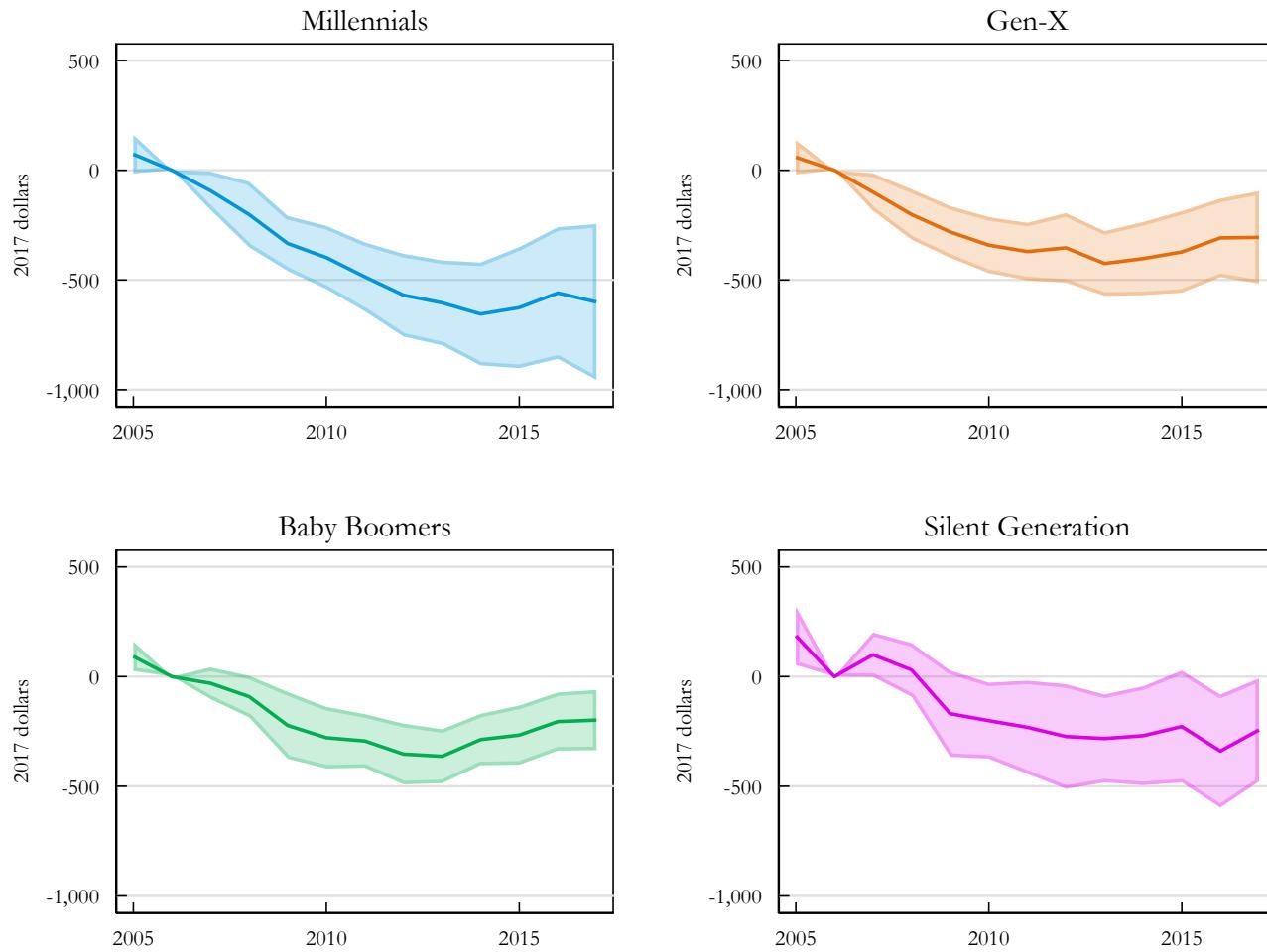
Figure A8: Effects of Local Unemployment Shocks on Earnings, by Generation, Allowing No Missing Data or Imputation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

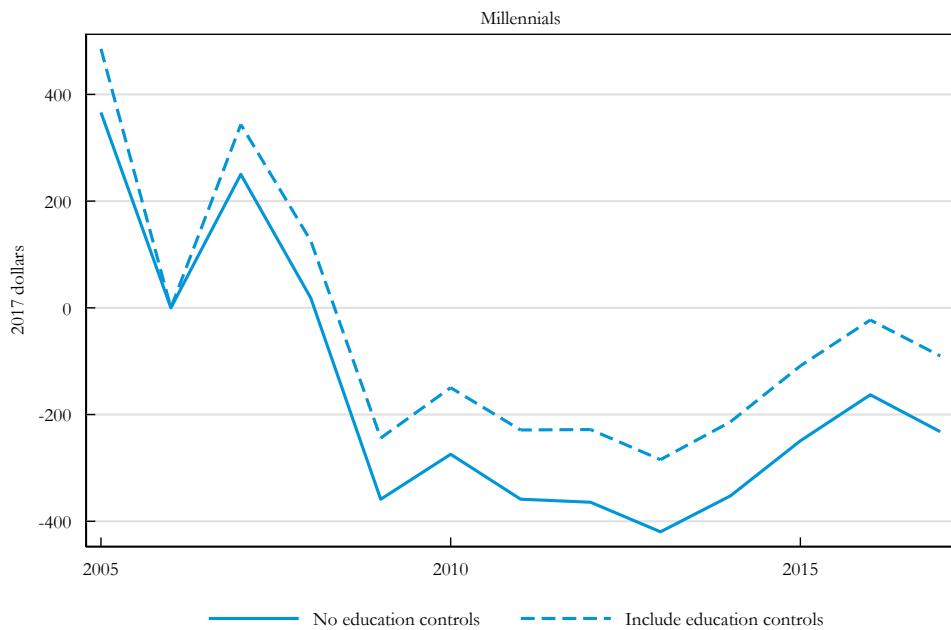
Figure A9: Effects of Local Unemployment Shocks on Co-Workers' Earnings, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY20-343.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, with co-workers' earnings on the left-hand side. Shaded regions represent 95 percent confidence intervals.

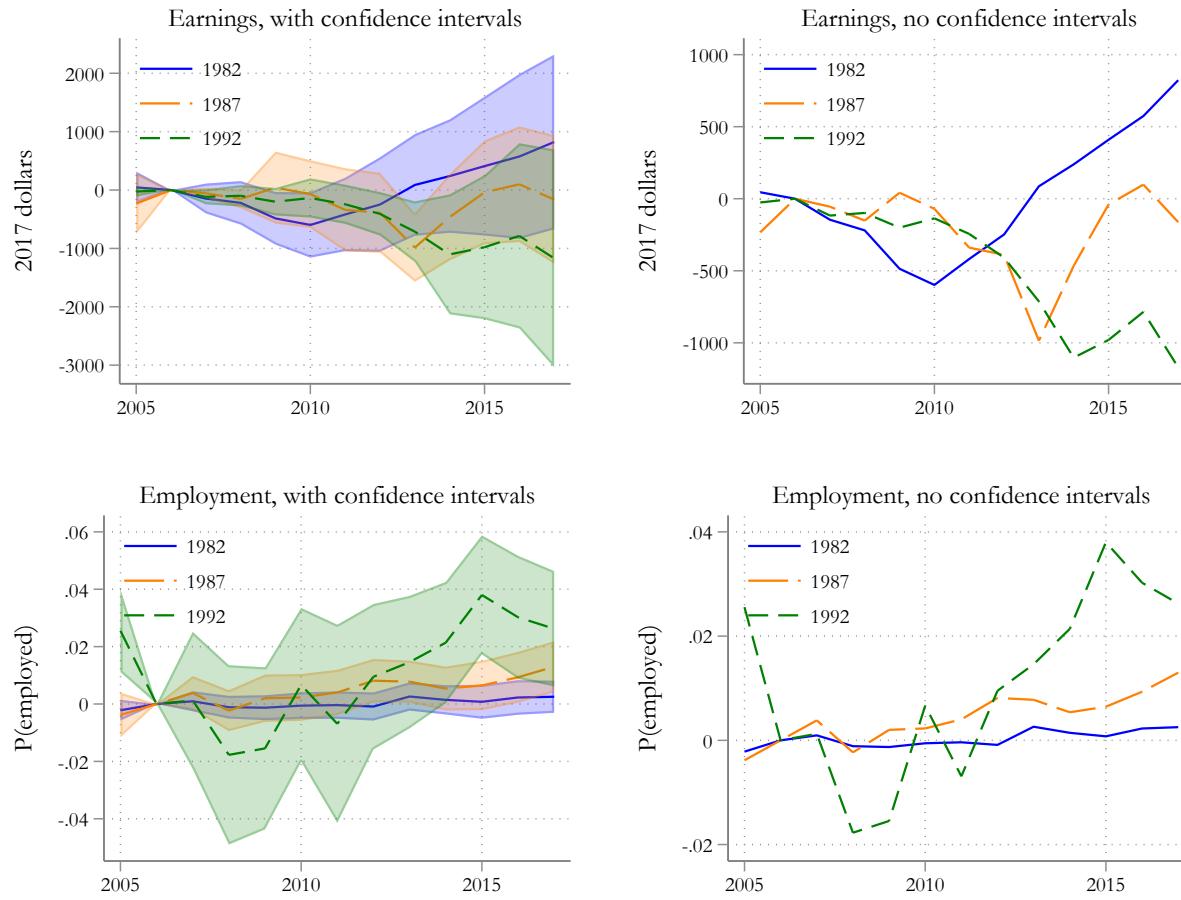
Figure A10: Effects of Local Unemployment Shocks on Millennials' Earnings, with without Education Controls



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY2021-CES005-010.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

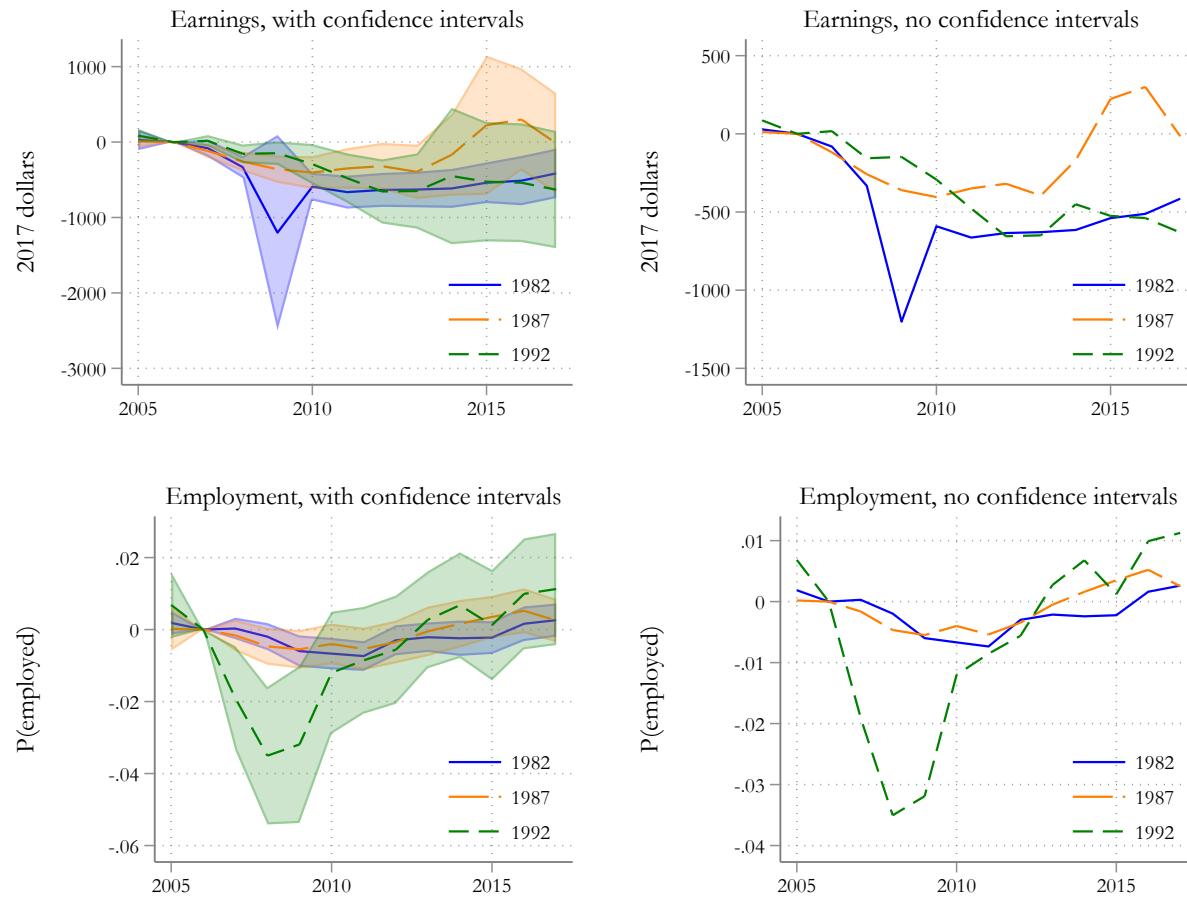
Figure A11: Effects of Local Unemployment Shocks on Narrower Cohorts, College Graduates



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY2021-CES005-010.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, estimated separately for three-year birth cohorts centered on the indicated years. Shaded regions represent 95 percent confidence intervals.

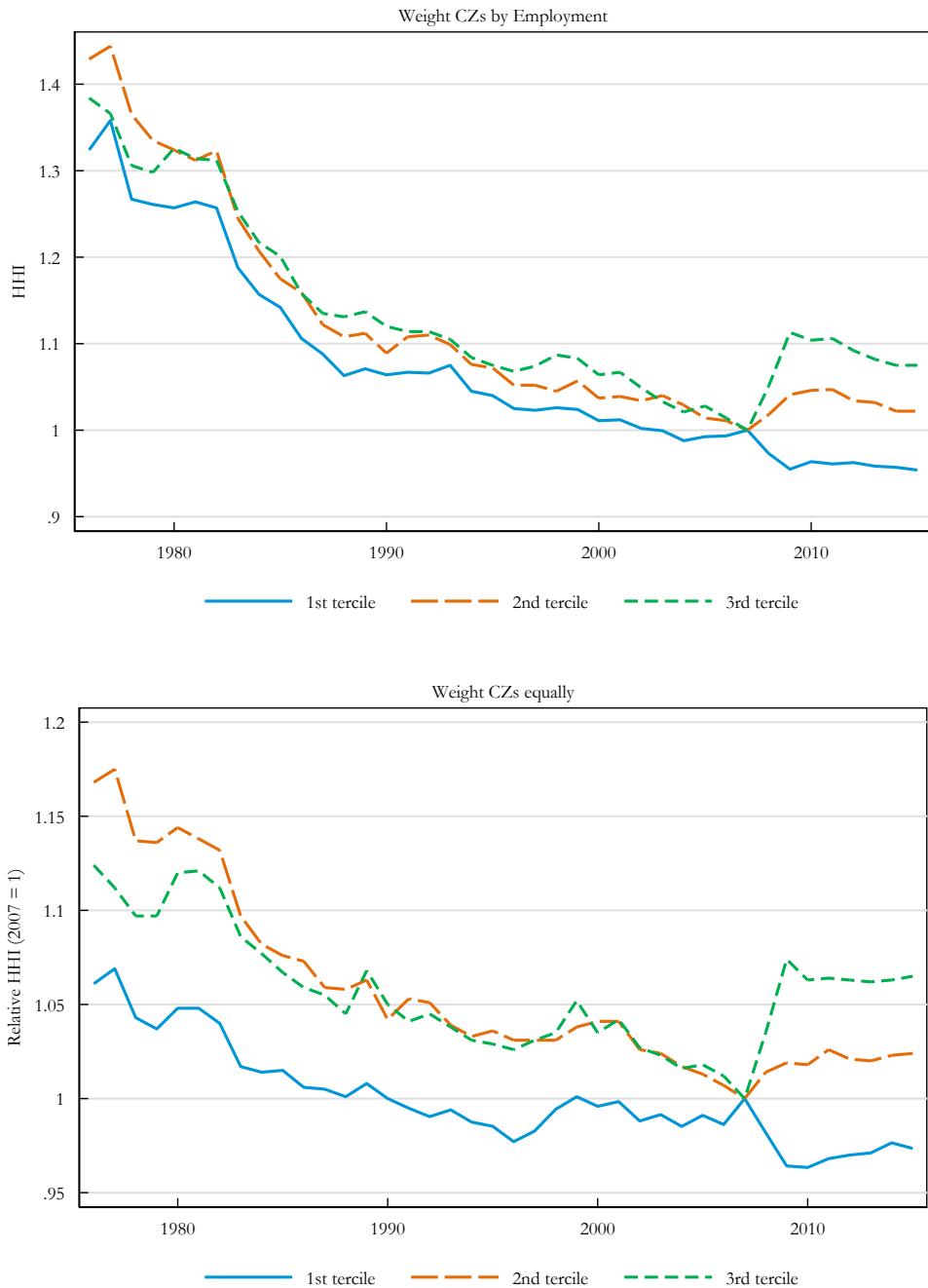
Figure A12: Effects of Local Unemployment Shocks on Narrower Cohorts, Non-College Graduates



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY2021-CES005-010.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, estimated separately for three-year birth cohorts centered on the indicated years. Shaded regions represent 95 percent confidence intervals.

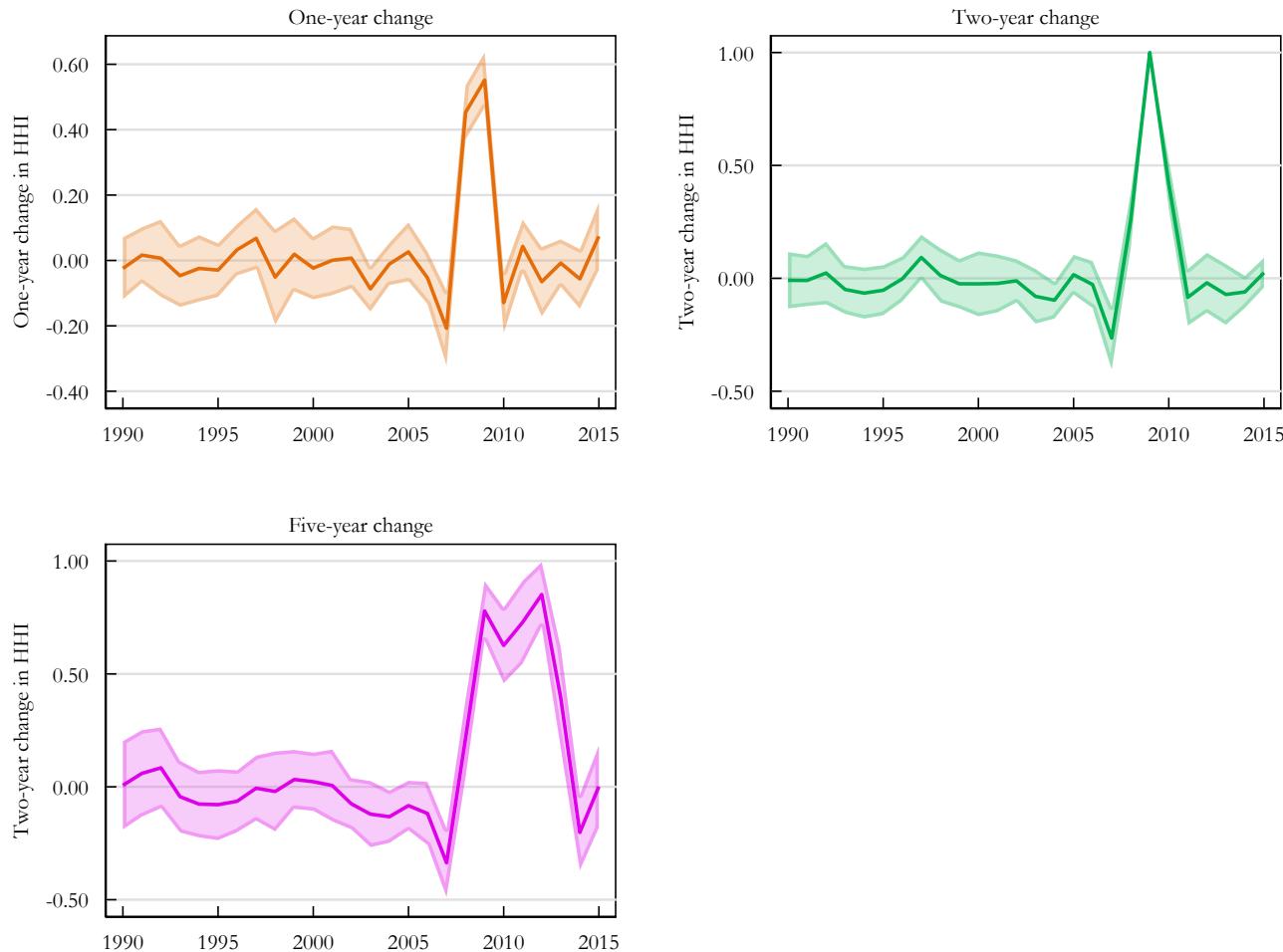
Figure A13: Local Labor Market Concentration Trends, by Tercile of 2007-2009 Change in Concentration



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY20-343.

Note: Figure plots the average CZ-level HHI, with CZs weighted as indicated, indexed to 1 in 2007 for all terciles.

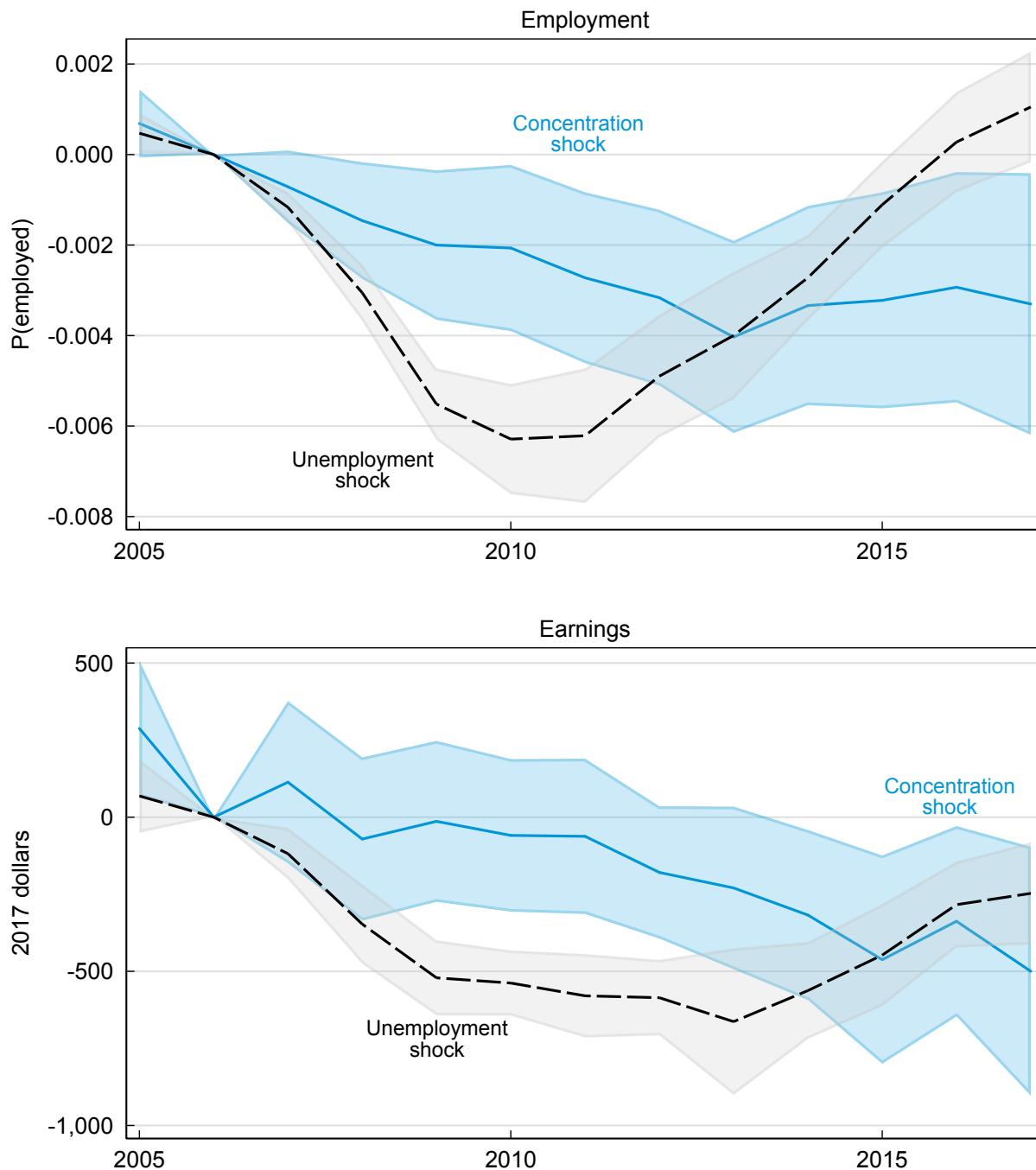
Figure A14: Relationship between 2007-2009 HHI Change and Changes in HHI in Other Periods



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY20-343.

Note: Points plotted are coefficients estimated in separate CZ-level regressions of change in HHI over a period of a given duration ending in the year indicated on the x-axis on the change in HHI from 2007-2009. Shaded regions represent 95 percent confidence intervals.

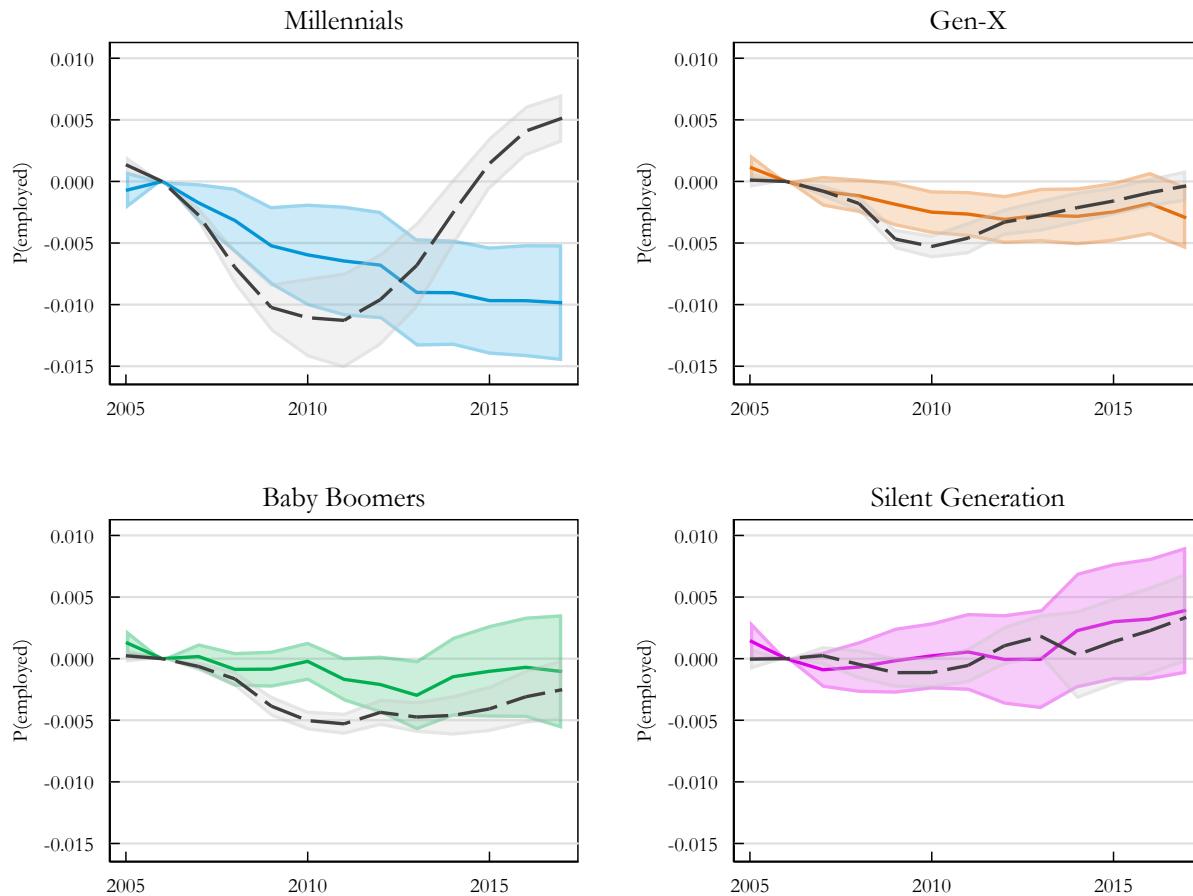
Figure A15: Effects of Local Concentration Shocks on Employment and Earnings, 1928-1996 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in solid, blue lines are  $\beta$  coefficients as estimated in Equation A3. Dashed black lines are the effects of local unemployment shocks from this estimating equation (the  $\zeta$  coefficients), for reference. Shaded regions represent 95 percent confidence intervals.

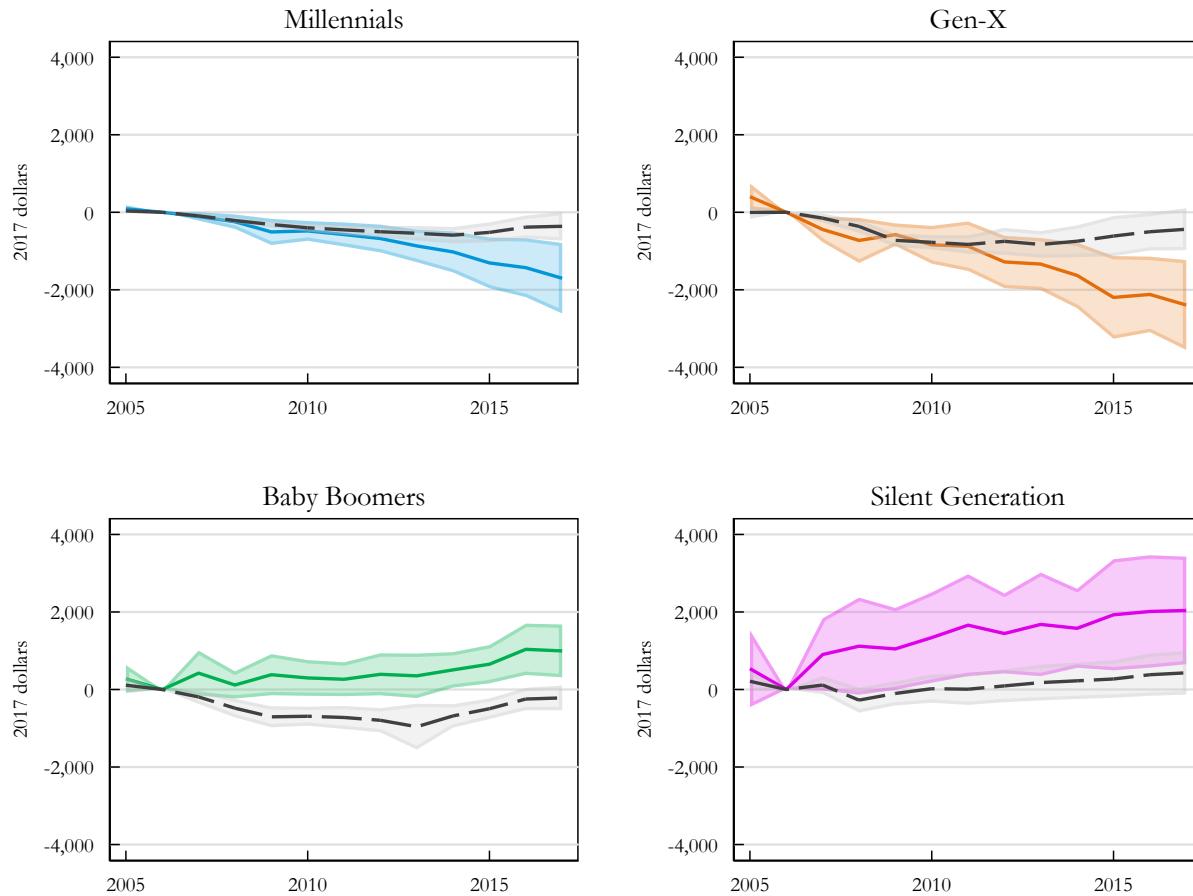
Figure A16: Effects of Local Concentration Shocks on Employment, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in solid, colored lines are  $\beta$  coefficients as estimated in Equation A3. Dashed black lines are the effects of local unemployment shocks from this estimating equation (the  $\zeta$  coefficients), for reference. Shaded regions represent 95 percent confidence intervals.

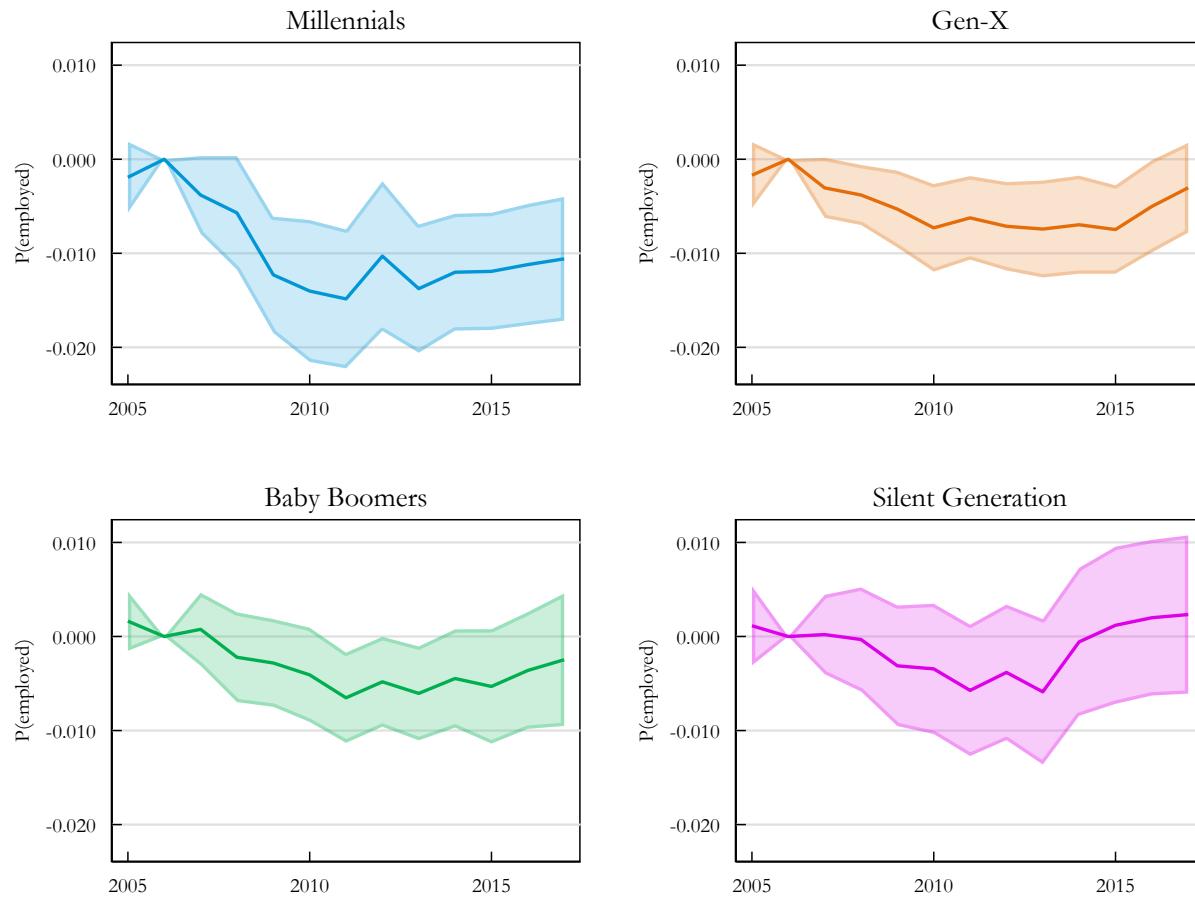
Figure A17: Effects of Local Concentration Shocks on Earnings, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in solid, colored lines are  $\beta$  coefficients as estimated in Equation A3. Dashed black lines are the effects of local unemployment shocks from this estimating equation (the  $\zeta$  coefficients), for reference. Shaded regions represent 95 percent confidence intervals.

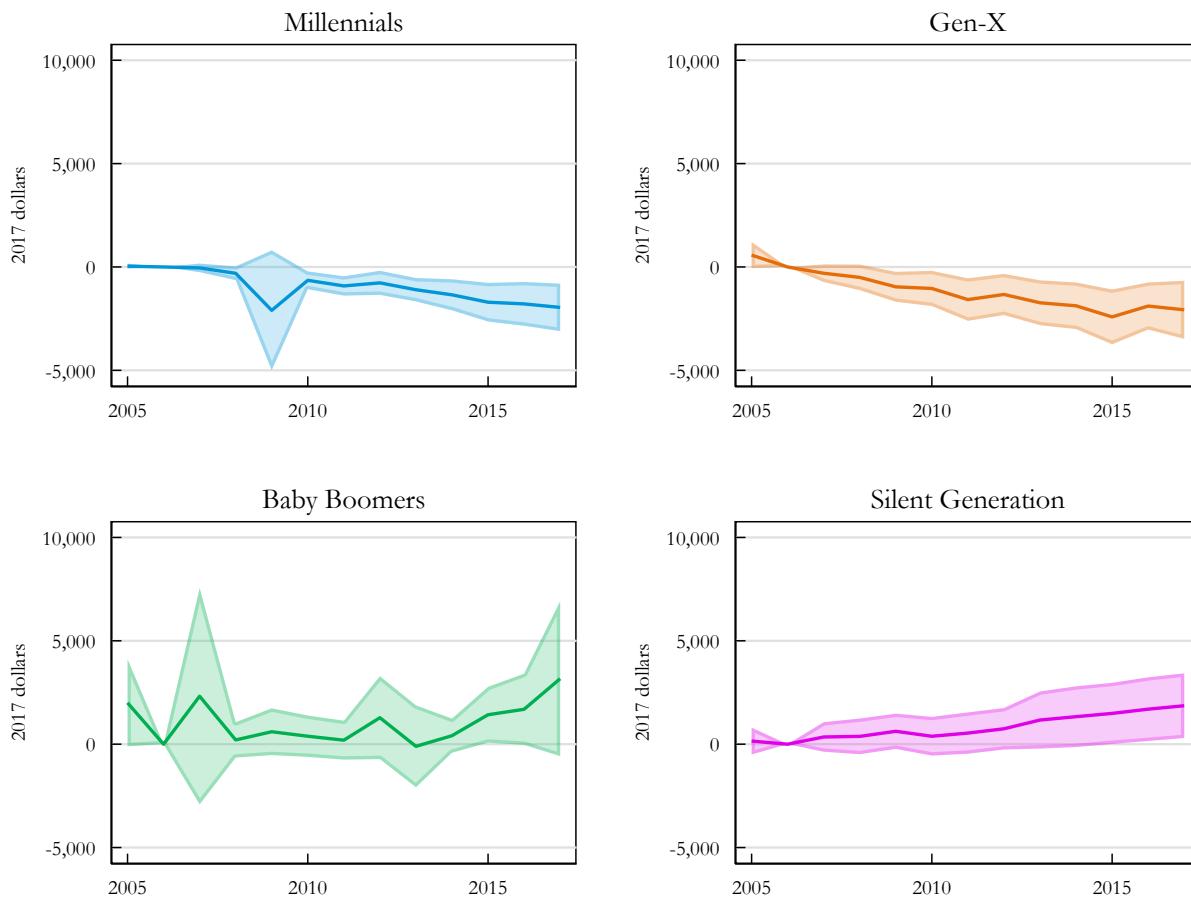
Figure A18: Effects of Local Concentration Shocks on Employment, by Generation (No Other Shocks)



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in solid, colored lines are  $\beta$  coefficients as estimated in Equation A4. Dashed black lines are the effects of local unemployment shocks from this estimating equation (the  $\zeta$  coefficients), for reference. Shaded regions represent 95 percent confidence intervals.

Figure A19: Effects of Local Concentration Shocks on Earnings, by Generation (No Other Shocks)



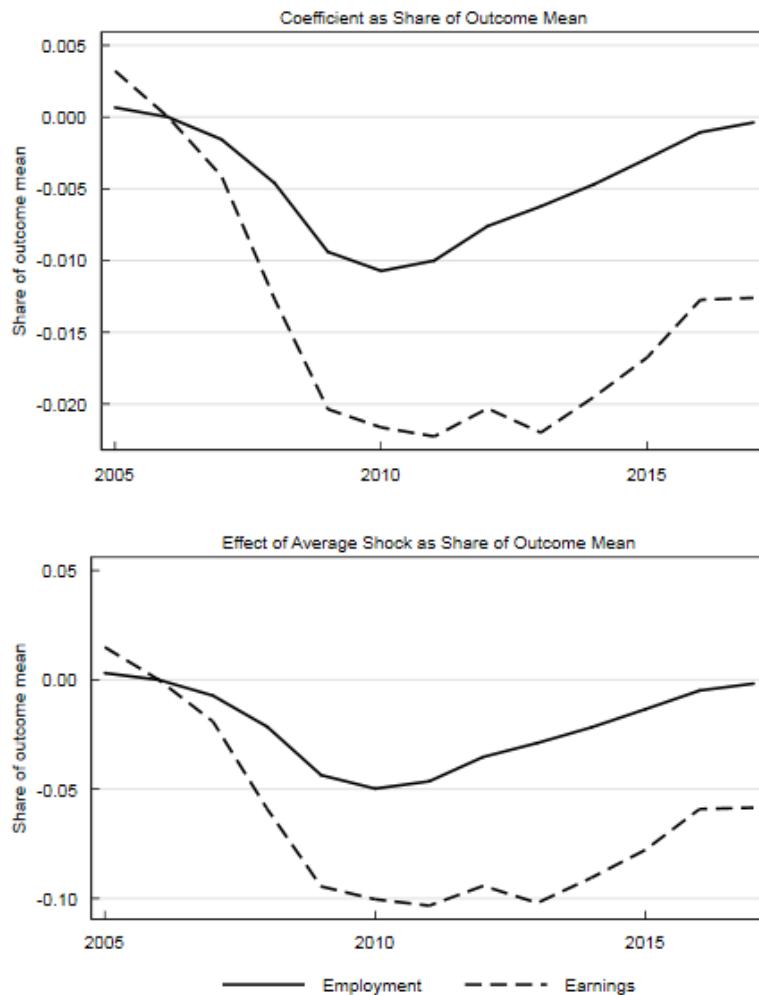
Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in solid, colored lines are  $\beta$  coefficients as estimated in Equation A4. Dashed black lines are the effects of local unemployment shocks from this estimating equation (the  $\zeta$  coefficients), for reference. Shaded regions represent 95 percent confidence intervals.

## Appendix B Additional Estimates

### B.1 Estimates as Shares of Outcome Means

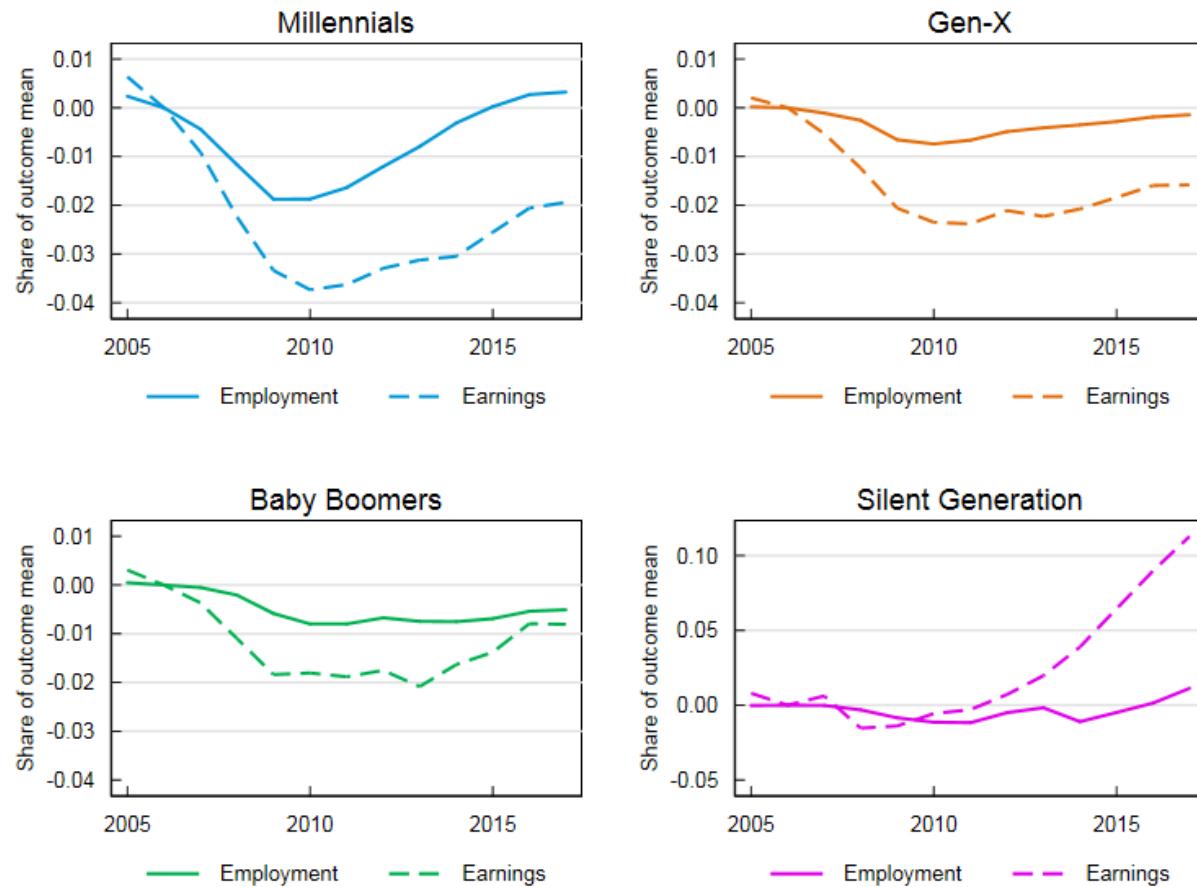
Figure B1: Effects of Local Unemployment Shocks on Employment and Earnings, Coefficients as Shares of Outcome Means



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

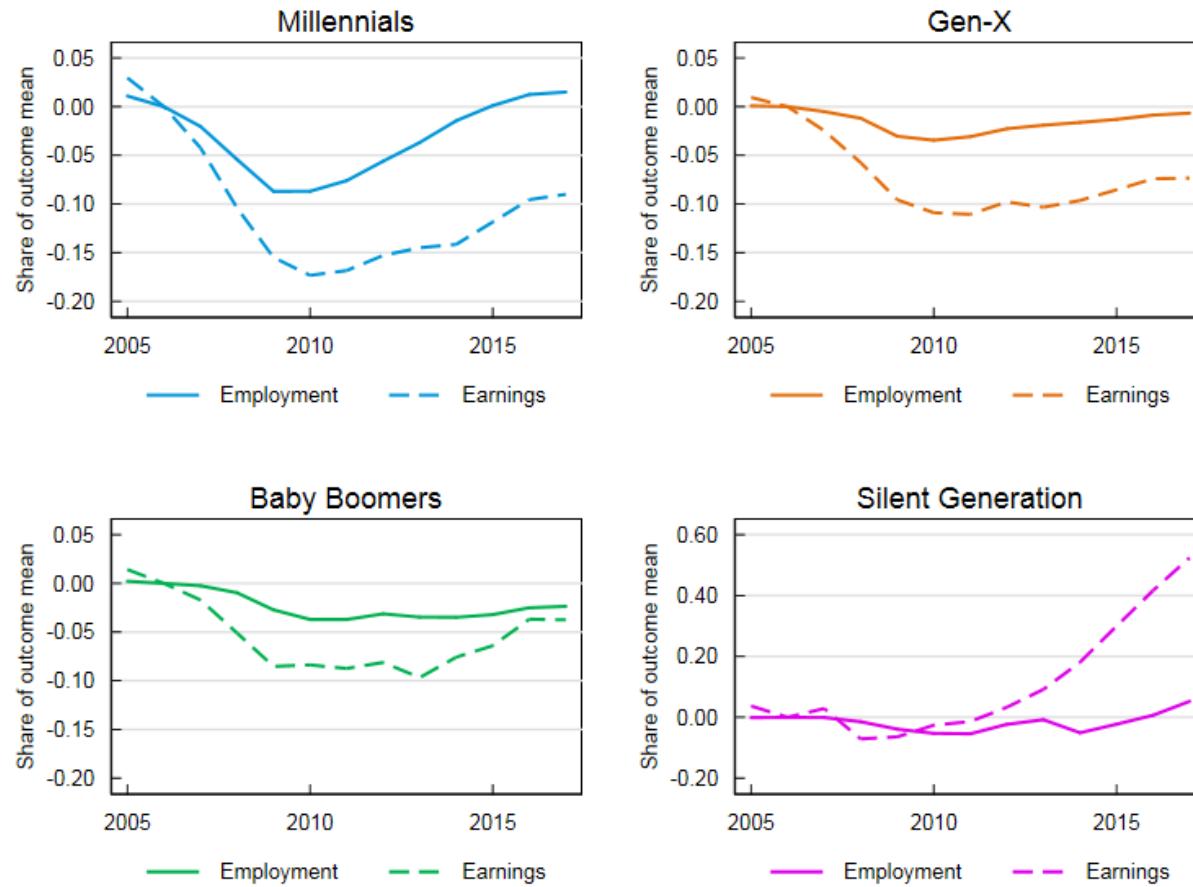
Figure B2: Effects of Local Unemployment Shocks on Employment and Earnings, Coefficients as Shares of Mean Outcomes, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

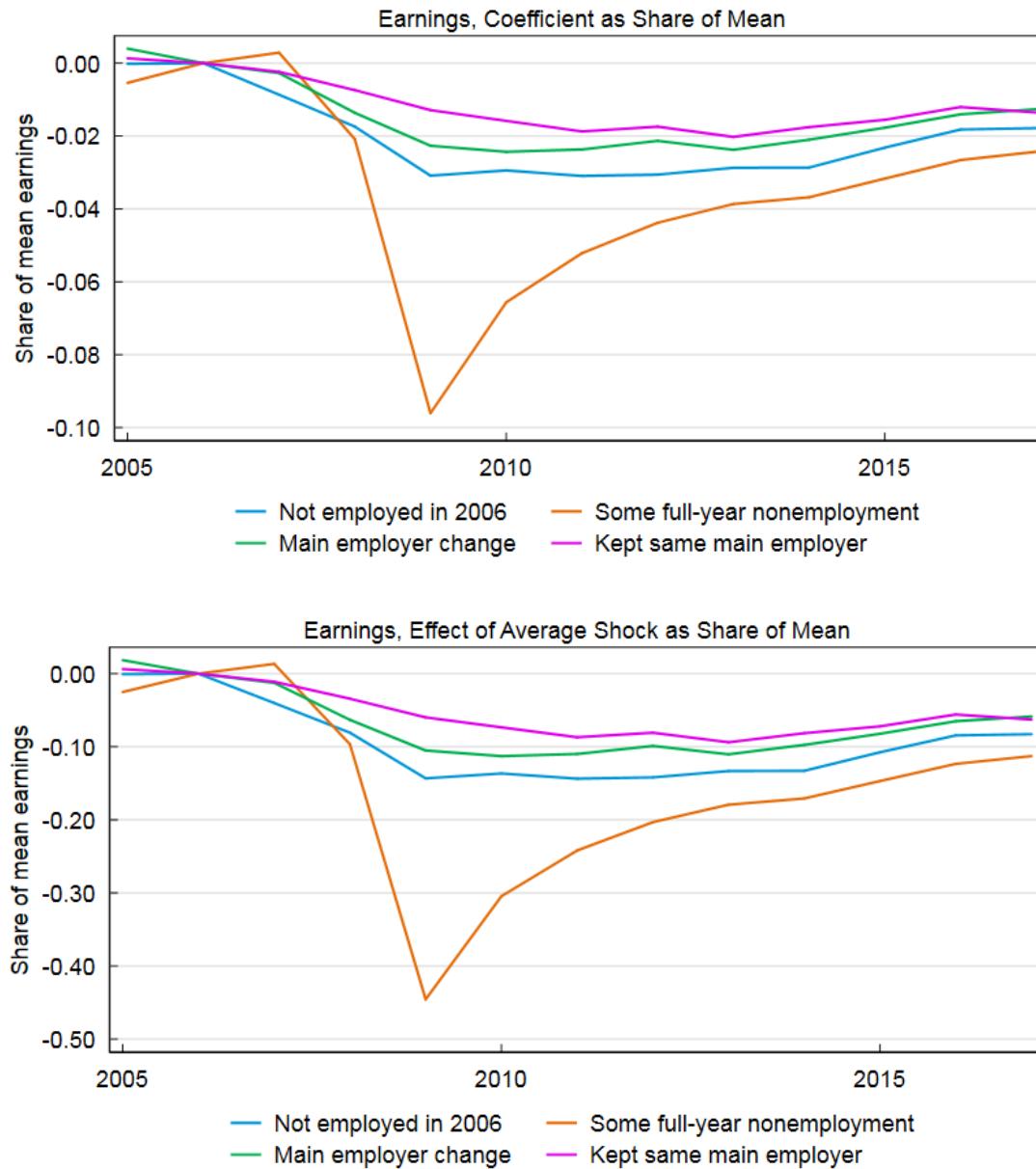
Figure B3: Effects of Local Unemployment Shocks on Employment and Earnings, Effects of Average Shocks as Shares of Mean Outcomes, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

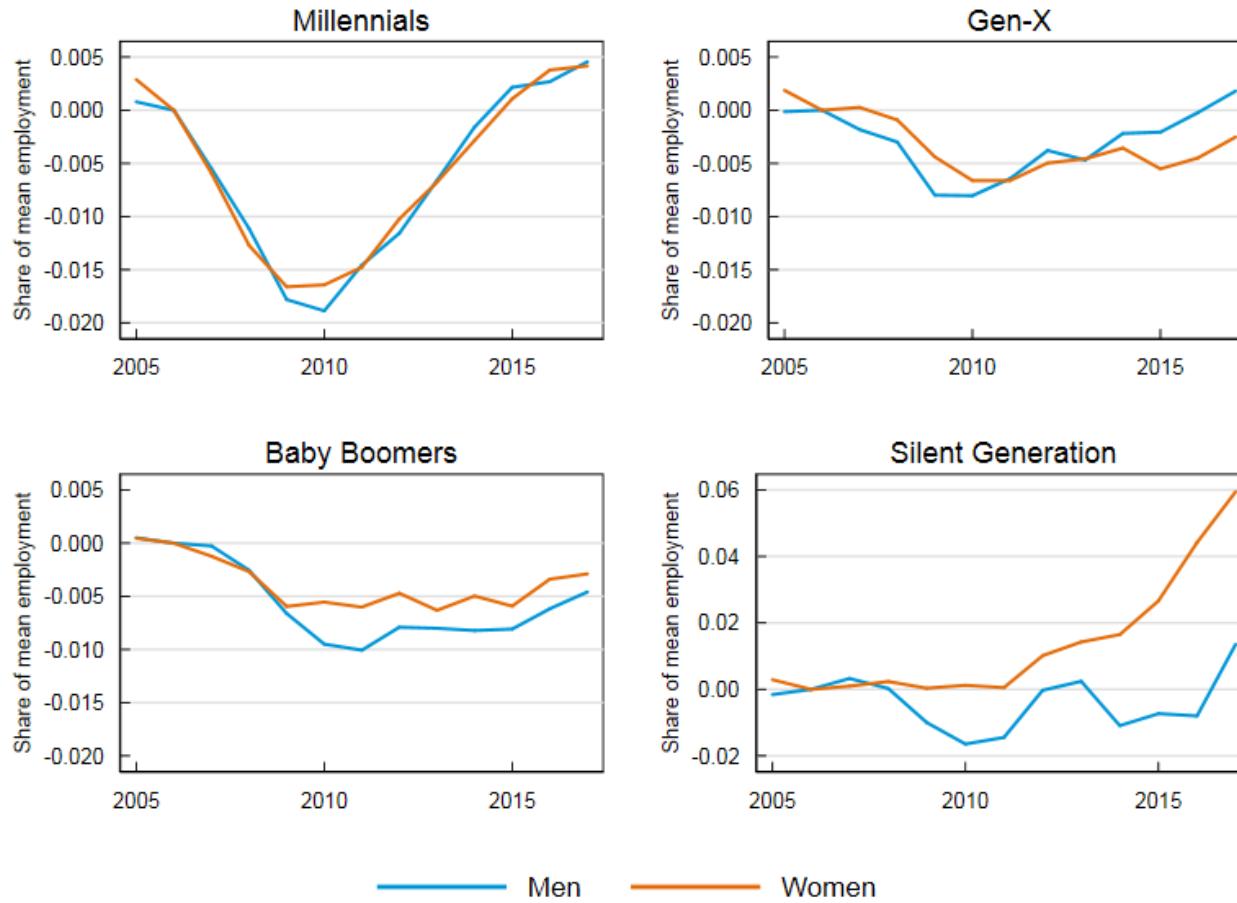
Figure B4: Effects of Local Unemployment Shocks on Earnings, by Displacement Status



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

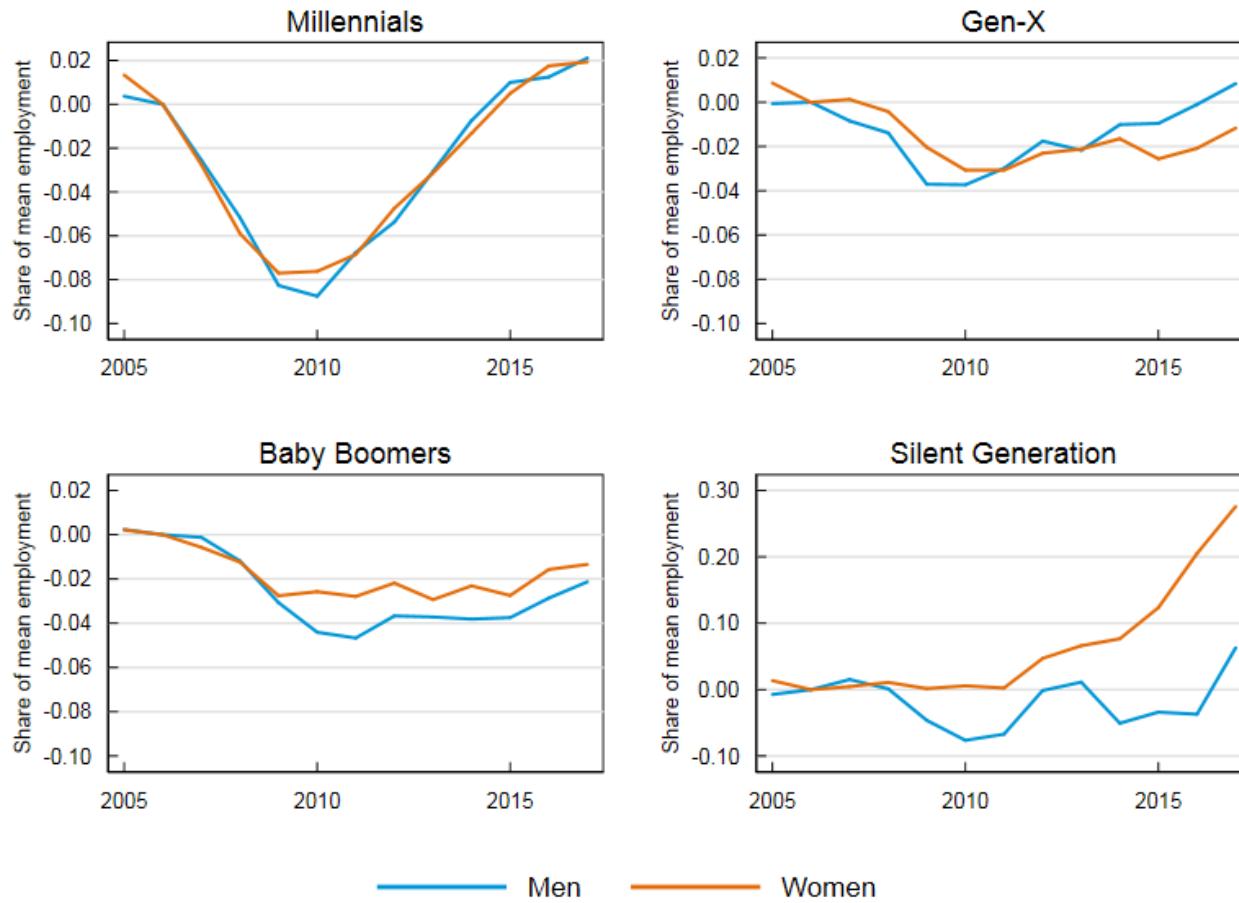
Figure B5: Effects of Local Unemployment Shocks on Employment, Coefficients as Shares of Mean Employment, by Gender and Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

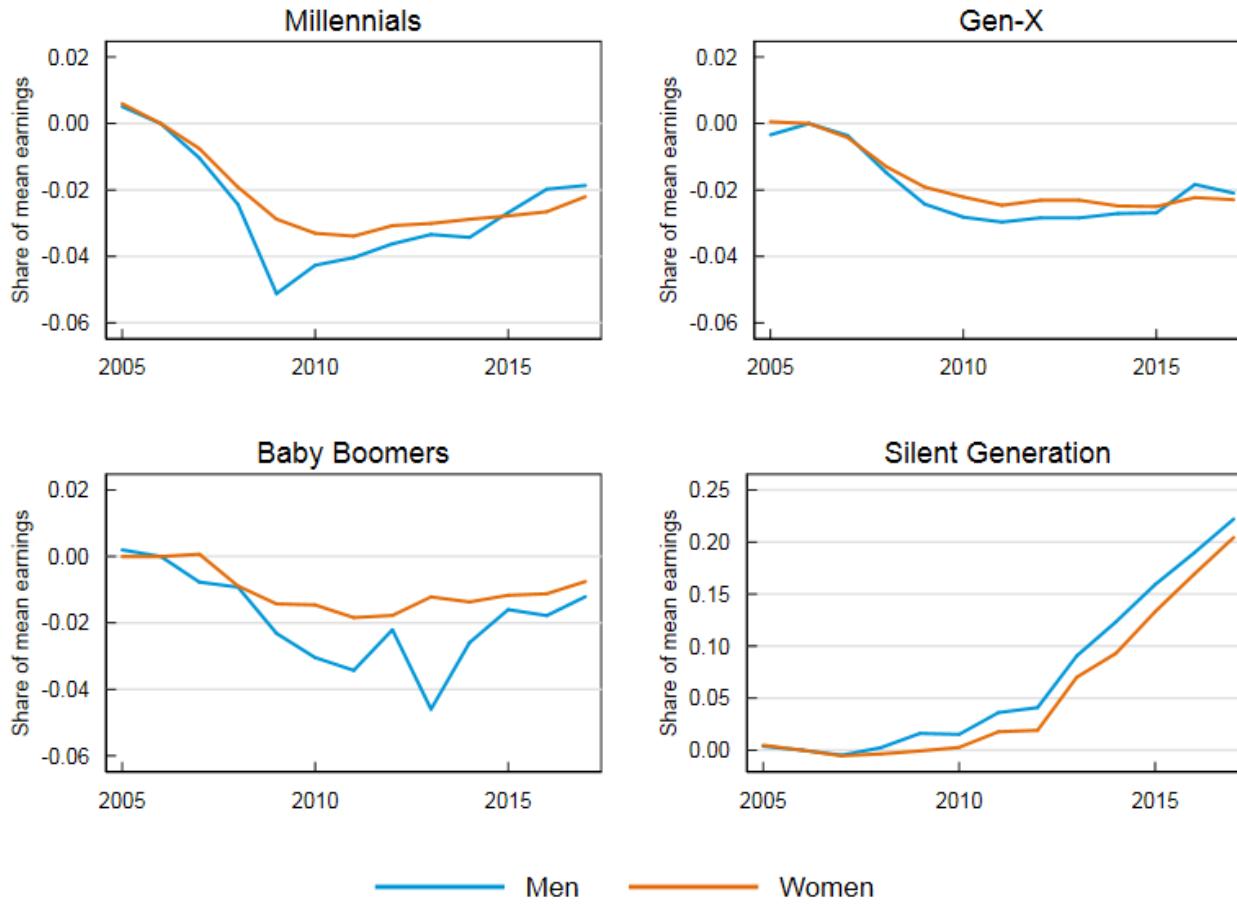
Figure B6: Effects of Local Unemployment Shocks on Employment, Effects of Average Shocks as Shares of Mean Employment, by Gender and Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

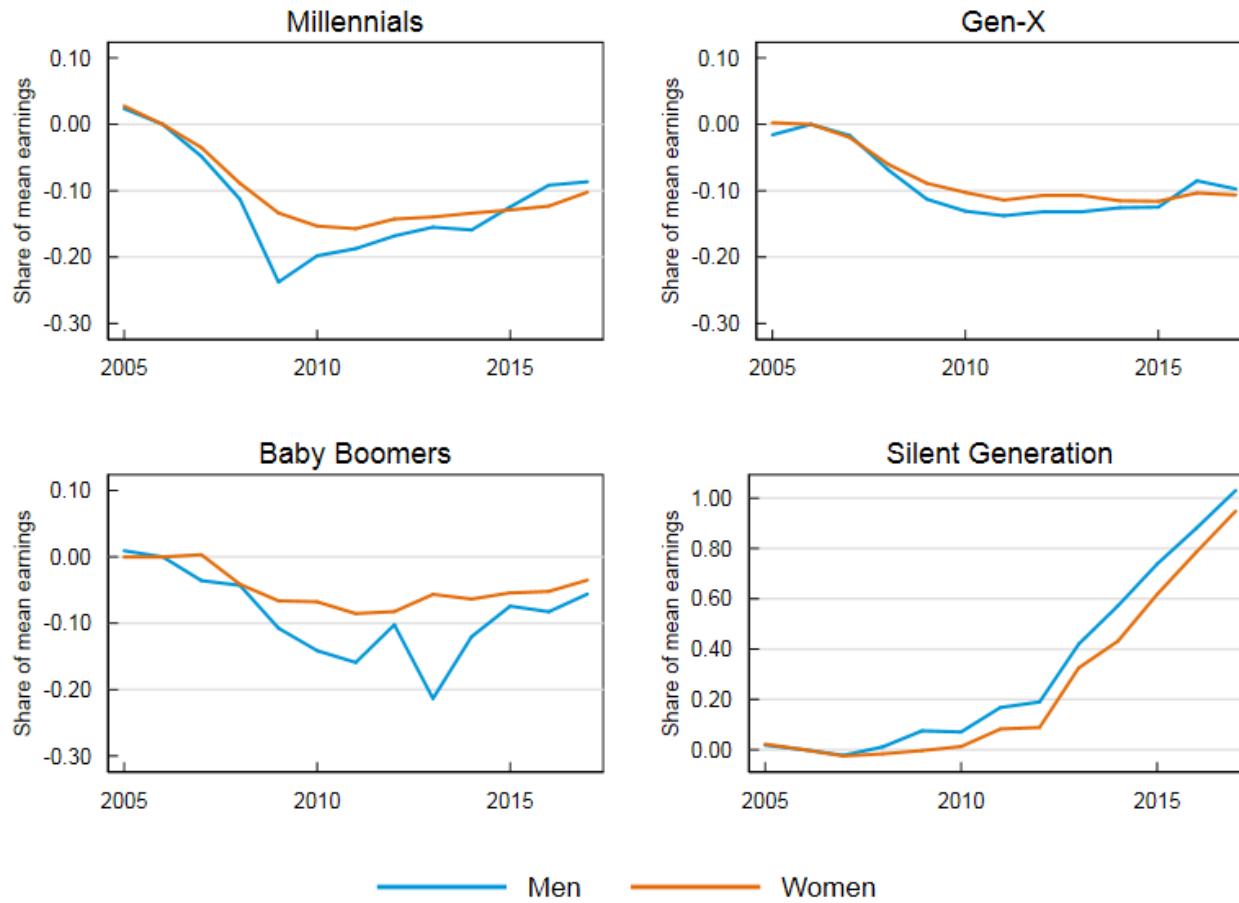
Figure B7: Effects of Local Unemployment Shocks on Earnings, Coefficients as Shares of Mean Earnings, by Gender and Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

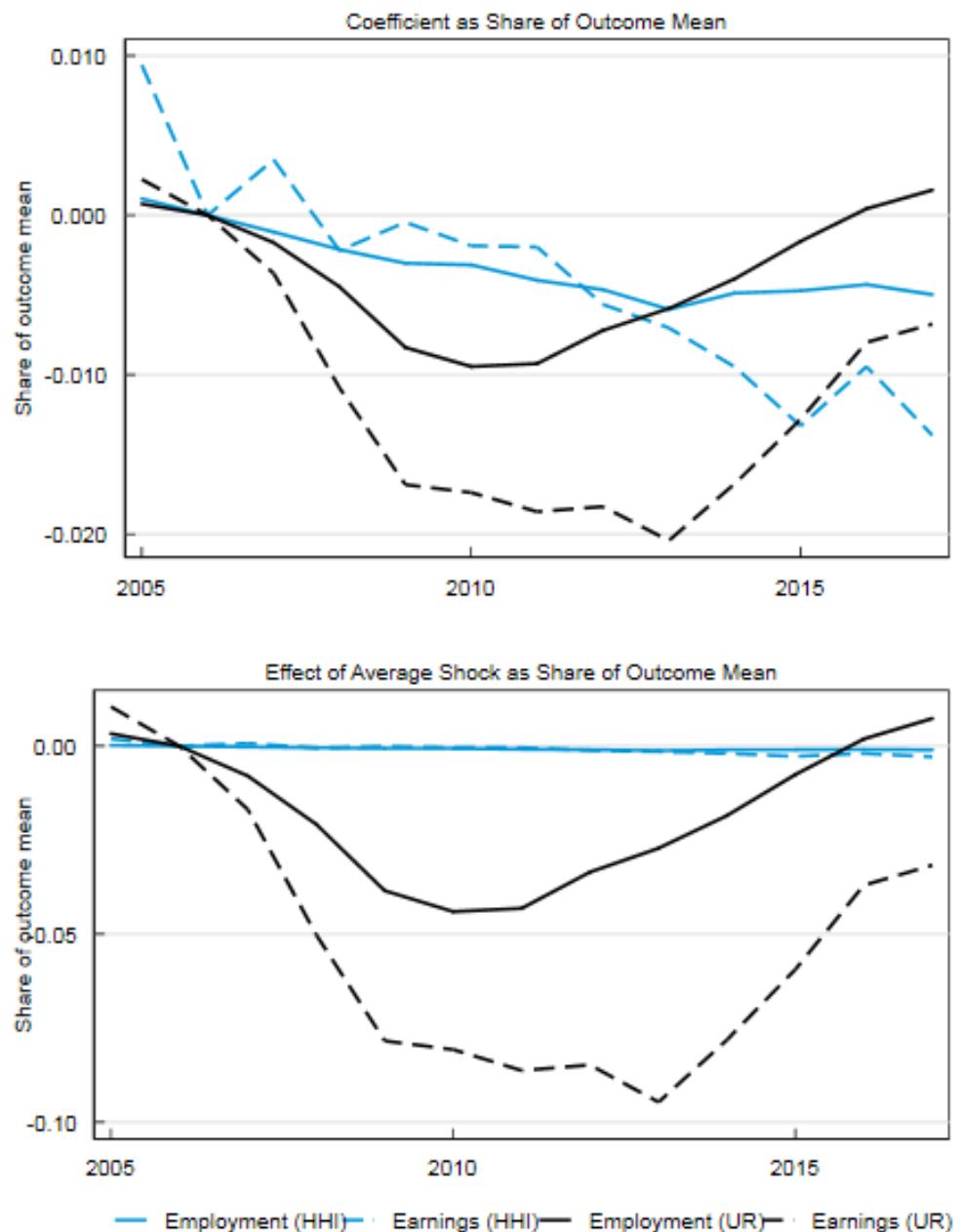
Figure B8: Effects of Local Unemployment Shocks on Earnings, Effects of Average Shock as Shares of Mean Earnings, by Gender and Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

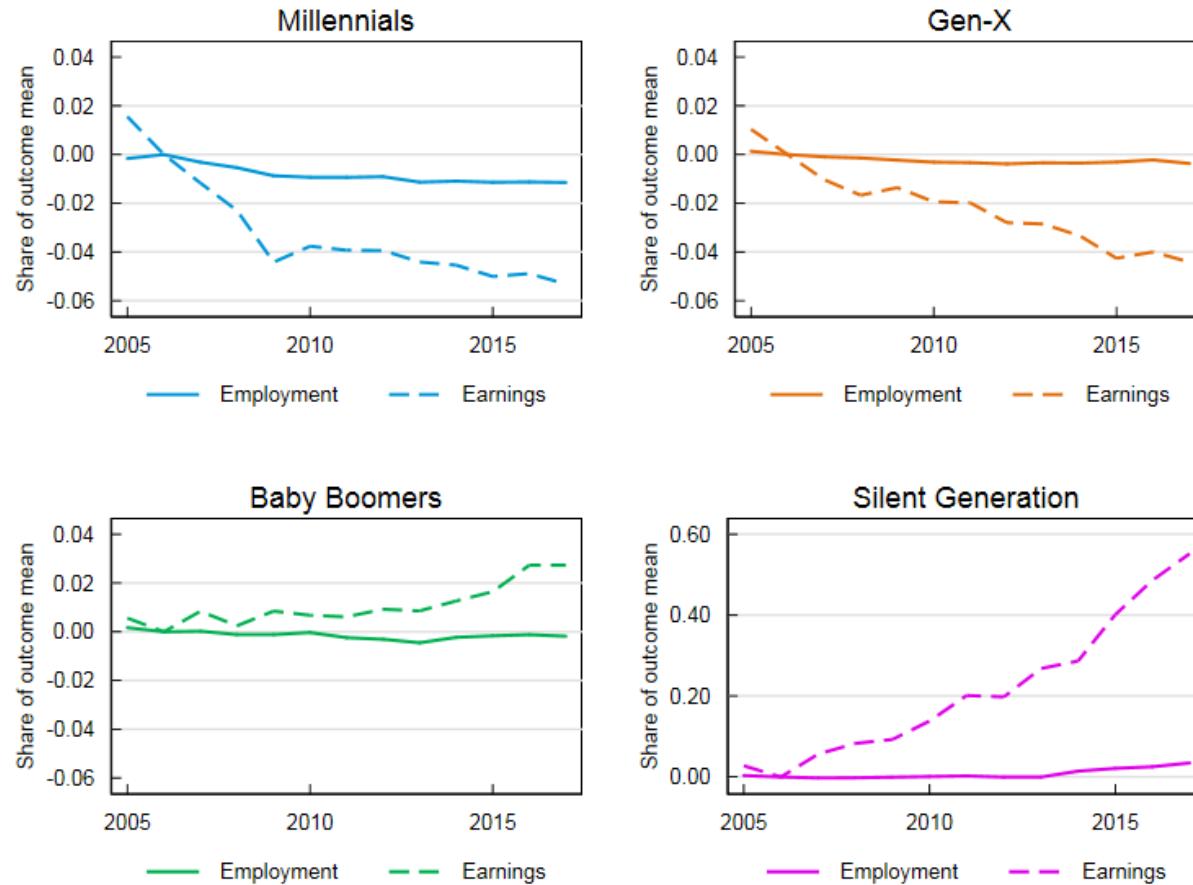
Figure B9: Effects of Local Concentration Shocks on Employment and Earnings, as Shares of Outcome Means



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in blue are  $\beta$  coefficients as estimated in Equation A3, divided by the mean of the corresponding outcome for the relevant group and year. Points plotted in black are the effects of local unemployment shocks from the same estimating equation (the  $\zeta$  coefficients), also divided by outcome means, for reference.

Figure B10: Effects of Local Concentration Shocks on Employment and Earnings, Coefficients as Shares of Outcome Means, by Generation

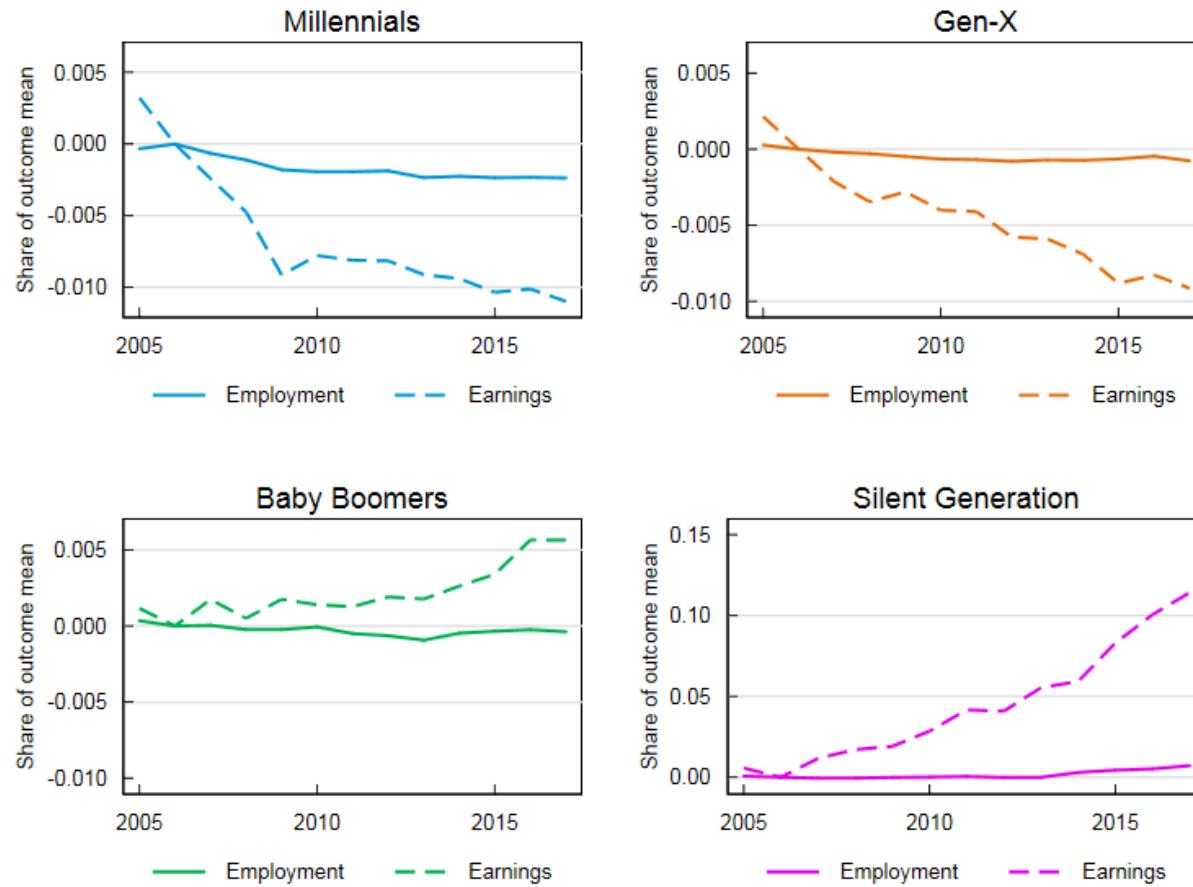


39

Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation A3, divided by the mean of the corresponding outcome for the relevant group and year.

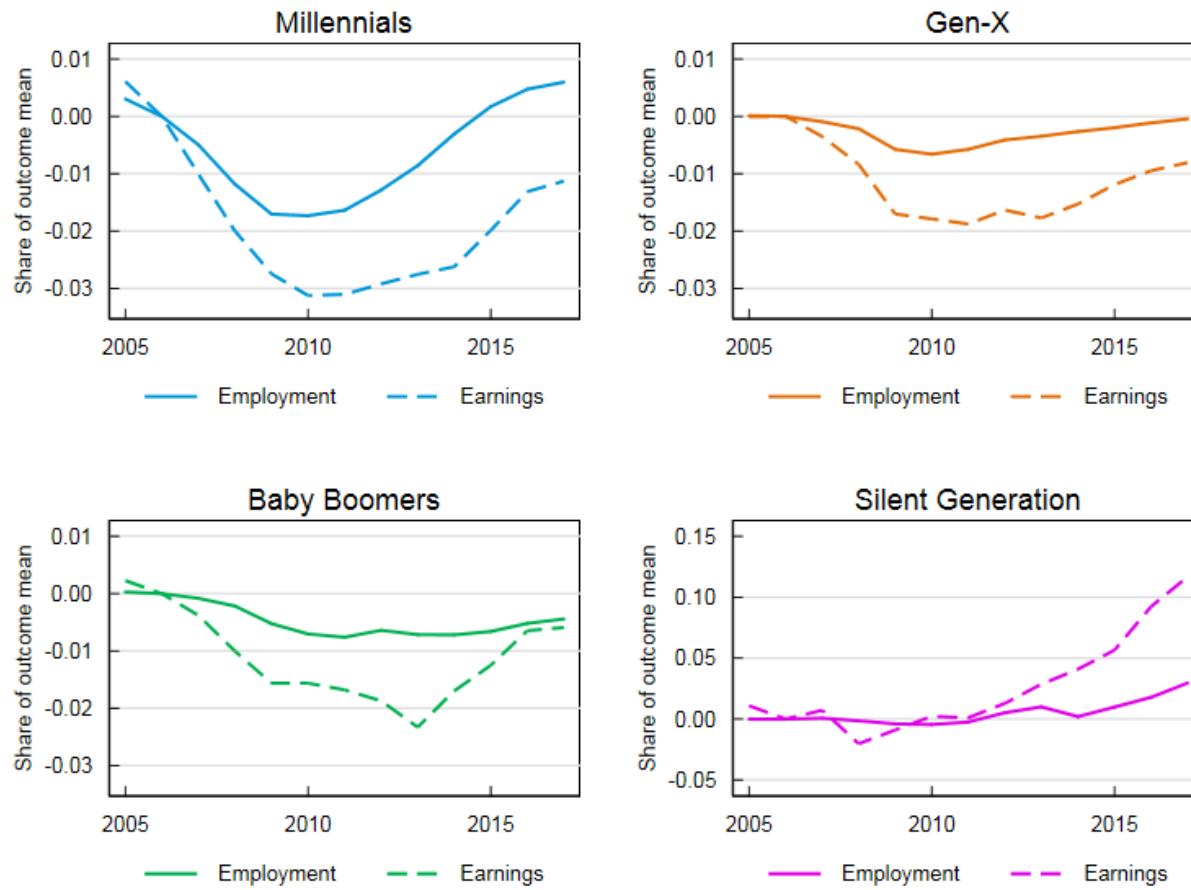
Figure B11: Effects of Local Concentration Shocks on Employment and Earnings, Effects of Average Shock as Shares of Mean Outcomes, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation A3, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

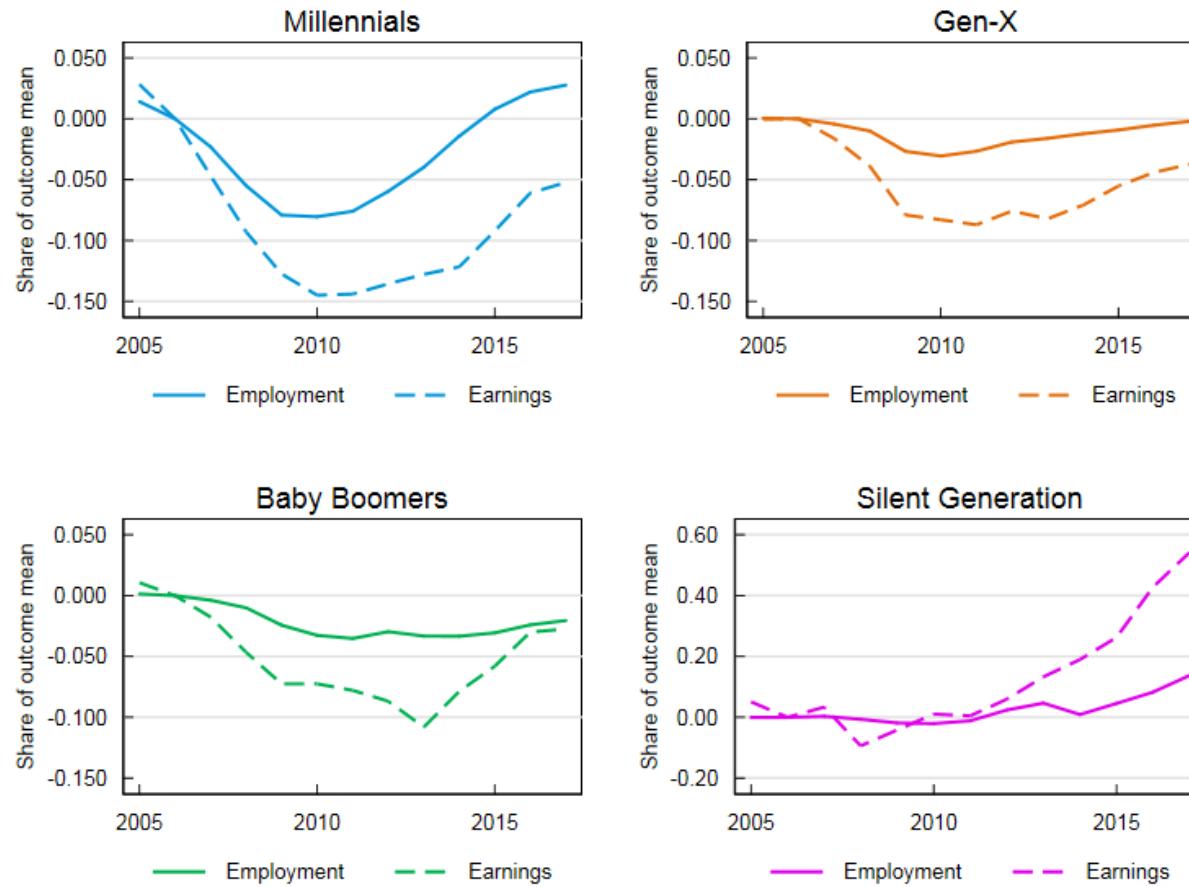
Figure B12: Effects of Local Unemployment Shocks on Employment and Earnings, Coefficients as Shares of Mean Outcomes, Conditional on Concentration and Bartik Shocks, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

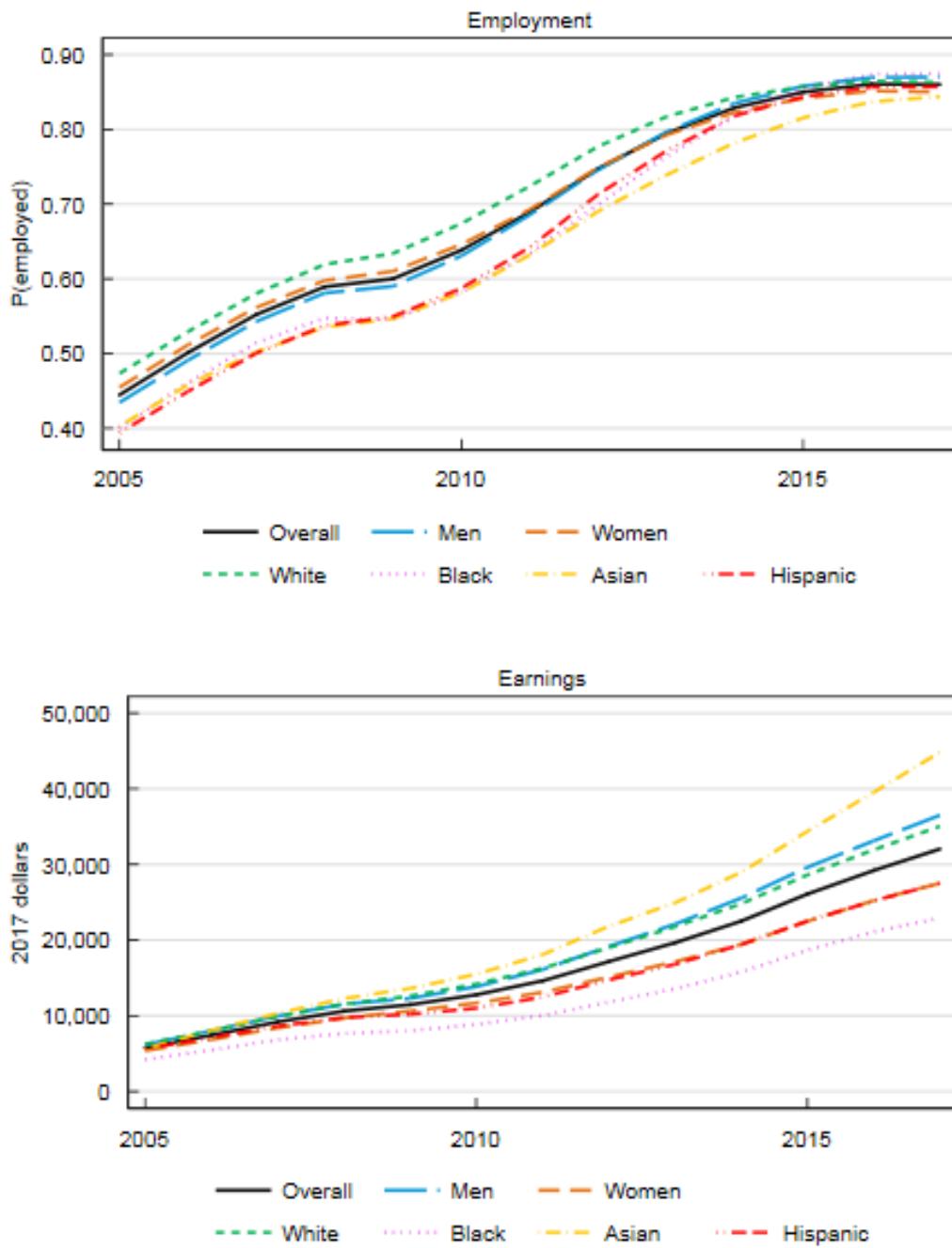
Figure B13: Effects Local Concentration Shocks on Employment and Earnings, Effects of Average Shock as Shares of Mean Outcomes, Conditional on Concentration and Bartik Shocks, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

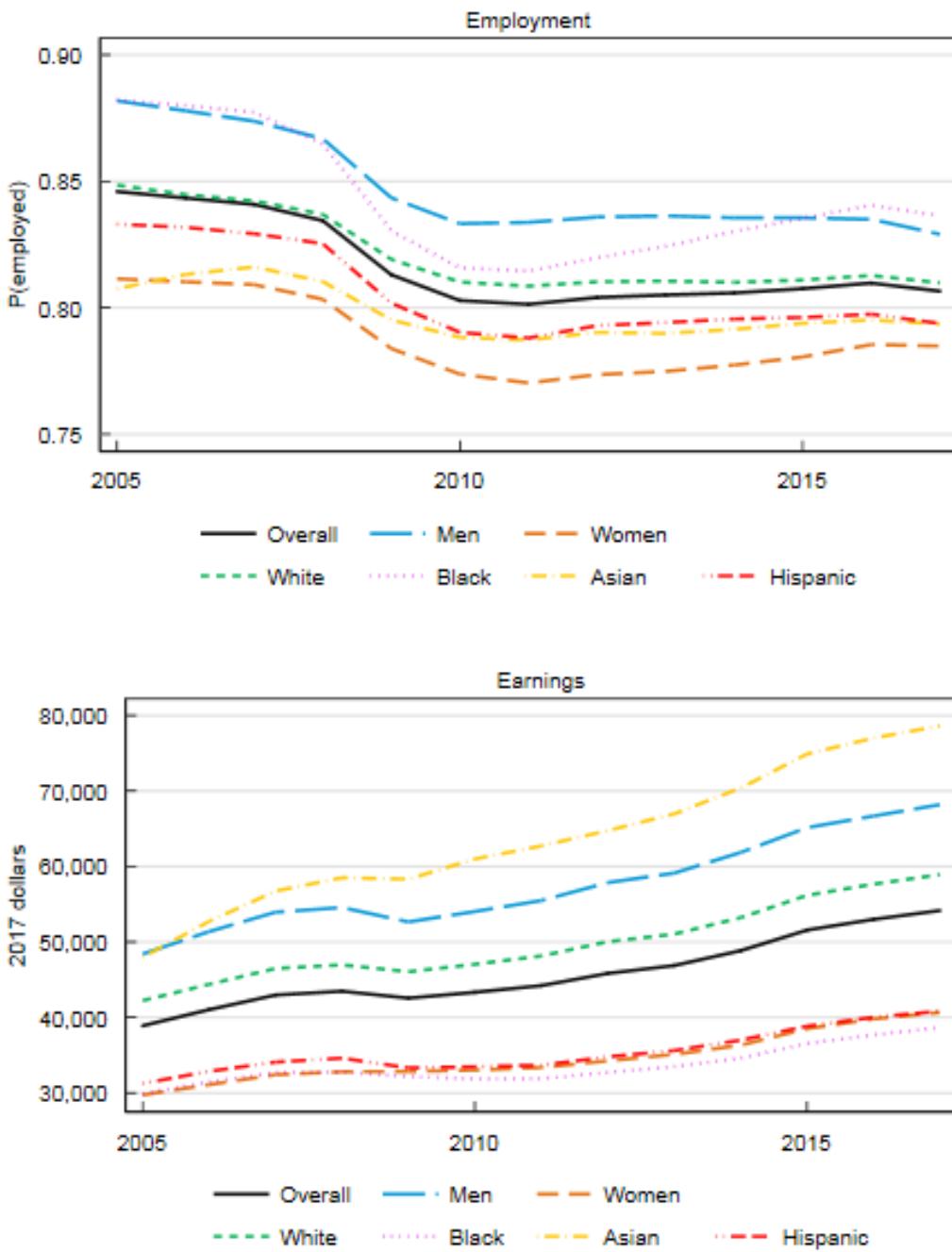
Figure B14: Employment and Earnings Trends, Millennials



Source: Form W-2, Census Numident. Release authorization number CBDRB-FY19-376.

Note: Individuals are employed if they have any W-2 earnings in a given year. Earnings include wage and salary income as well as deferred compensation.

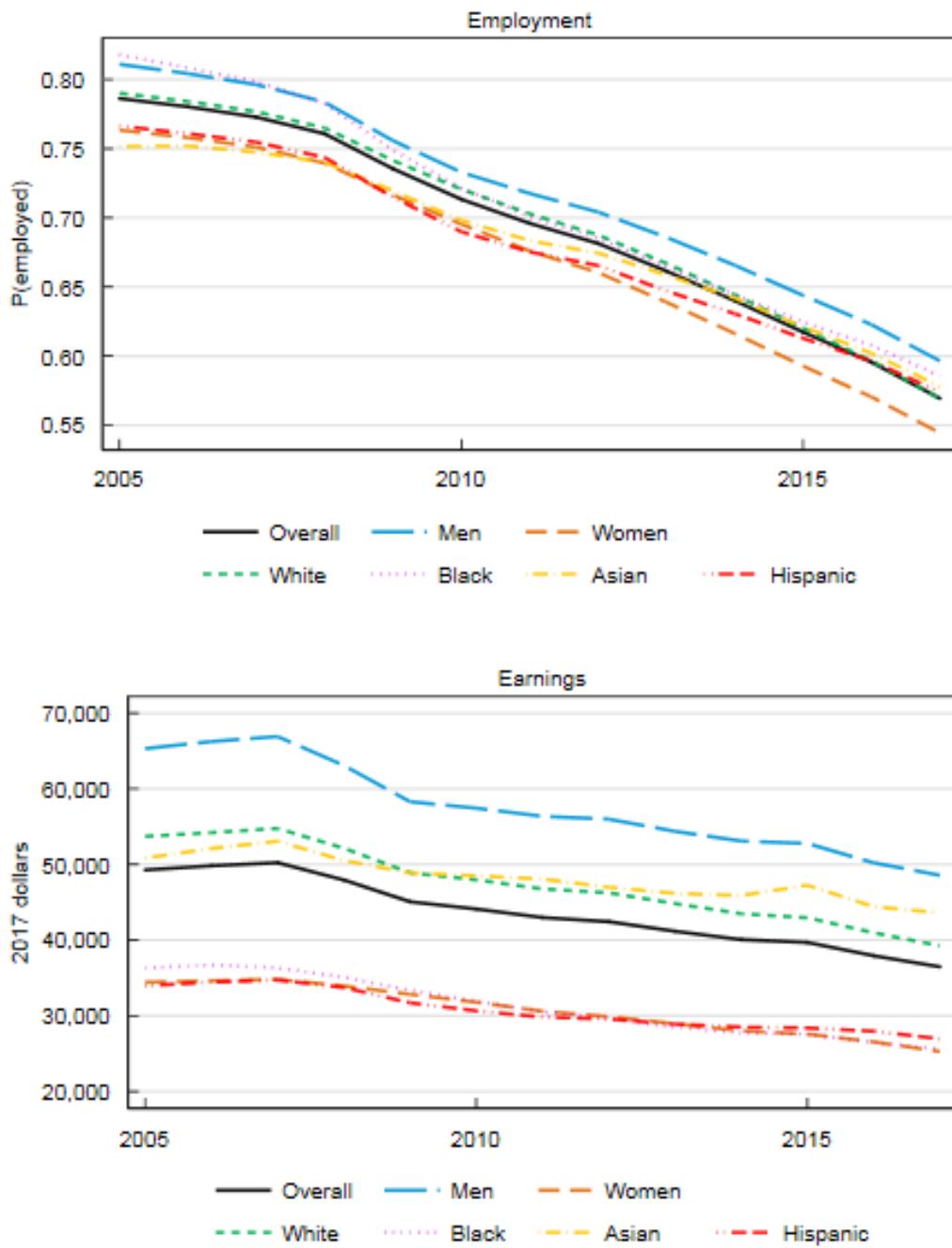
Figure B15: Employment and Earnings Trends, Generation X



Source: Form W-2, Census Numident. Release authorization number CBDRB-FY19-376.

Note: Individuals are employed if they have any W-2 earnings in a given year. Earnings include wage and salary income as well as deferred compensation.

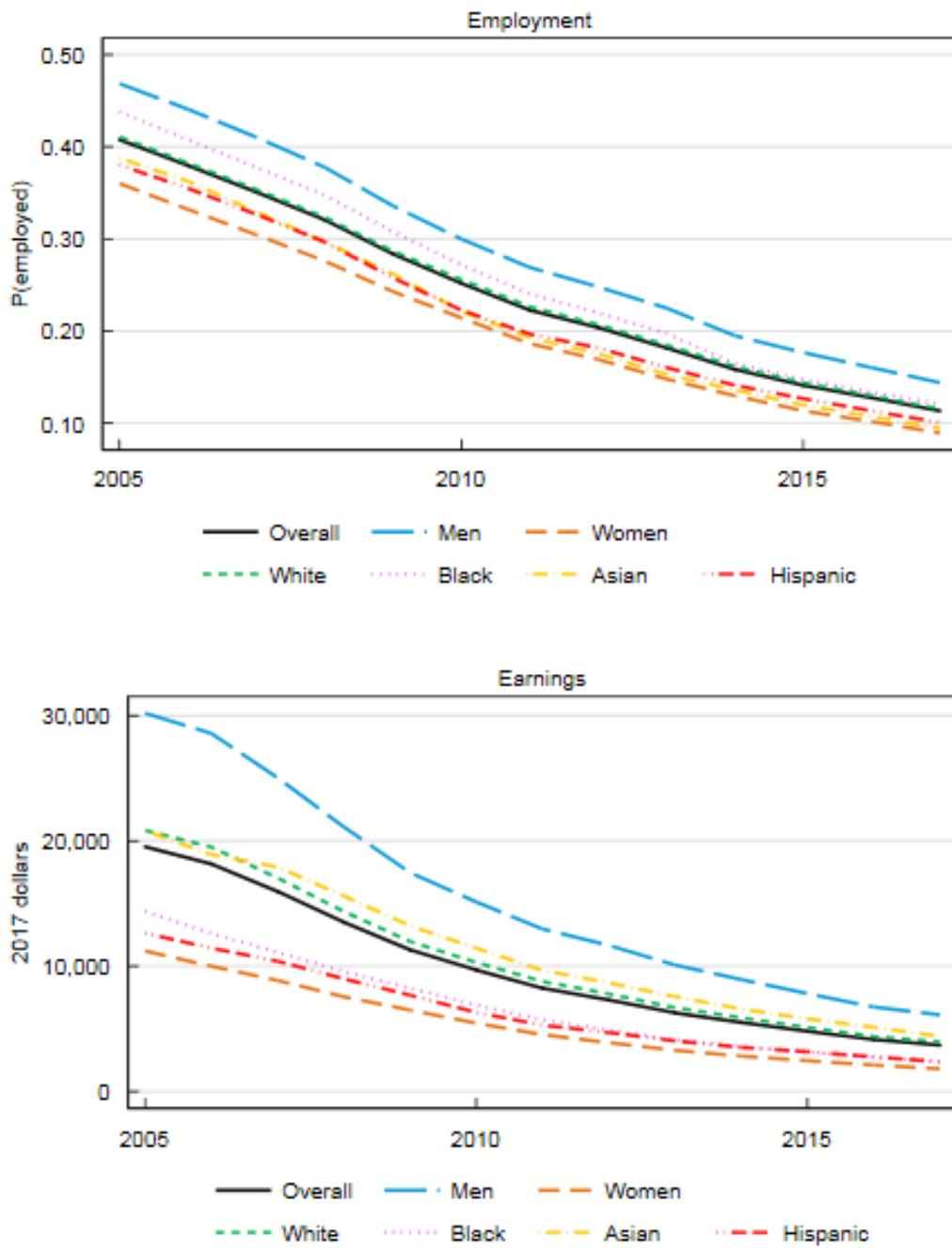
Figure B16: Employment and Earnings Trends, Baby Boomers



Source: Form W-2, Census Numident. Release authorization number CBDRB-FY19-376.

Note: Individuals are employed if they have any W-2 earnings in a given year. Earnings include wage and salary income as well as deferred compensation.

Figure B17: Employment and Earnings Trends, Silent Generation



Source: Form W-2, Census Numident. Release authorization number CBDRB-FY19-376.

Note: Individuals are employed if they have any W-2 earnings in a given year. Earnings include wage and salary income as well as deferred compensation.

Table B1: Point Estimates as Percents of Outcome Means

	(1) 2010 Employment	(2) 2010 Earnings	(3) 2012 Employment	(4) 2012 Earnings	(5) 2015 Employment	(6) 2015 Earnings	(7) 2017 Employment	(8) 2017 Earnings
Overall	-1.07	-2.16	-0.76	-2.03	-0.29	-1.68	-0.04	-1.26
Male	-1.17	-2.85	-0.73	-2.42	-0.23	-1.89	0.14	-1.37
Female	-0.83	-1.9	-0.57	-2.08	-0.24	-1.88	0.1	-1.59
White	-0.85	-2.4	-0.52	-2.1	-0.25	-1.78	0.04	-1.38
Black	-1.27	-3.14	-0.99	-3.35	-0.49	-2.88	0.09	-2.41
Asian	-0.77	-1.7	-0.62	-1.69	-0.41	-1.31	0.39	-2.79
Hispanic	-1.12	-2.34	-0.69	-2.21	-0.03	-1.08	0.33	0.02
Not employed in 2006	-3.82	-2.94	-2.7	-3.06	-0.82	-2.32	-0.36	-1.78
Some full-year nonemployment	-1.61	-6.56	-0.61	-4.38	-0.04	-3.17	0.19	-2.43
Main employer change	-0.43	-2.43	-0.32	-2.13	-0.36	-1.77	-0.24	-1.26
Kept same main employer	-0.41	-1.58	-0.42	-1.74	-0.54	-1.55	-0.53	-1.35
Place, Equation 3	-1.25	-2.18	-0.98	-2.18	-0.64	-1.9	-0.41	-1.39
HHI Shock, Equation A3	-0.31	-0.19	-0.47	-0.56	-0.47	-1.32	-0.5	-1.38
UR Shock, Equation A3	-0.95	-1.74	-0.72	-1.83	-0.16	-1.28	0.16	-0.68
Millennials	-1.87	-3.73	-1.21	-3.29	0.02	-2.55	0.32	-1.94
Male	-1.89	-4.26	-1.16	-3.62	0.22	-2.68	0.46	-1.86
Female	-1.64	-3.3	-1.02	-3.07	0.11	-2.78	0.42	-2.2
White	-1.53	-3.83	-0.75	-3.45	0.17	-2.76	0.29	-2.13
Black	-1.72	-3.2	-1.28	-2.98	0.14	-2.45	0.6	-1.9
Asian	-1.66	-2.71	-1.9	-2.94	-0.88	-3.65	0.31	-3.72
Hispanic	-2.1	-2.58	-1.69	-1.65	0.21	-0.66	0.56	0.8
Not employed in 2006	-5.19	-4.35	-3.21	-3.39	-0.65	-2.18	-0.22	-1.49
Some full-year nonemployment	-2.15	-8	-0.99	-5.27	-0.03	-4.21	0.28	-3.81
Main employer change	-0.43	-3.25	-0.26	-3.07	-0.13	-2.37	-0.04	-1.85
Kept same main employer	-0.36	-2.26	-0.24	-1.98	-0.17	-1.84	-0.11	-1.35
Place, Equation 3	-1.84	-4.55	-1.02	-4.19	0.35	-3.04	0.7	-2.04
HHI Shock, Equation 4	-0.93	-3.76	-0.91	-3.94	-1.14	-5	-1.14	-5.31
UR Shock, Equation 4	-1.73	-3.12	-1.28	-2.92	0.17	-1.99	0.6	-1.13
Gen-X	-0.74	-2.35	-0.49	-2.11	-0.28	-1.84	-0.14	-1.58
Male	-0.8	-2.82	-0.38	-2.84	-0.21	-2.69	0.18	-2.09
Female	-0.66	-2.21	-0.5	-2.31	-0.55	-2.5	-0.25	-2.29
White	-0.6	-2.36	-0.41	-2.32	-0.39	-2.57	0.01	-2.08
Black	-1.43	-4.65	-1	-5.81	-0.66	-5.17	-0.42	-4.55
Asian	-0.8	-1.6	-0.33	-1.04	0.26	-0.21	0.09	-1.4
Hispanic	-0.49	-2.34	0.1	-2.2	-0.25	-0.73	-0.06	-0.15
Not employed in 2006	-1.32	-2.83	-1.37	-2.84	-1.11	-2.17	-0.63	-2.27
Some full-year nonemployment	-1.14	-4.25	0.02	-3.23	0.26	-1.75	0.4	-0.88
Main employer change	-0.51	-2.8	-0.44	-2.47	-0.29	-2.05	-0.21	-1.53
Kept same main employer	-0.31	-1.48	-0.23	-1.39	-0.2	-1.35	-0.18	-1.33
Place, Equation 3	-0.8	-2.18	-0.55	-2.03	-0.38	-1.85	-0.26	-1.51
HHI Shock, Equation A3	-0.31	-1.94	-0.38	-2.79	-0.31	-4.26	-0.37	-4.42
UR Shock, Equation A3	-0.66	-1.79	-0.41	-1.63	-0.2	-1.19	-0.04	-0.81
Baby Boomers	-0.8	-1.8	-0.67	-1.75	-0.69	-1.38	-0.51	-0.81
Male	-0.95	-3.04	-0.79	-2.21	-0.81	-1.6	-0.46	-1.21
Female	-0.55	-1.46	-0.47	-1.77	-0.59	-1.17	-0.29	-0.75
White	-0.65	-2.43	-0.63	-1.92	-0.7	-1.34	-0.53	-1.01
Black	-0.81	-1.81	-0.6	-1.09	-1.09	-0.38	0.16	-0.01
Asian	-0.85	-2.77	-0.62	-3.77	-1.39	-3.06	-0.02	-5.87
Hispanic	-1.09	-2.6	-0.58	-3.05	-0.44	-2.5	0.01	-1.16
Not employed in 2006	-0.72	-1.53	-0.86	-2.84	-1.2	-3.19	-0.82	-2.83
Some full-year nonemployment	-1.36	-5.25	-0.7	-3.5	-0.4	-2.46	-0.1	-1.4
Main employer change	-0.53	-1.71	-0.5	-1.15	-0.71	-1.15	-0.61	-0.59
Kept same main employer	-0.41	-1.53	-0.49	-1.9	-0.74	-1.73	-0.82	-1.46
Place, Equation 3	-0.93	-1.79	-0.91	-1.87	-1.2	-1.51	-1.13	-0.91
HHI Shock, Equation A3	-0.03	0.68	-0.31	0.92	-0.17	1.64	-0.18	2.73
UR Shock, Equation A3	-0.7	-1.56	-0.64	-1.87	-0.66	-1.25	-0.44	-0.59

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Table B1 – continued from previous page

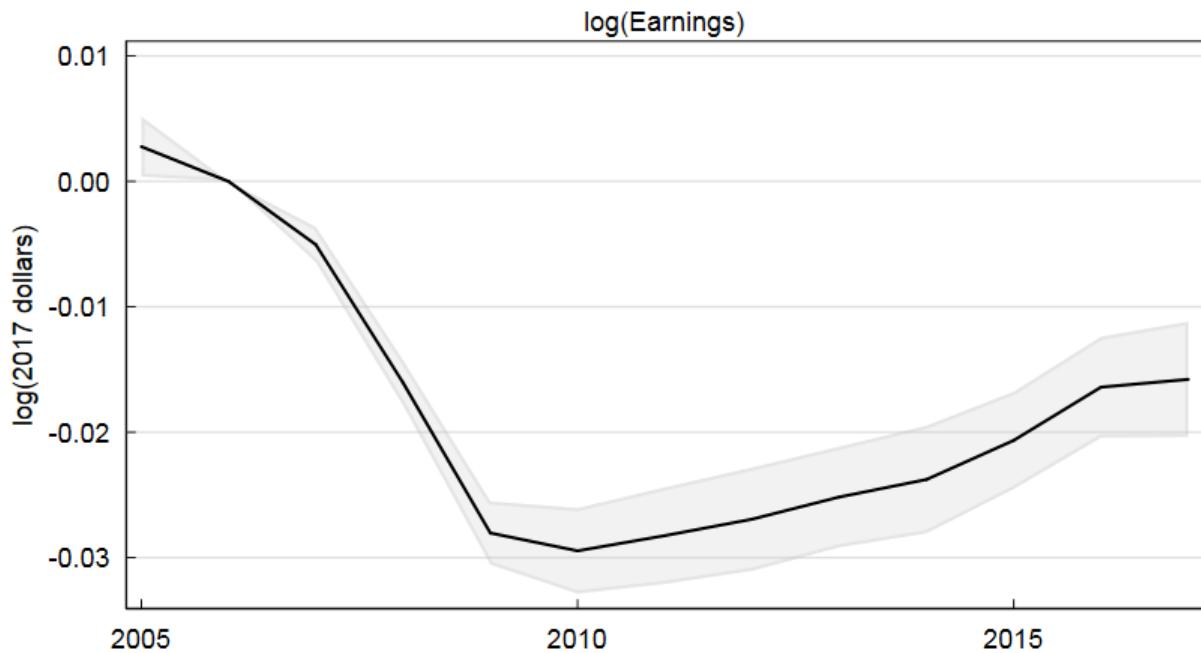
	2010	2012	2015	2017				
	Employment	Earnings	Employment	Earnings	Employment	Earnings	Employment	Earnings
Silent Generation	-1.14	-0.56	-0.5	0.71	-0.49	6.45	1.13	11.3
Male	-1.64	1.53	-0.03	4.1	-0.73	15.92	1.36	22.21
Female	0.12	0.28	1.01	1.91	2.66	13.32	5.94	20.44
White	-1.1	0.44	0.44	2.63	1.01	14.67	3.64	20.99
Black	-0.82	-2.99	-2.62	-4.51	-5.31	-4.83	-7.16	0.33
Asian	4.71	13.12	6.81	19.84	9.76	35.21	18.46	45.09
Hispanic	2.57	2.16	4.02	3.72	4.06	8.86	8.67	10.77
Not employed in 2006	-3.86	-4.4	-4.34	-4.47	-4.1	-2.5	-3.26	-0.85
Some full-year nonemployment	-3.53	-27.74	-3.52	-20.4	-2.44	-26.19	-2.76	-31.23
Main employer change	-0.73	4.93	0.06	4.6	-4.74	12.75	-4.03	19.47
Kept same main employer	-0.84	-2.26	-1.23	-2.65	-2.36	-0.8	-2.24	0.65
Place, Equation 3	-1.13	0.44	-0.33	2.63	-0.38	8.86	1.33	15.03
HHI Shock, Equation A3	0.09	13.82	-0.03	19.79	2.12	40.14	3.47	55.19
UR Shock, Equation A3	-0.45	0.23	0.52	1.28	0.98	5.66	2.96	11.68

Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010). Release authorization numbers CBDRB-FY19-376 and CBDRB-FY19-431.

Note: Each cell report the  $\beta$  coefficient for the indicated group, outcome, and year, estimated using Equation 1 (unless otherwise indicated), as a share of the mean value of that outcome for that group in that year. Each row presents estimates from two regressions (with employment and earnings as the dependent variables) for a single sample. Values are reported in percentage points. Indented rows report estimates for subgroups or alternative specifications of the generation under which they are listed.

## B.2 $\log(\text{Earnings})$

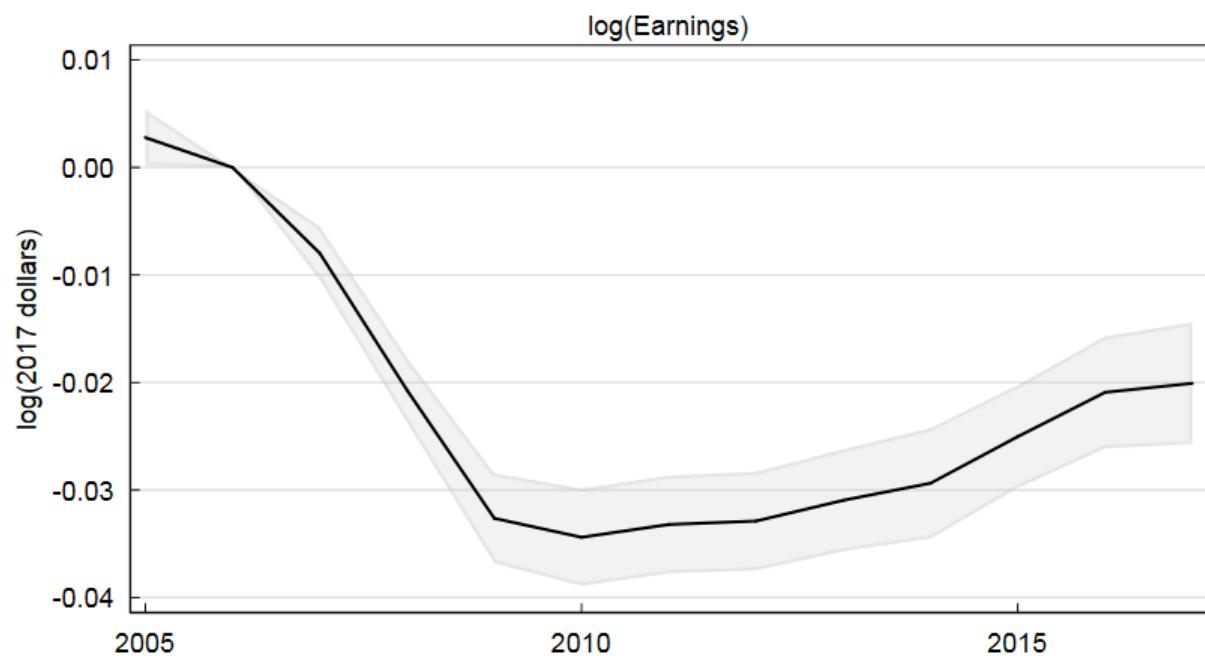
Figure B18: Effects of Local Unemployment Shocks on Log Earnings, 1957-1976 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

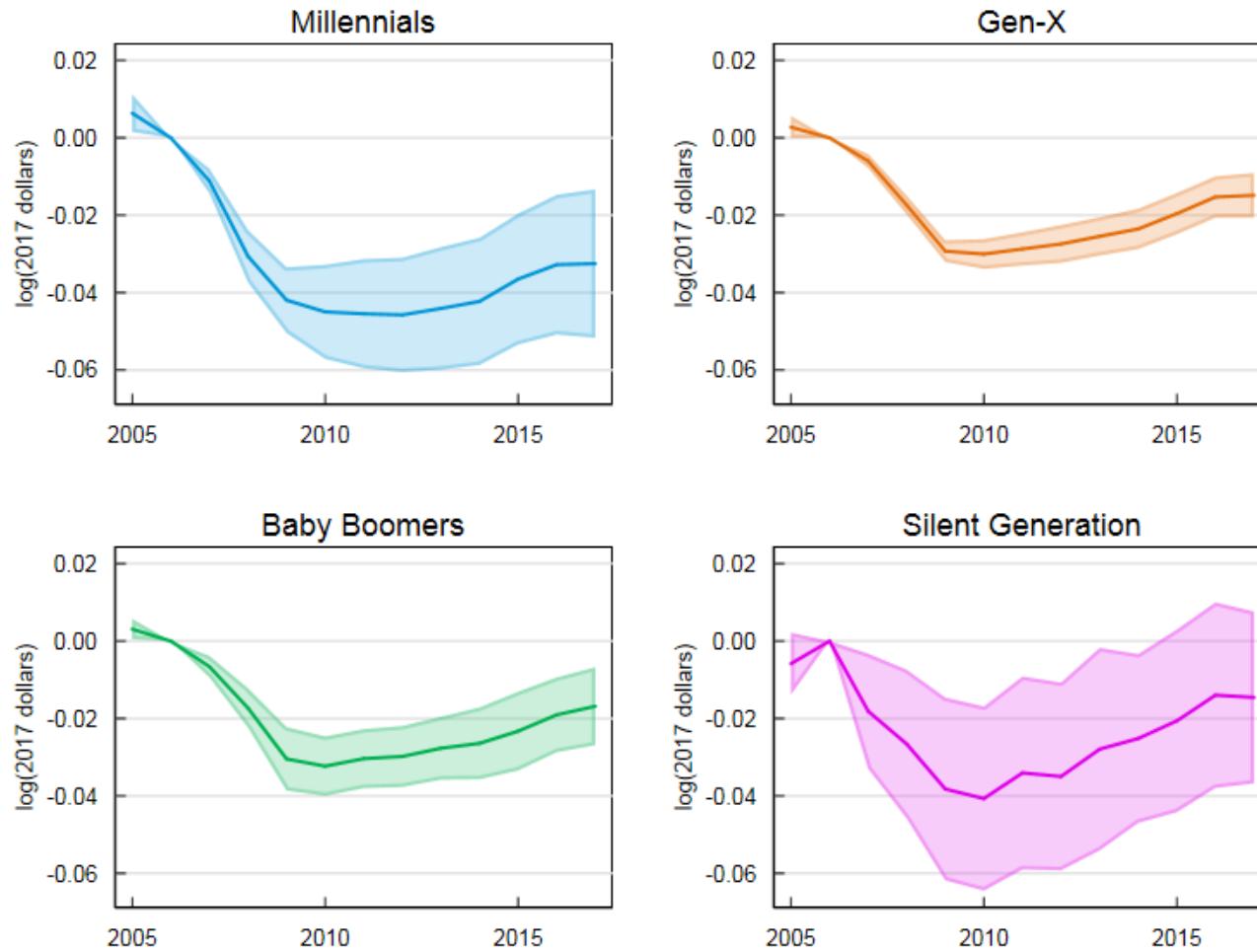
Figure B19: Effects of Local Unemployment Shocks on Log Earnings, 1928-1996 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

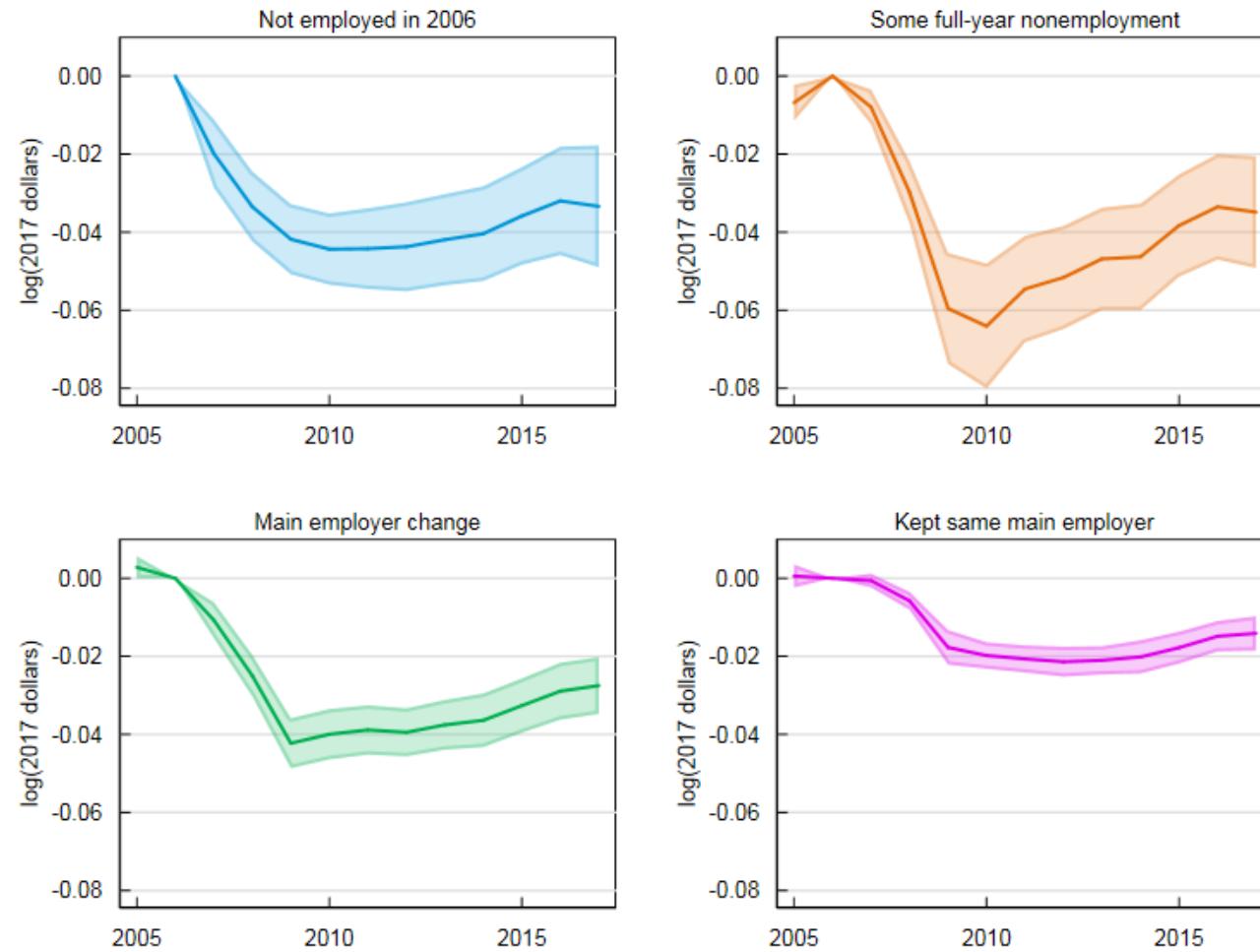
Figure B20: Effects of Local Unemployment Shocks on Log Earnings, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

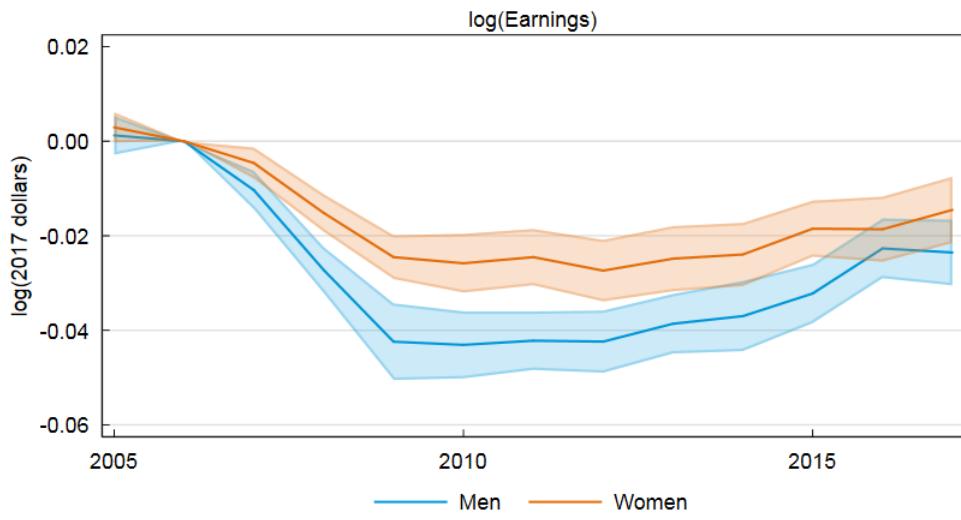
Figure B21: Effects of Local Unemployment Shocks on Log Earnings, by Displacement Status



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

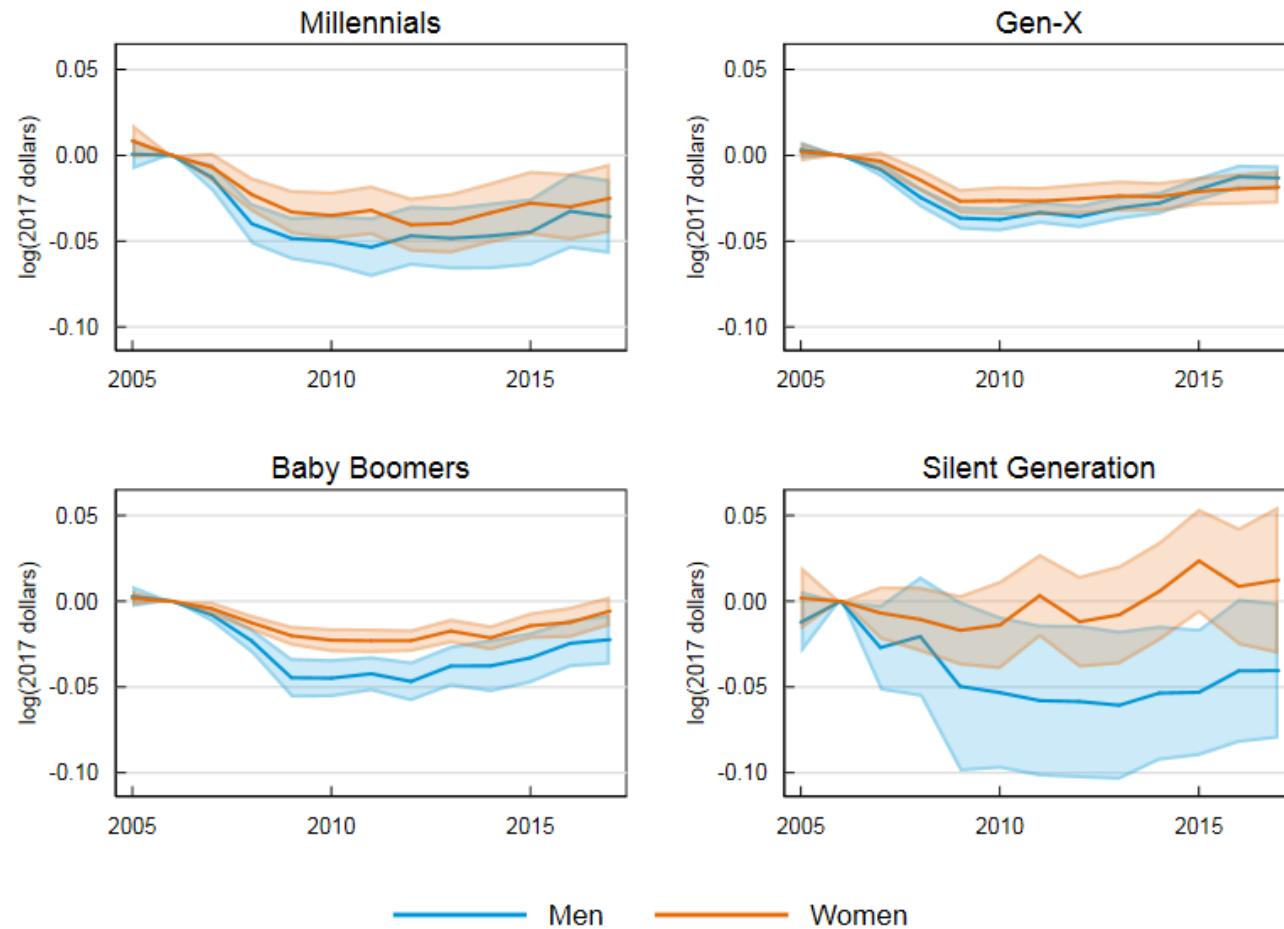
Figure B22: Effects of Local Unemployment Shocks on Log Earnings, by Gender



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure B23: Effects of Local Unemployment Shocks on Log Earnings, by Gender and by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

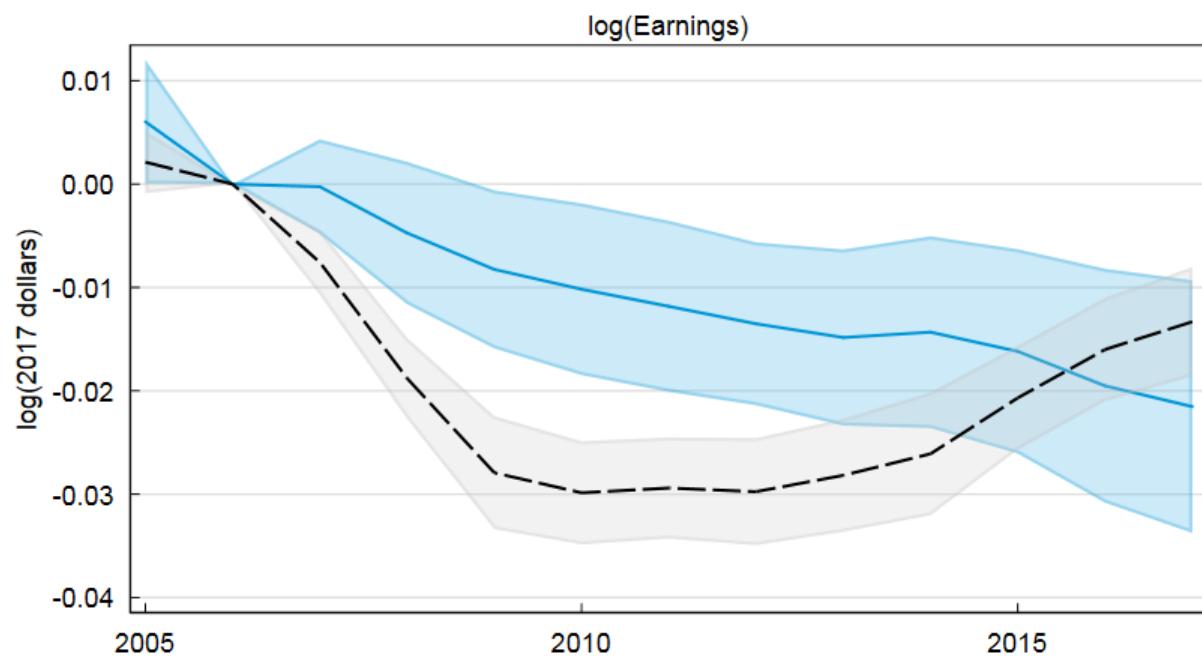
Figure B24: Person vs. Place Estimates, Log Earnings, 1928-1996 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted in green are  $\beta$  coefficients as estimated in Equation 1. Points plotted in magenta are  $\beta$  coefficients as estimated in Equation 3. Shaded regions represent 95 percent confidence intervals.

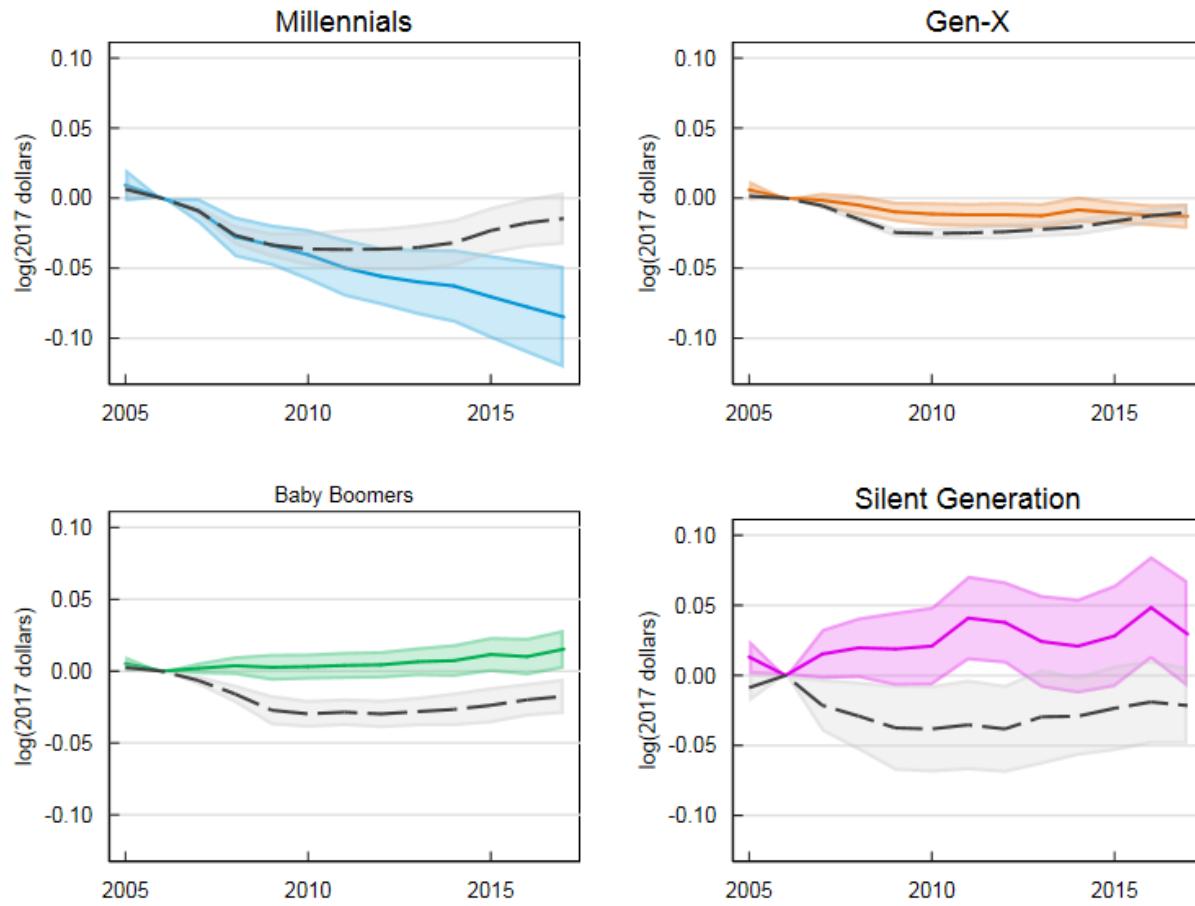
Figure B25: Effects of Local Concentration Shocks on Log Earnings, 1928-1996 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation A3. Shaded regions represent 95 percent confidence intervals.

Figure B26: Effects of Local Concentration Shocks on Log Earnings, by Generation

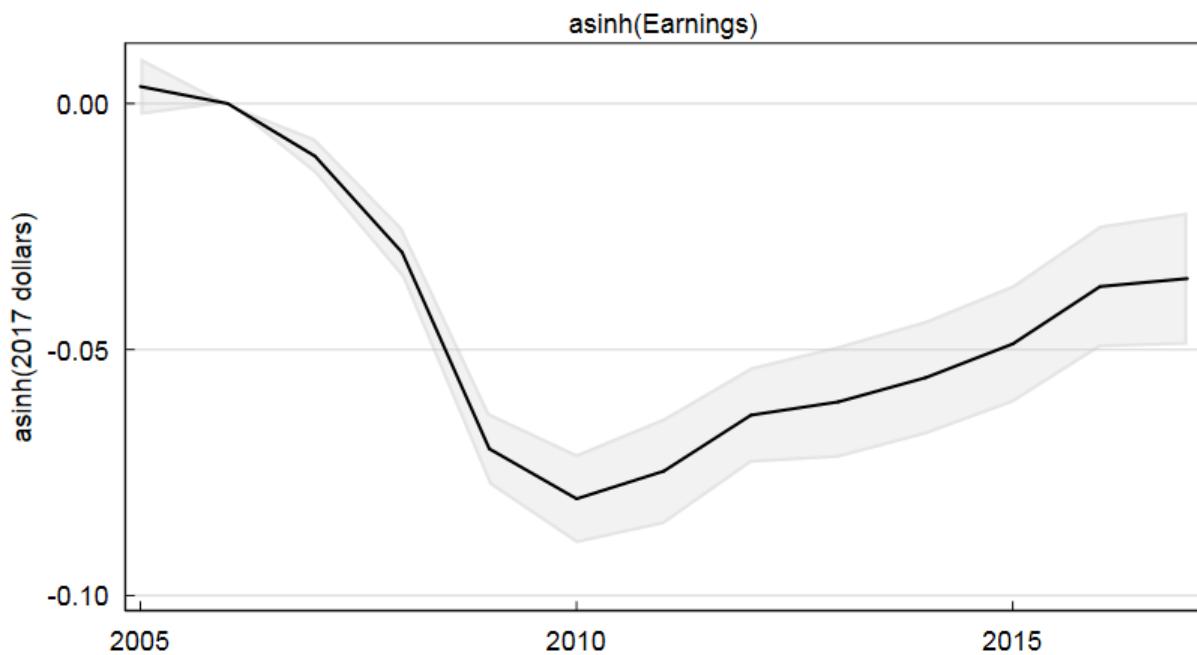


Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in solid blue are  $\beta$  coefficients as estimated in Equation A3. Dashed black lines are the effects of local unemployment shocks from this estimating equation (the  $\zeta$  coefficients), for reference. Shaded regions represent 95 percent confidence intervals.

### B.3 $\text{asinh}(\text{Earnings})$

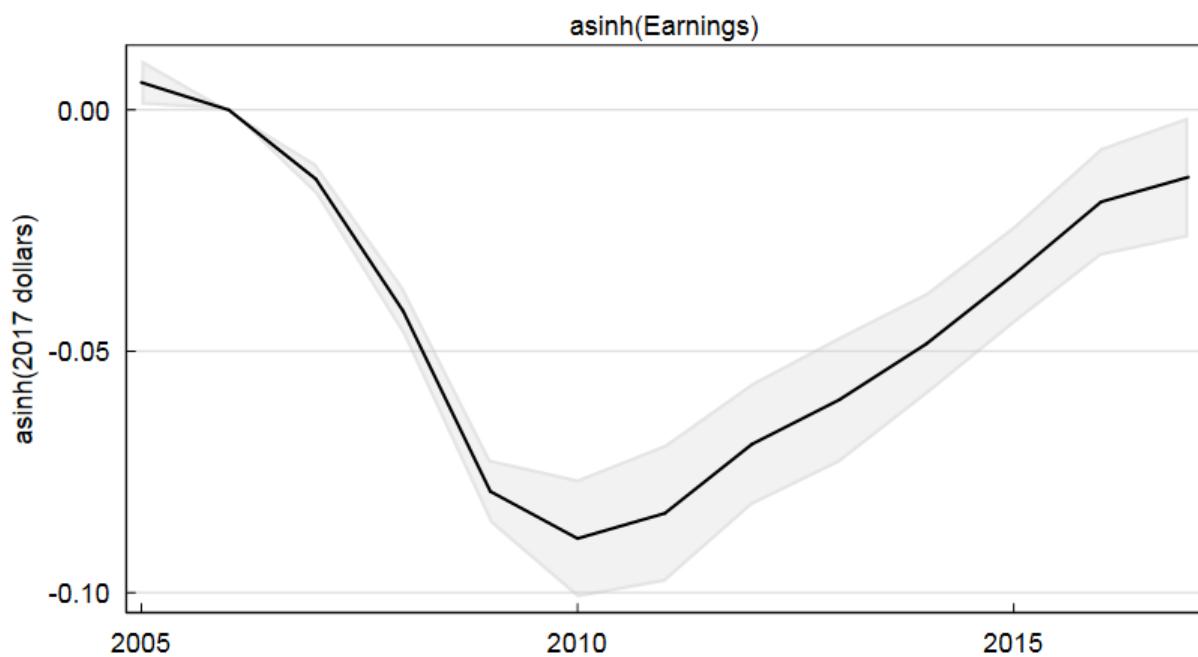
Figure B27: Effects of Local Unemployment Shocks on  $\text{asinh}(\text{Earnings})$ , 1957-1976 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

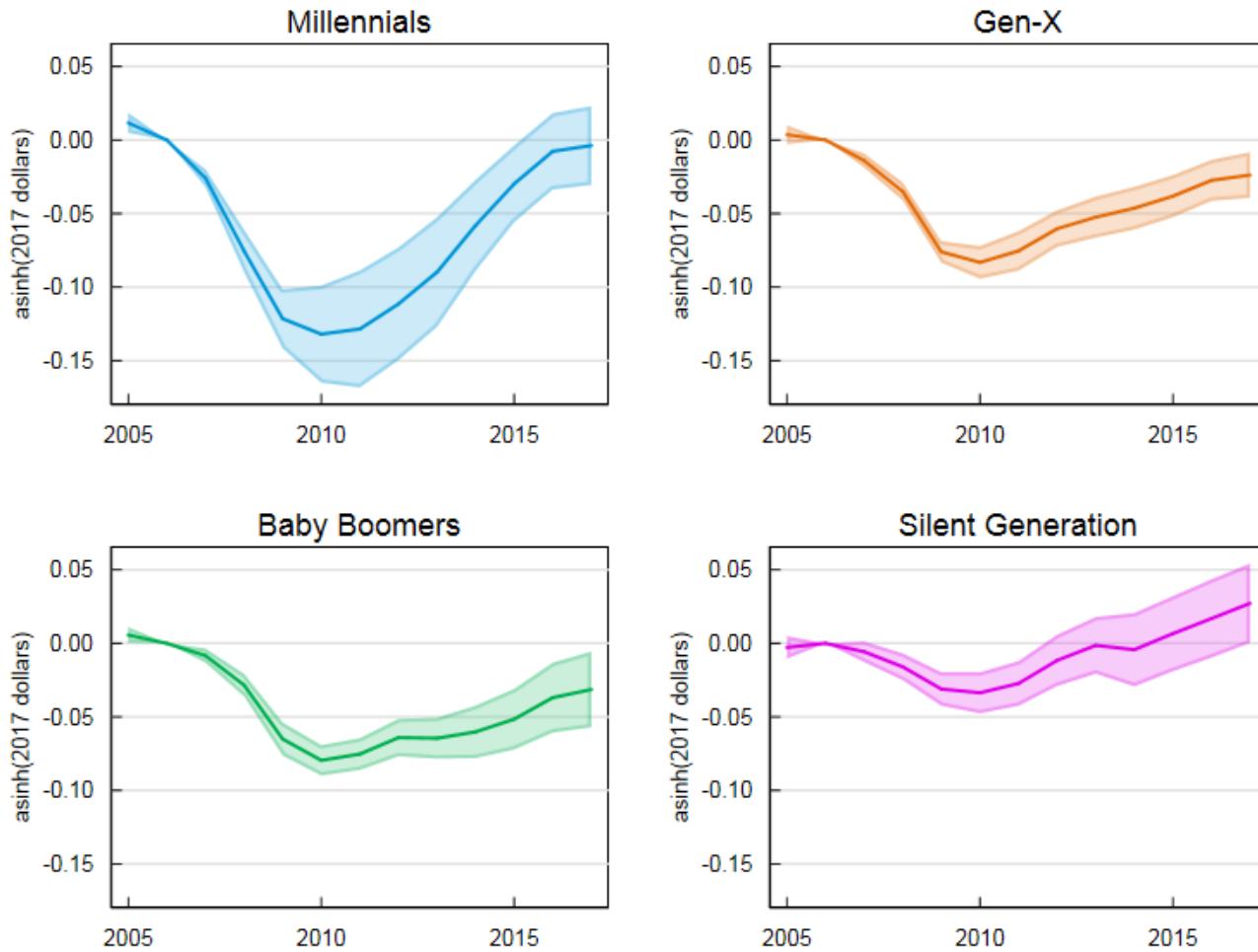
Figure B28: Effects of Local Unemployment Shocks on  $\text{asinh}(\text{Earnings})$ , 1928-1996 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

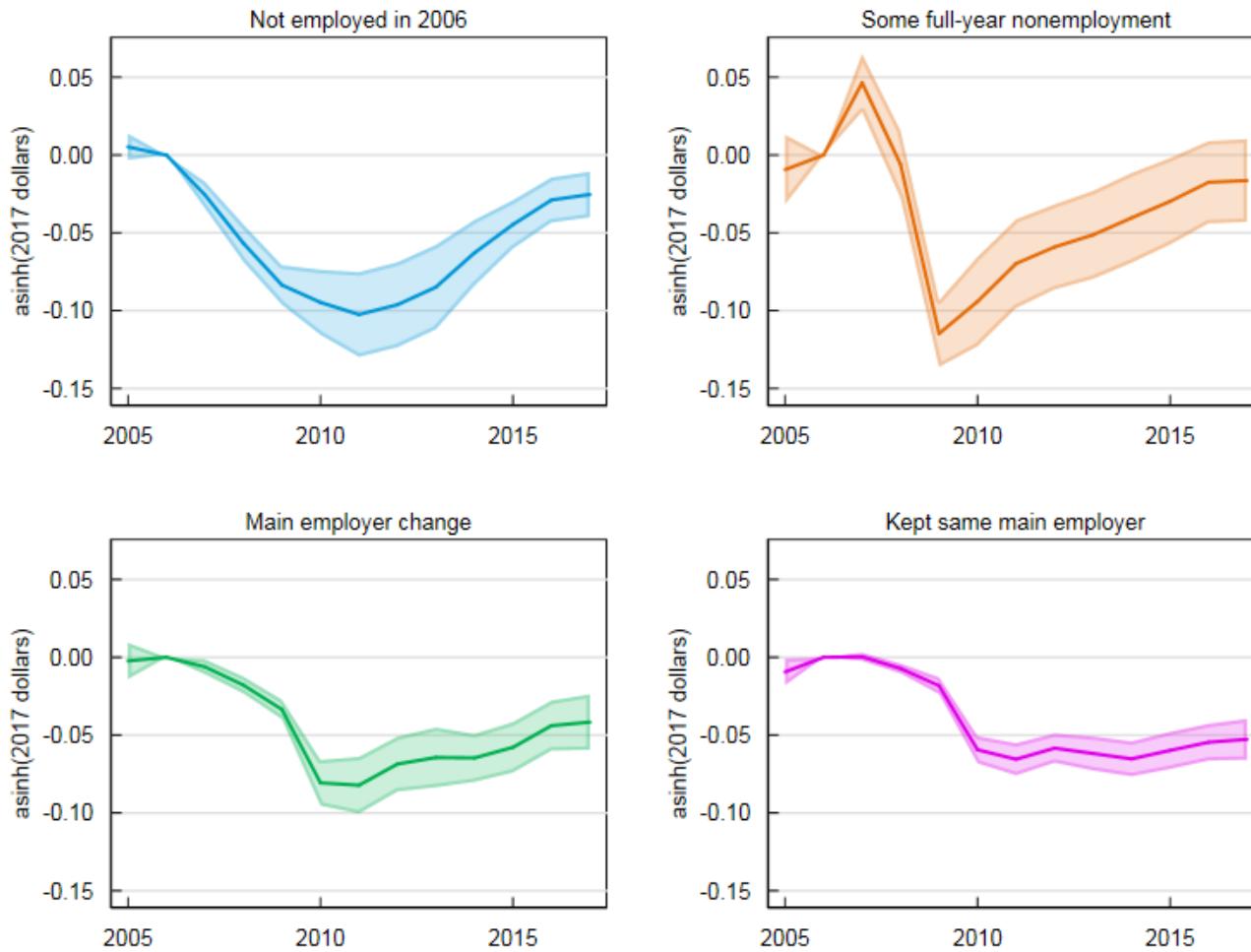
Figure B29: Effects of Local Unemployment Shocks on  $\text{asinh}(\text{Earnings})$ , by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

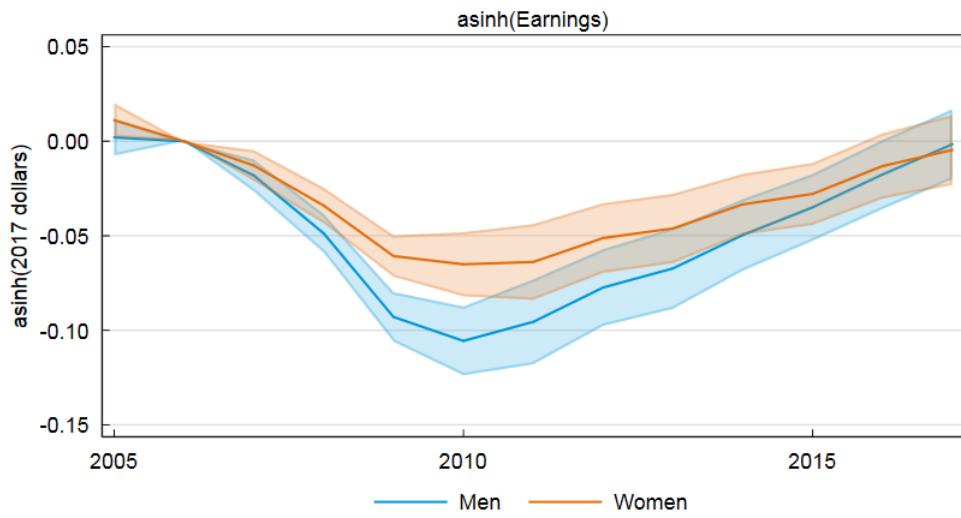
Figure B30: Effects of Local Unemployment Shocks on  $\text{asinh}(\text{Earnings})$ , by Displacement Status



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

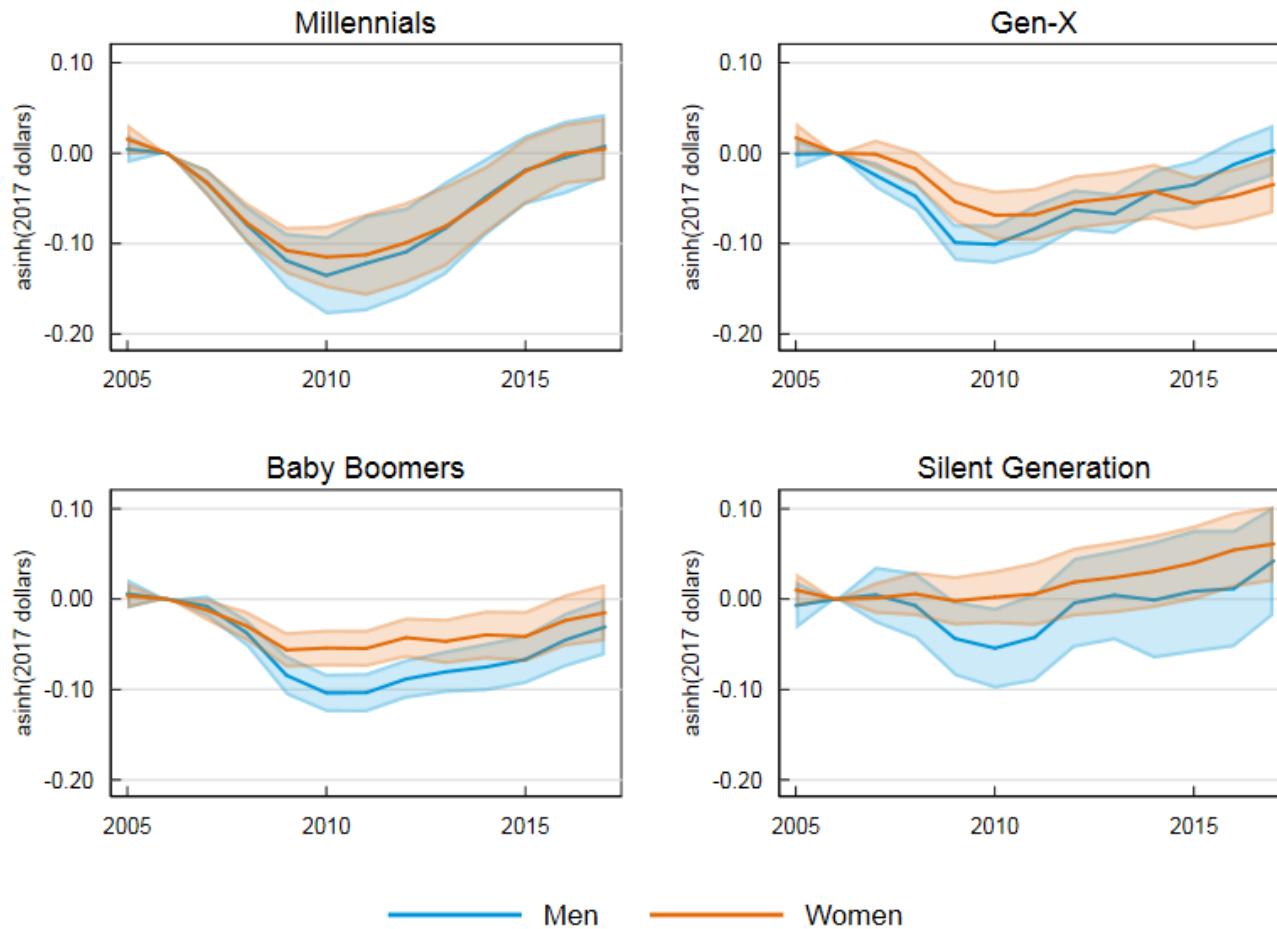
Figure B31: Effects of Local Unemployment Shocks on  $\text{asinh}(\text{Earnings})$ , by Gender



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

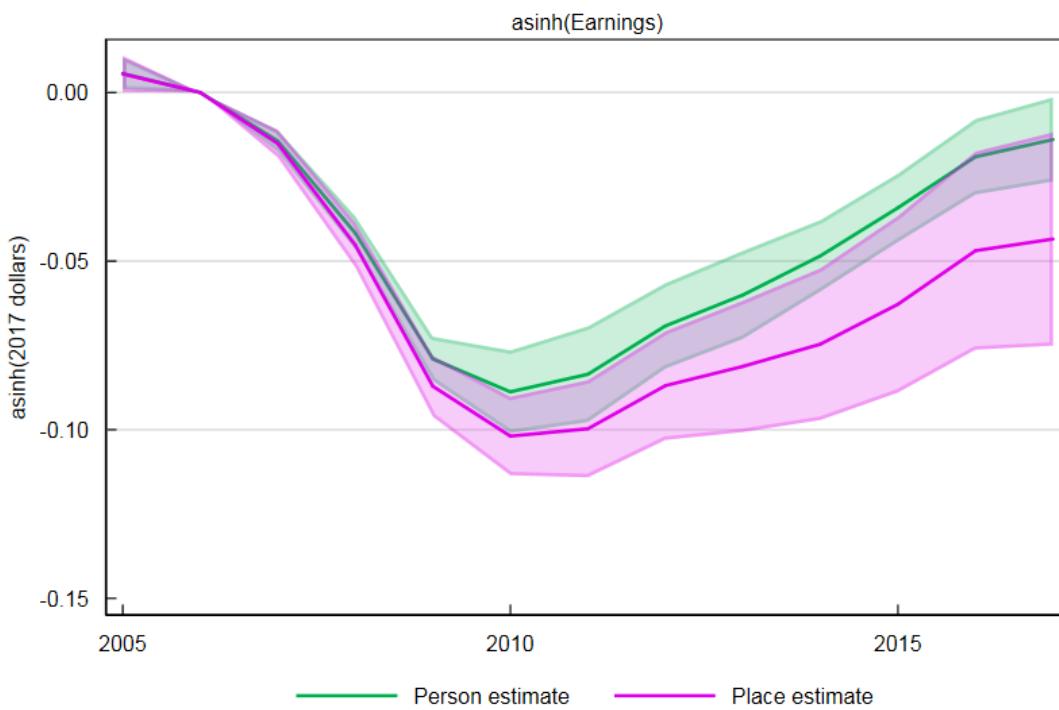
Figure B32: Effects of Local Unemployment Shocks on  $\text{asinh}(\text{Earnings})$ , by Gender and Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

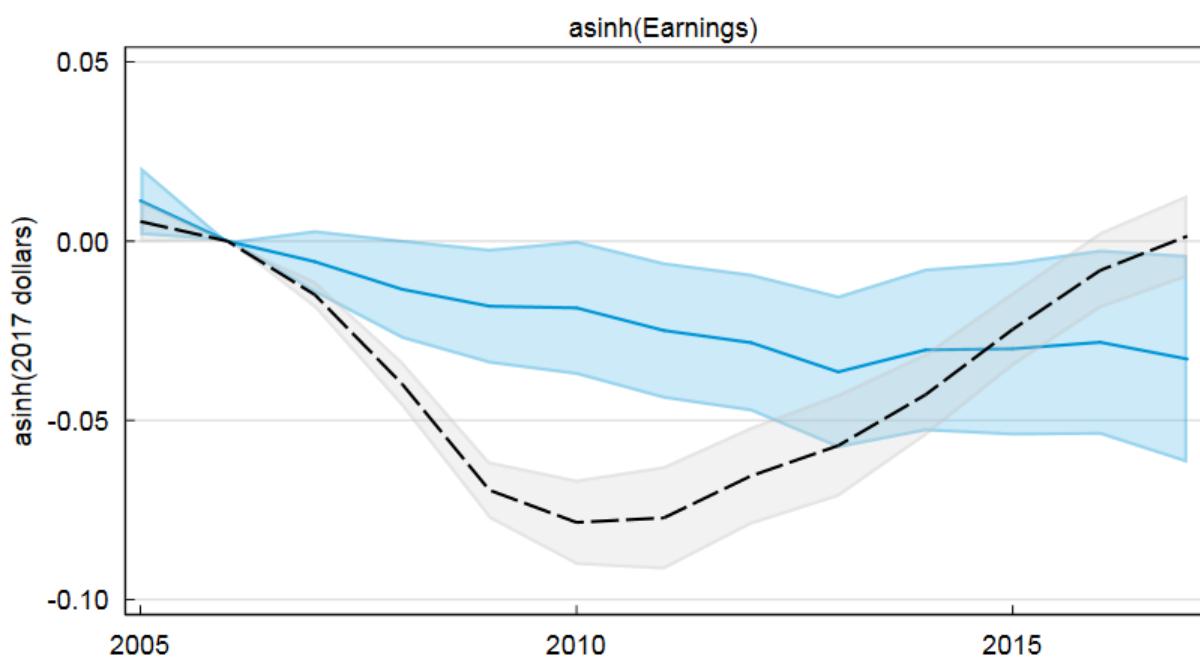
Figure B33: Person vs. Place Estimates,  $\text{asinh}(\text{Earnings})$ , 1928-1996 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

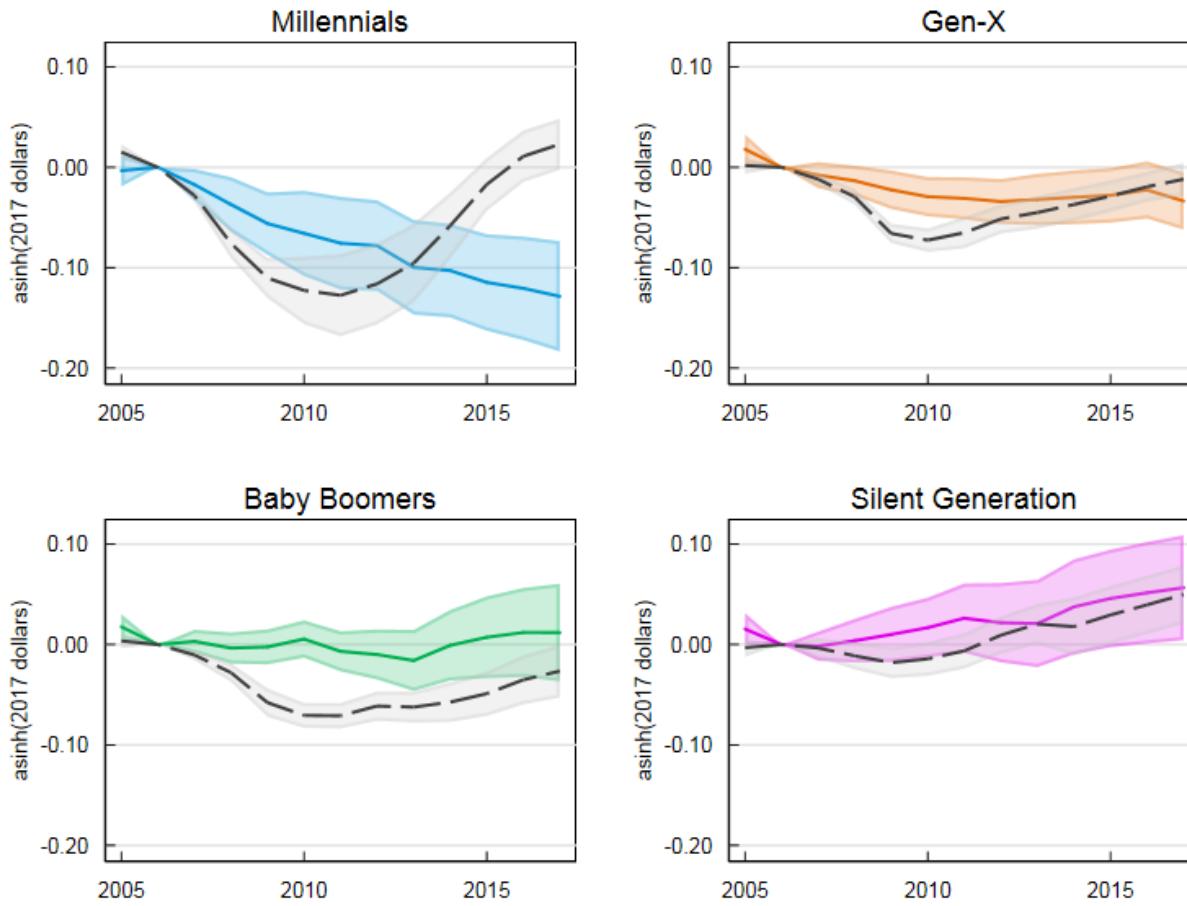
Figure B34: Effects of Local Concentration Shocks on  $\text{asinh}(\text{Earnings})$ , 1928-1996 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in solid blue are  $\beta$  coefficients as estimated in Equation A3. Dashed black lines are the effects of local unemployment shocks from this estimating equation (the  $\zeta$  coefficients), for reference. Shaded regions represent 95 percent confidence intervals.

Figure B35: Effects of Local Concentration Shocks on  $\text{asinh}(\text{Earnings})$ , by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted in solid blue are  $\beta$  coefficients as estimated in Equation A3. Dashed black lines are the effects of local unemployment shocks from this estimating equation (the  $\zeta$  coefficients), for reference. Shaded regions represent 95 percent confidence intervals.

## Appendix C Employer Quality

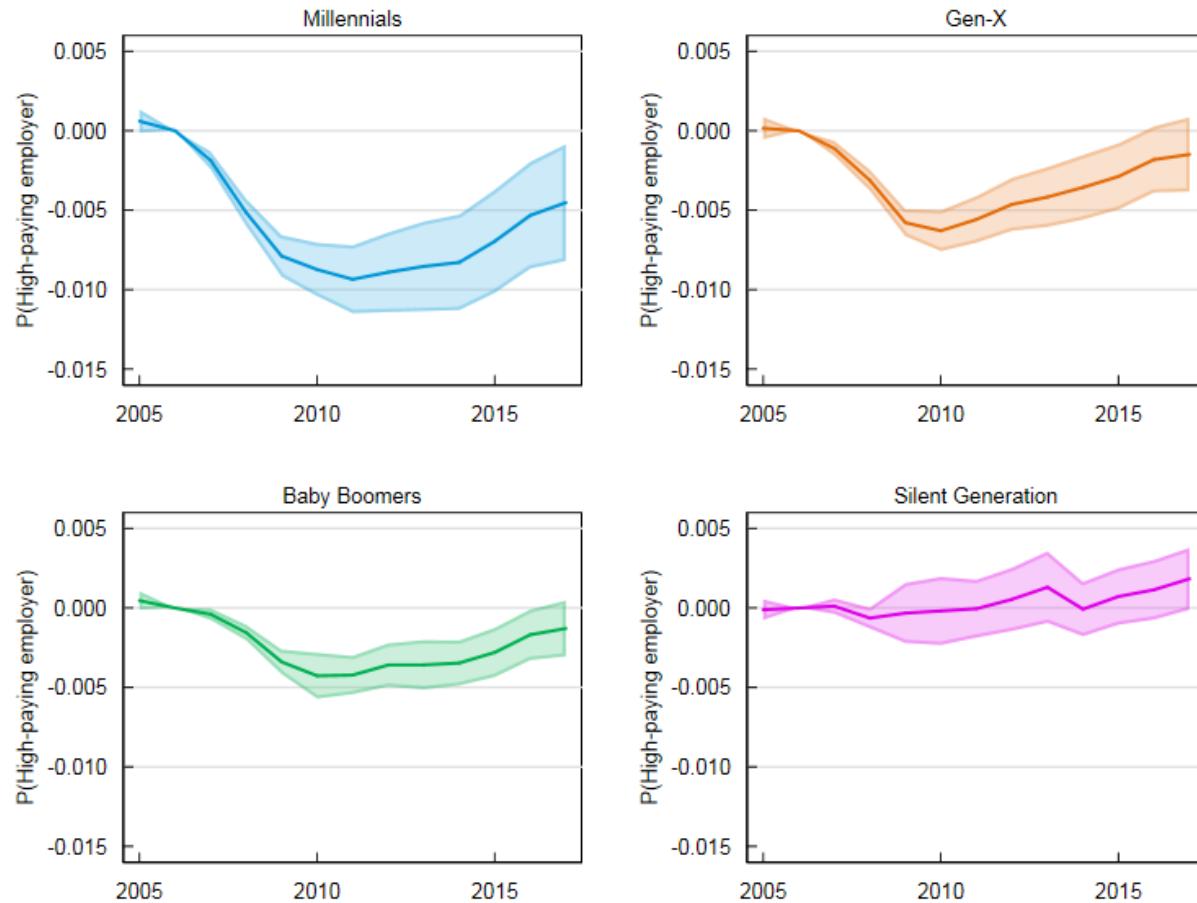
### C.1 Estimation Procedure

In order to measure firm quality, I use a procedure in the spirit of [Abowd et al. \(1999\)](#). I break the 2005-2017 period I consider into five sub-periods: pre-recession (2005-2006), recession (2007-2009), early recovery (2010-2012), middle recovery (2013-2015), and late recovery (2016-2017). Within each of those sub-periods, I then use the full set of W-2 data from which my sample is drawn to estimate regressions of earnings of person and firm fixed effects (technically, EIN fixed effects). I retain the firm fixed effects from these regressions and rank firms on them within sub-period. I then average these rankings within firms across sub-periods. Finally, I rank firms according to their average sub-period ranking. I use this final ranking to identify high-paying firms.

In the baseline analysis, firms in the top quartile of mean sub-period firm fixed effect ranking are considered high-paying. Other formulations, presented below, consider the top decile or top half of this ranking to be high-paying firms, or use the ranking itself as the outcome. When the ranking is used as the dependent variable, I produce estimates that use it directly, excluding employee-years of firms that could not have a fixed effect estimated, as well as estimates that incorporate those observations by assigning either zero or the mean ranking to firms that could not be ranked. All formulations of this firm quality analysis tell a similar story: younger workers' likelihood of working at high-paying firms has been more persistently negatively affected by exposure to local unemployment shocks than has older workers'.

### C.2 Additional Estimates

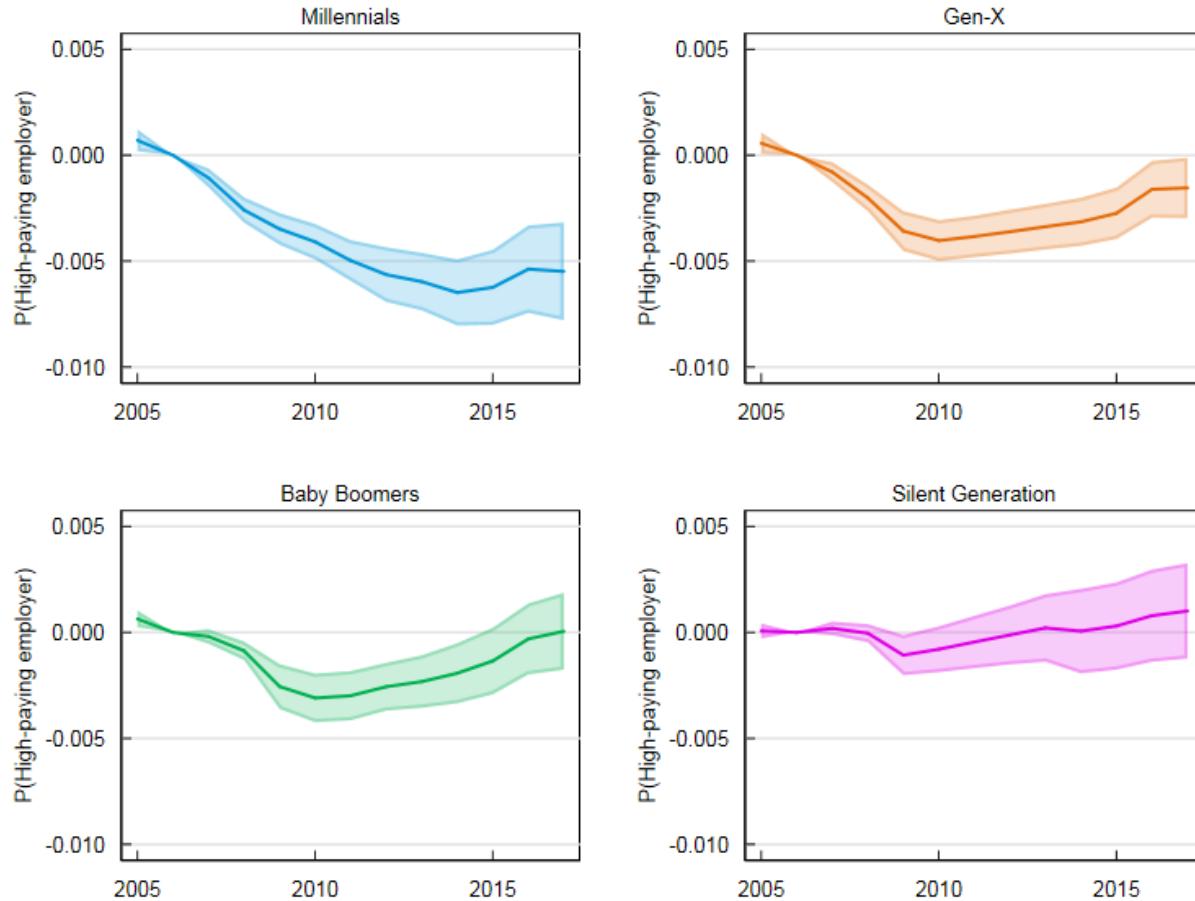
Figure C1: Effects of Local Unemployment Shocks on Probability of Working for a High-Paying Employer (Above Median), by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure C2: Effects of Local Unemployment Shocks on Probability of Working for a High-Paying Employer (Top Decile), by Generation

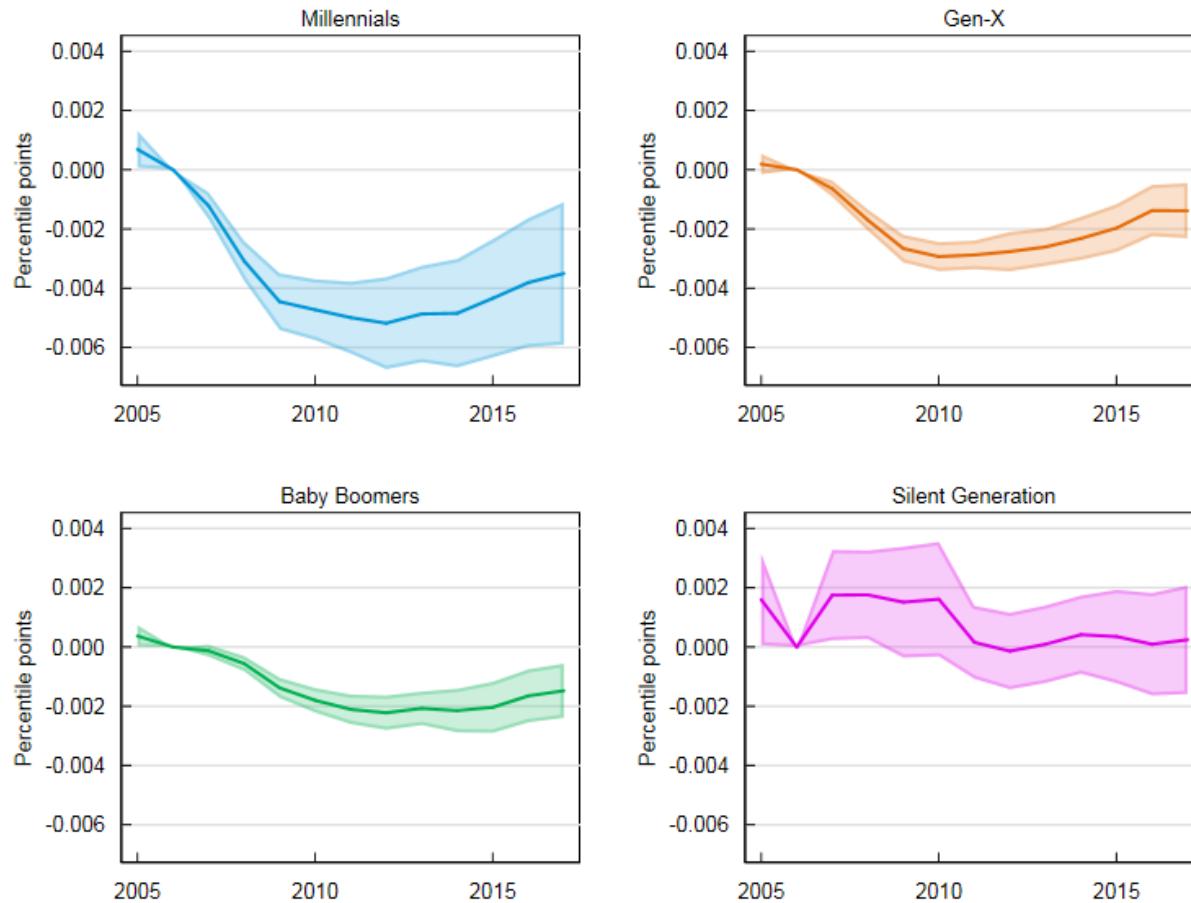


69

Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

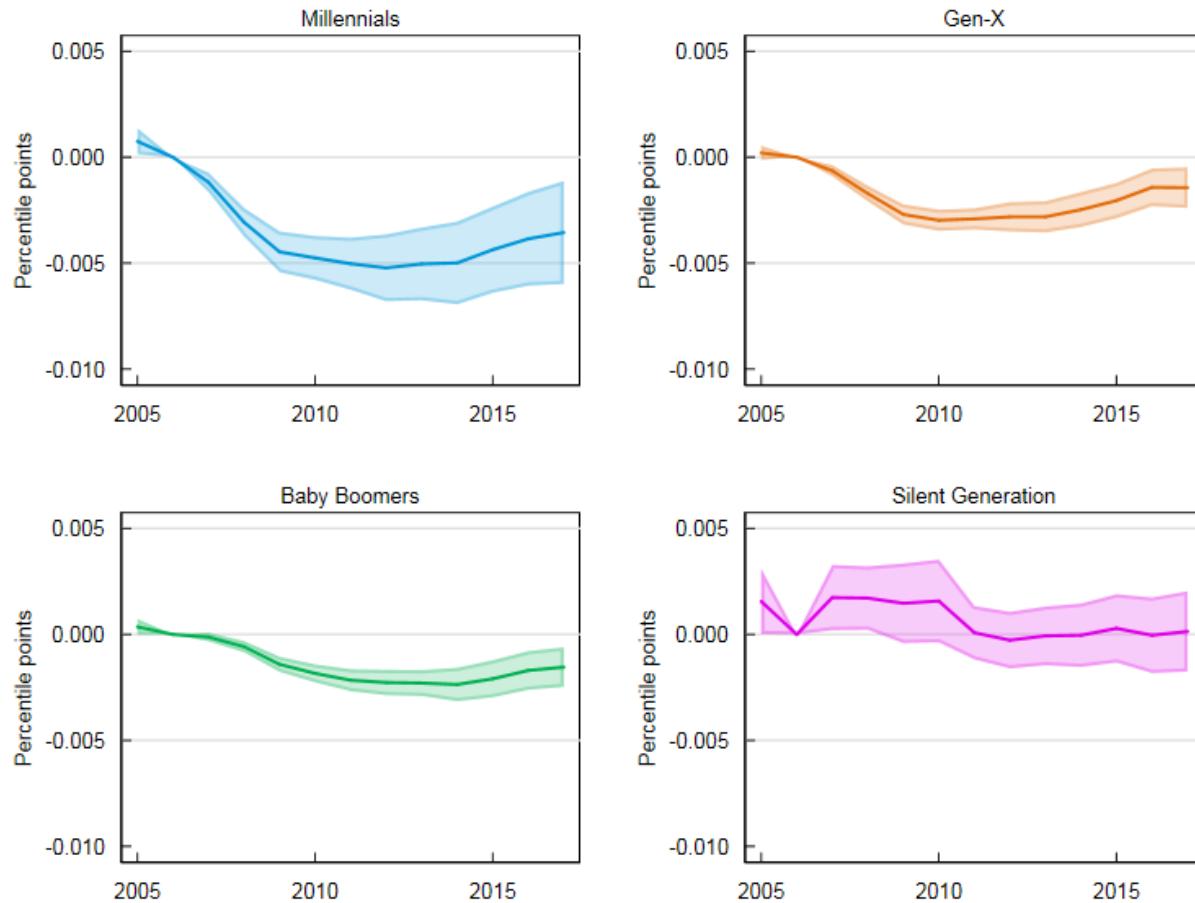
Figure C3: Effects of Local Unemployment Shocks on Employer Quality (Employer Pay Percentile, No Adjustment), by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

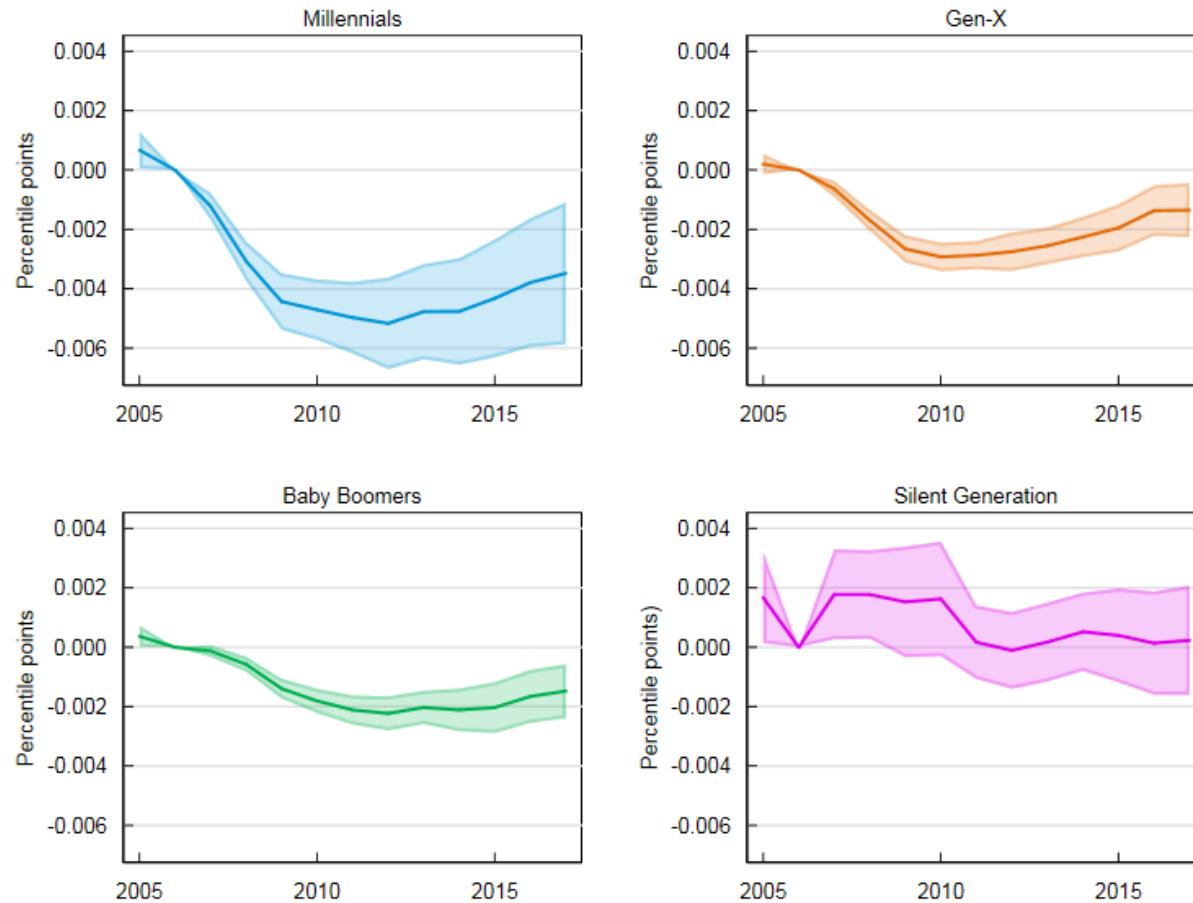
Figure C4: Effects of Local Unemployment Shocks on Employer Quality (Employer Pay Percentile, No Estimate = 0), by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

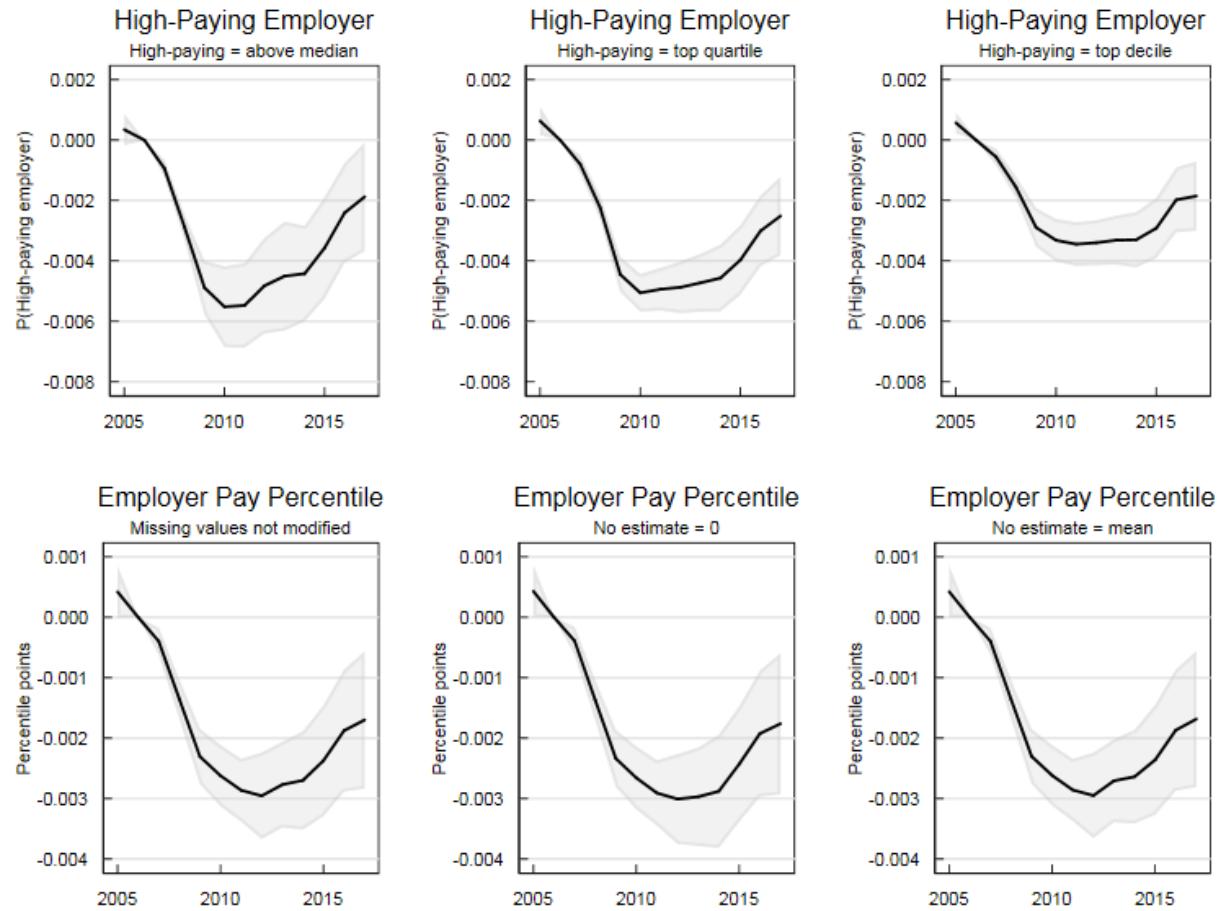
Figure C5: Effects of Local Unemployment Shocks on Employer Quality (Employer Pay Percentile, No Estimate = Mean), by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure C6: Effects of Local Unemployment Shocks on Employer Quality All MEasures, Full Sample

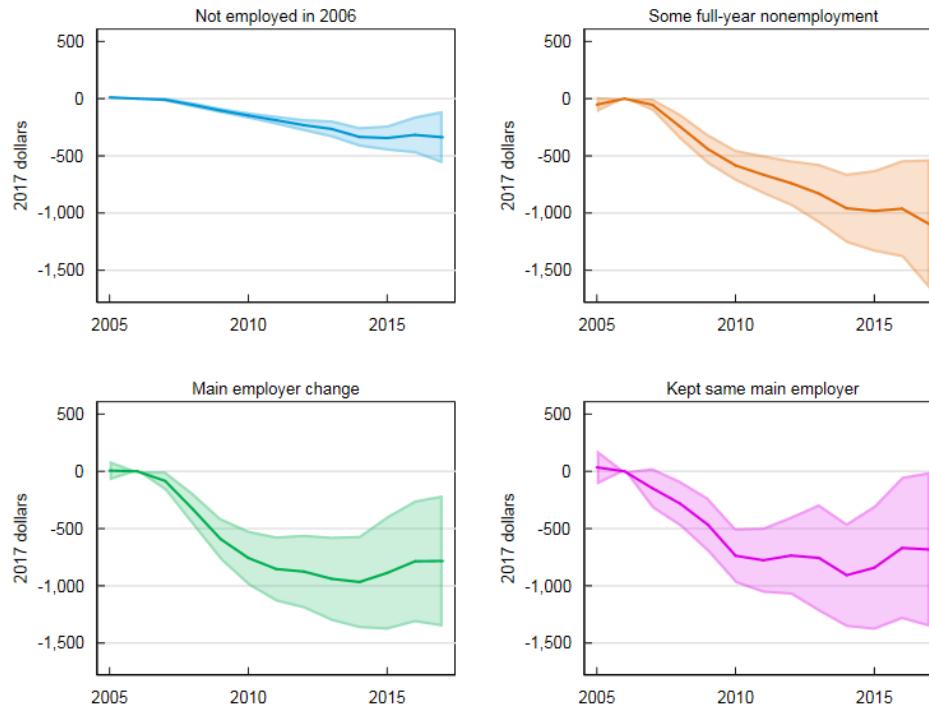


Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-500.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

## Appendix D Displacement Status Estimates by Generation

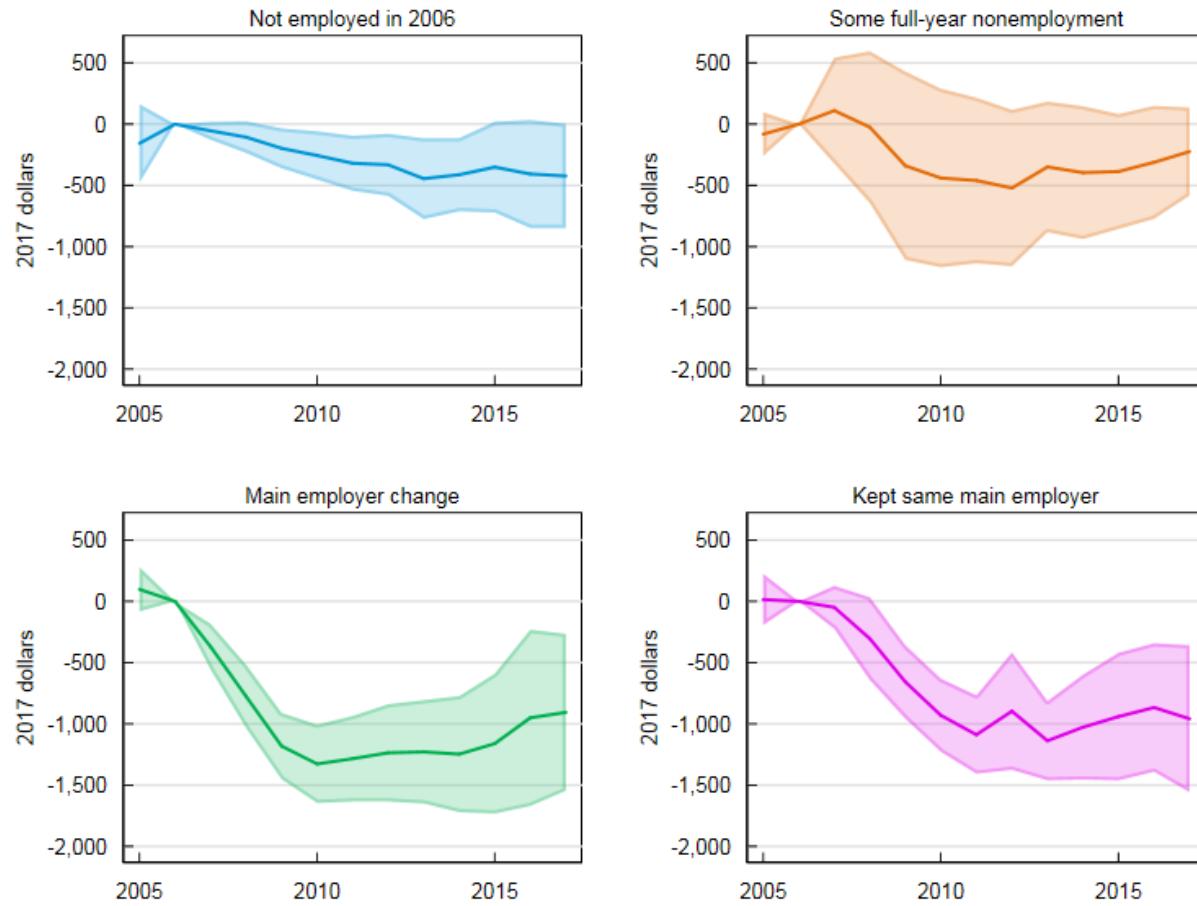
Figure D1: Effects of Local Unemployment Shocks on Earnings, by Displacement Status, Millennials



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure D2: Effects of Local Unemployment Shocks on Earnings, by Displacement Status, Generation X



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure D3: Effects of Local Unemployment Shocks on Earnings, by Displacement Status, Baby Boomers



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

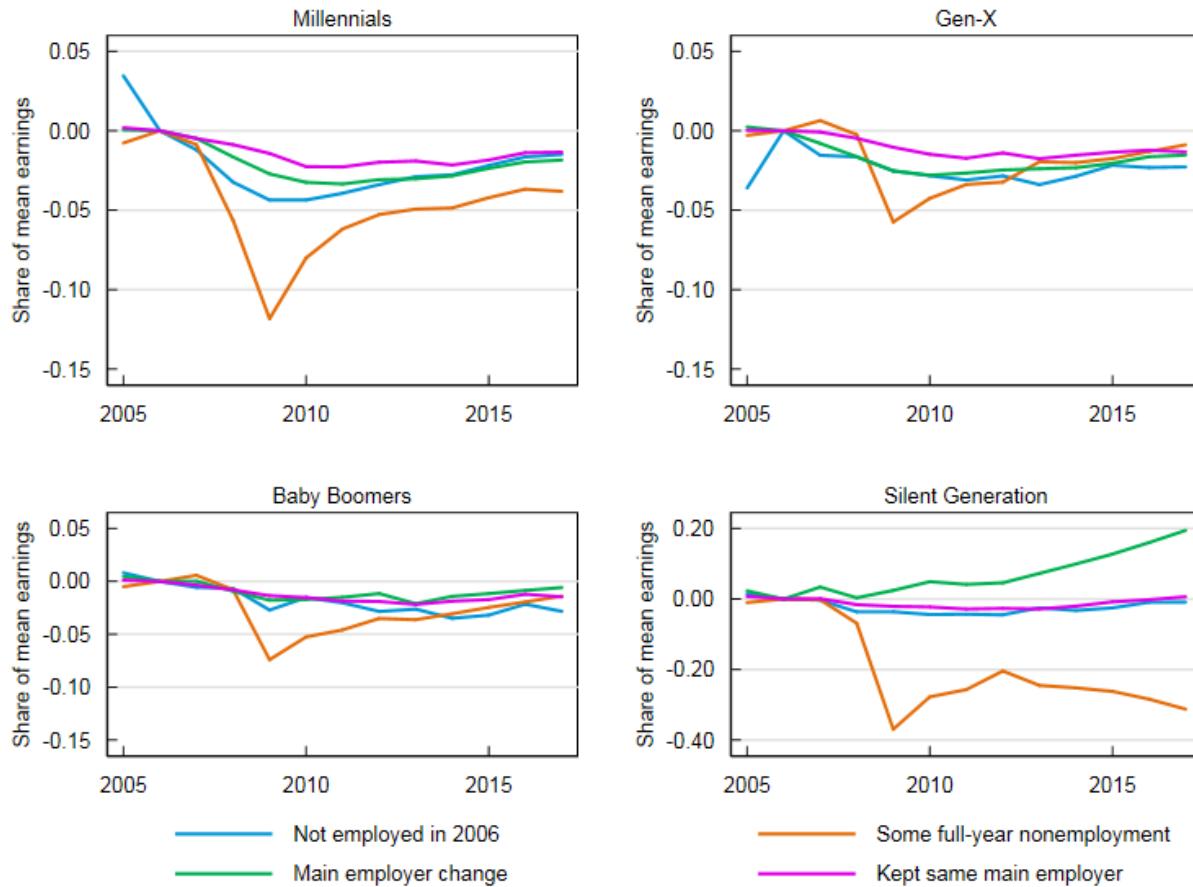
Figure D4: Effects of Local Unemployment Shocks on Earnings, by Displacement Status, Silent Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure D5: Effects of Local Unemployment Shocks on Earnings, by Displacement Status, Coefficient as Share of Mean Earnings



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

Figure D6: Effects of Local Unemployment Shocks on Earnings, by Displacement Status, Effect of Average Shock as Share of Mean Earnings



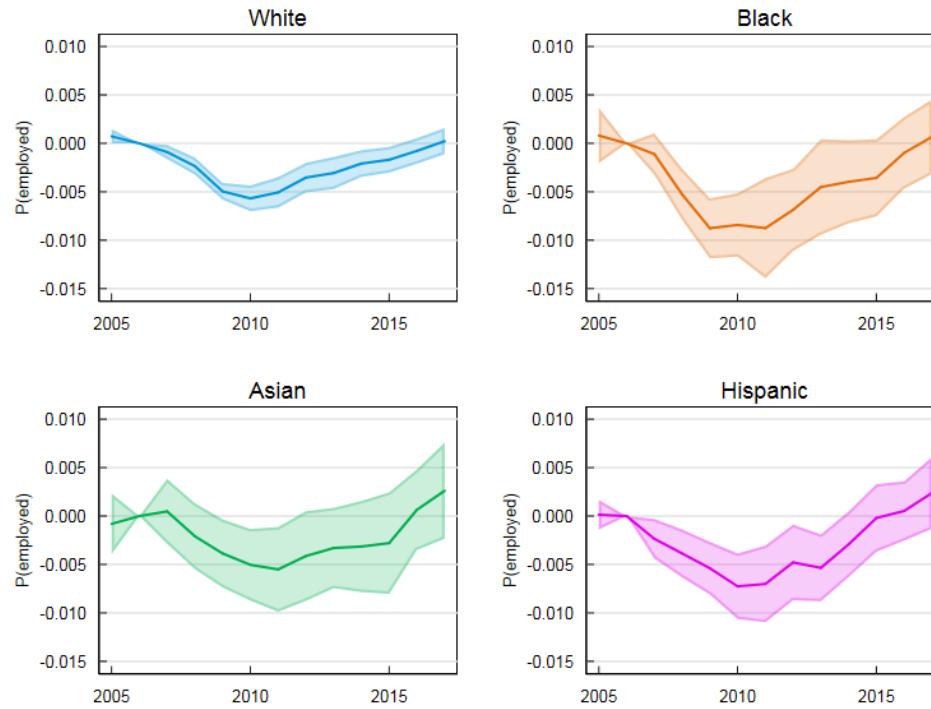
62

Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

## Appendix E Race Estimates

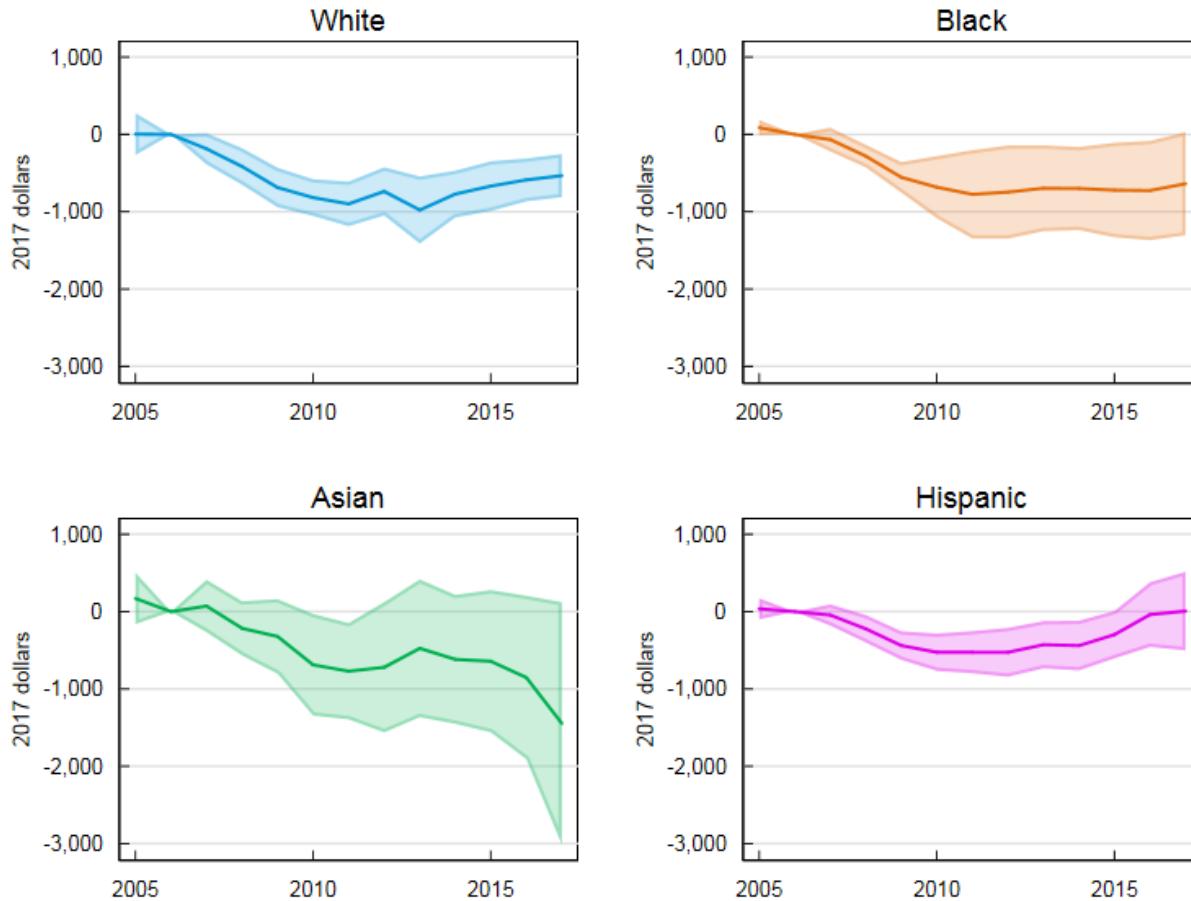
Figure E1: Effects of Local Unemployment Shocks on Employment, by Race



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure E2: Effects of Local Unemployment Shocks on Earnings, by Race

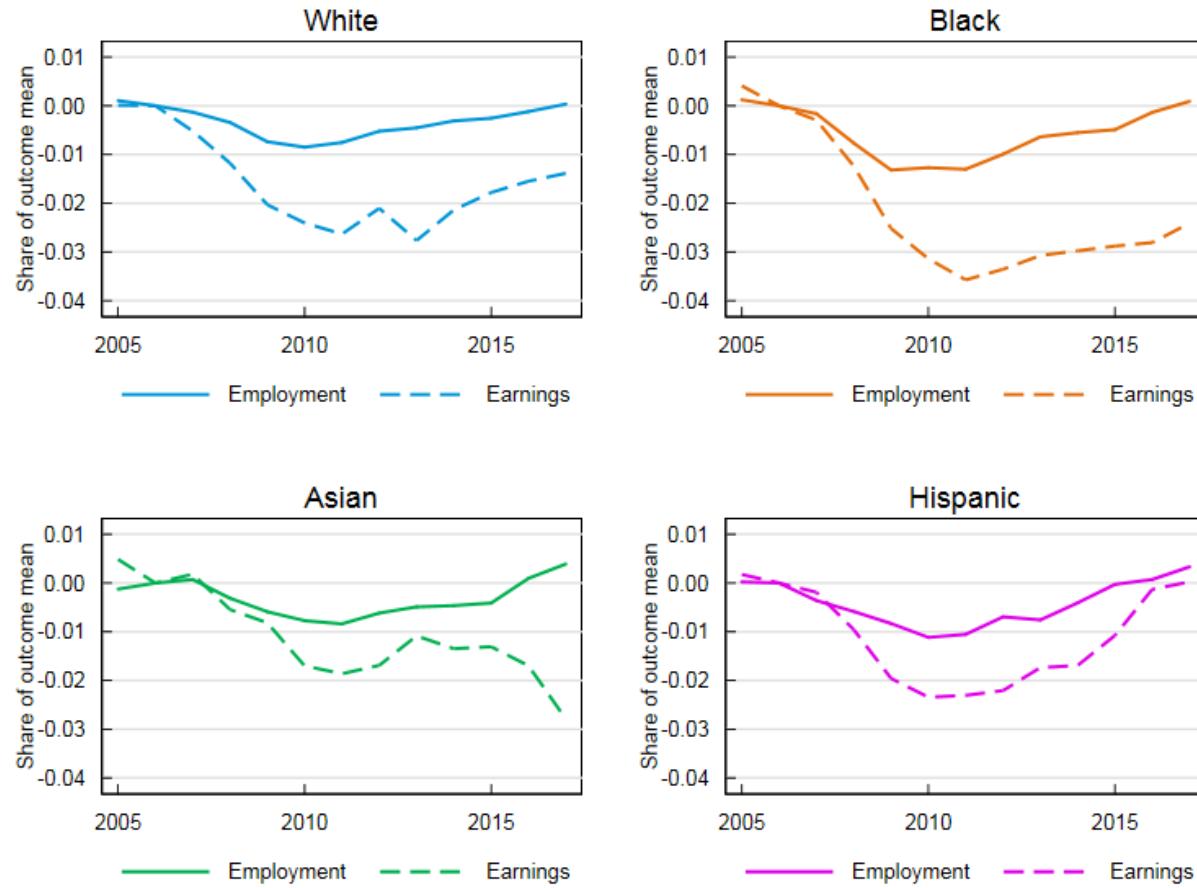


18

Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure E3: Effects of Local Unemployment Shocks on Earnings, Coefficients as Share of Mean Earnings, by Race

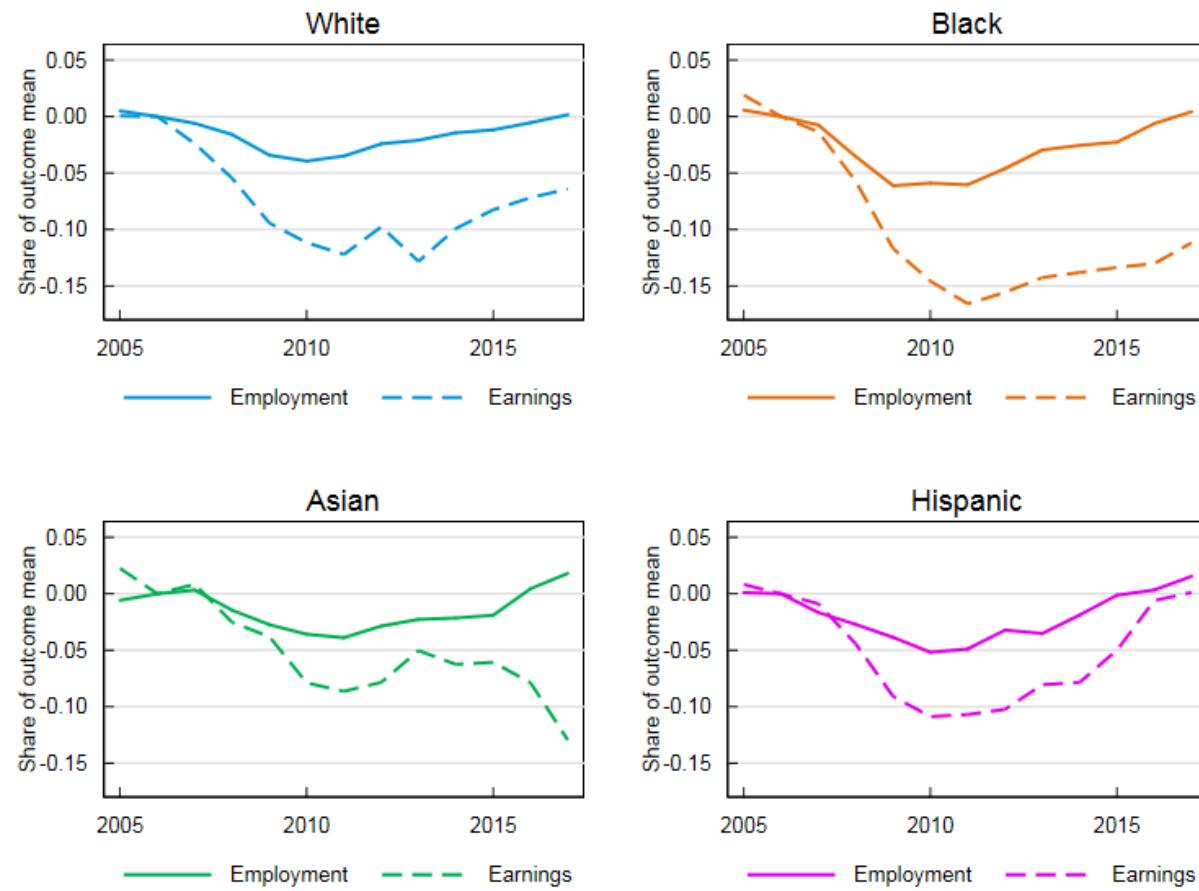


78

Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

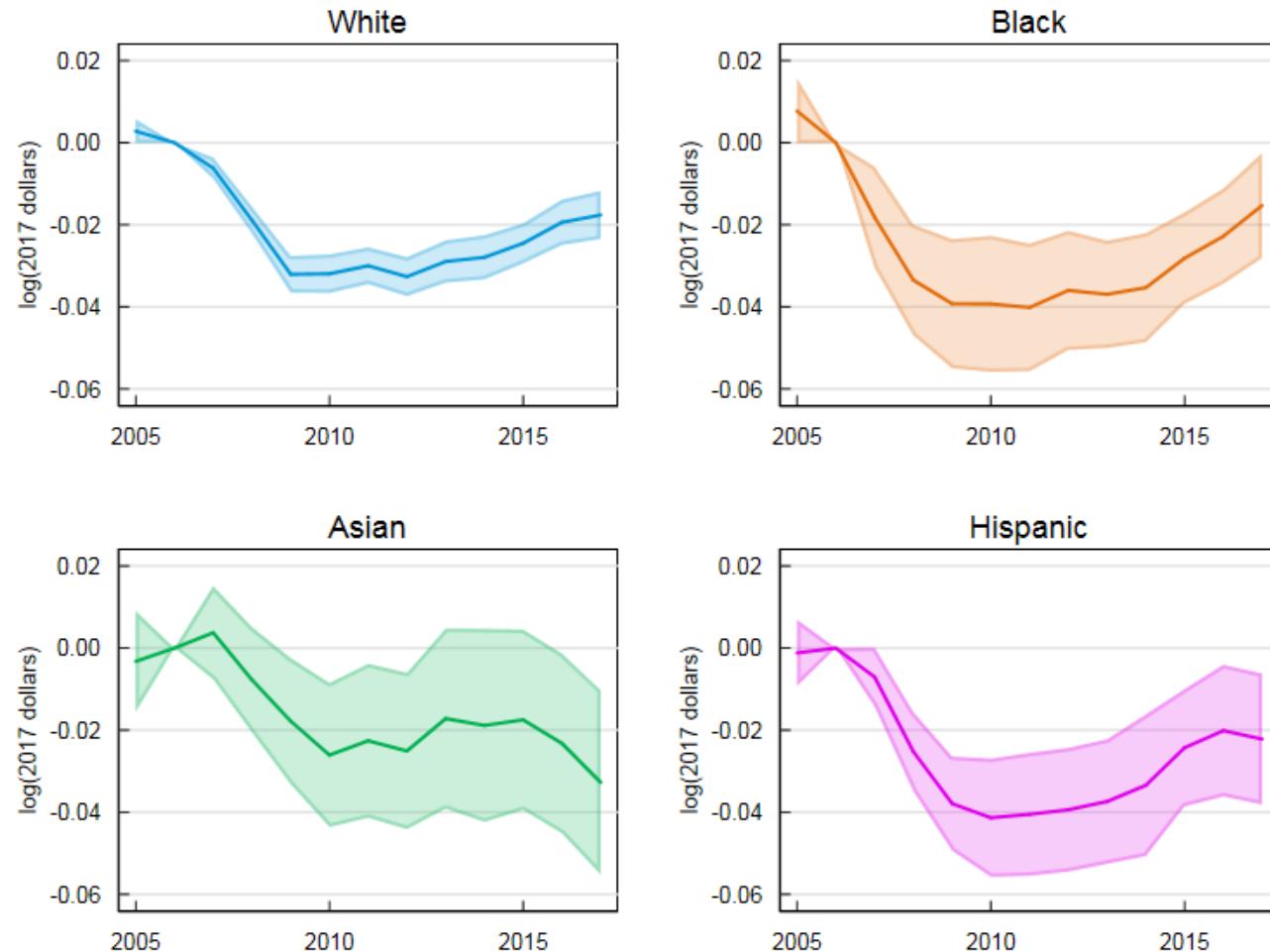
Figure E4: Effects of Local Unemployment Shocks on Earnings, Effects of Average Shock as Share of Mean Earnings, by Race



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

Figure E5: Effects of Local Unemployment Shocks on Log Earnings, by Race

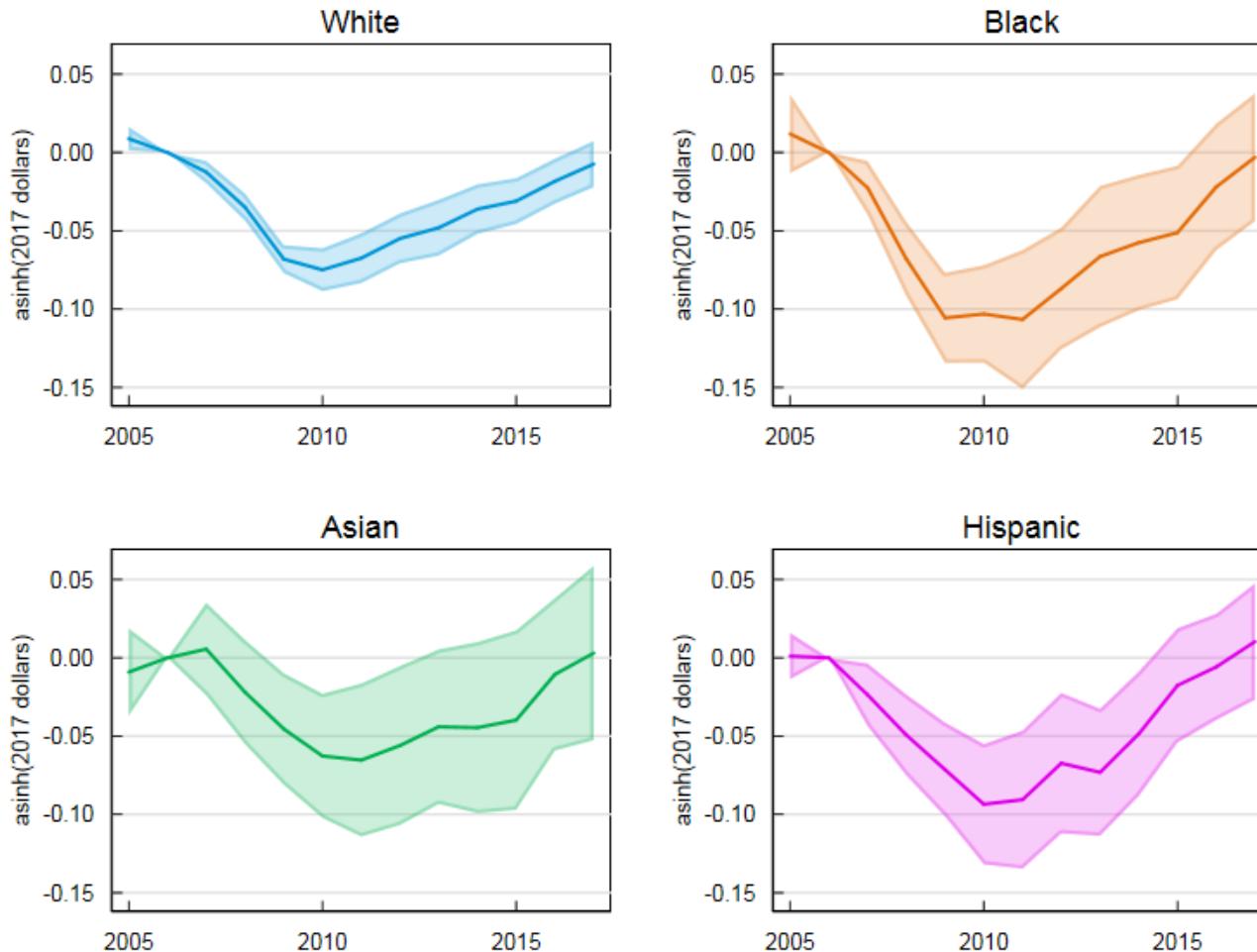


18

Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

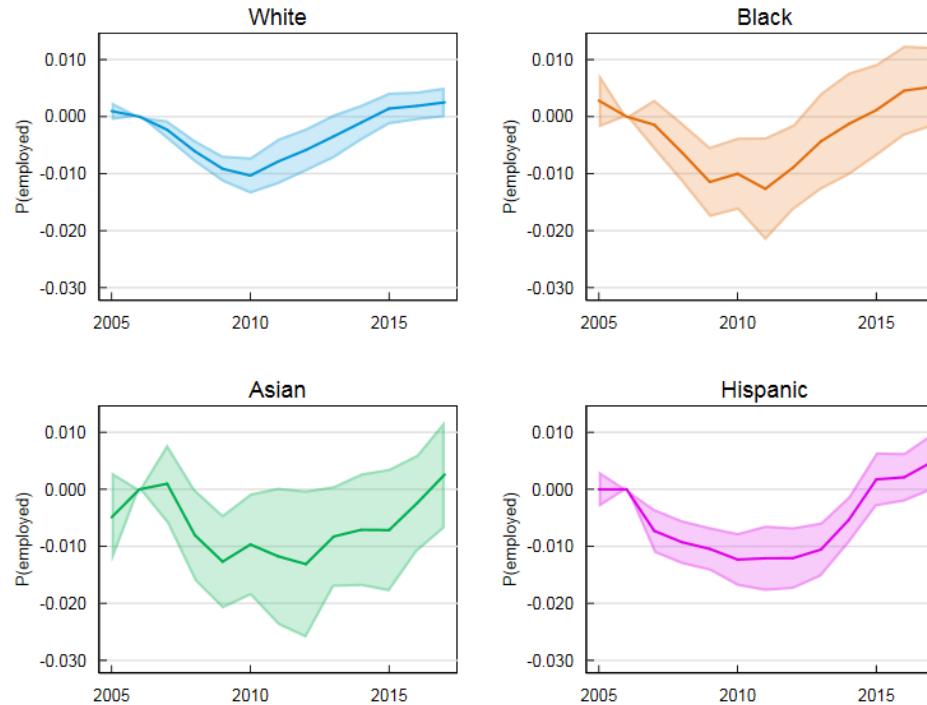
Figure E6: Effects of Local Unemployment Shocks on  $\text{asinh}(\text{Earnings})$ , by Race



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

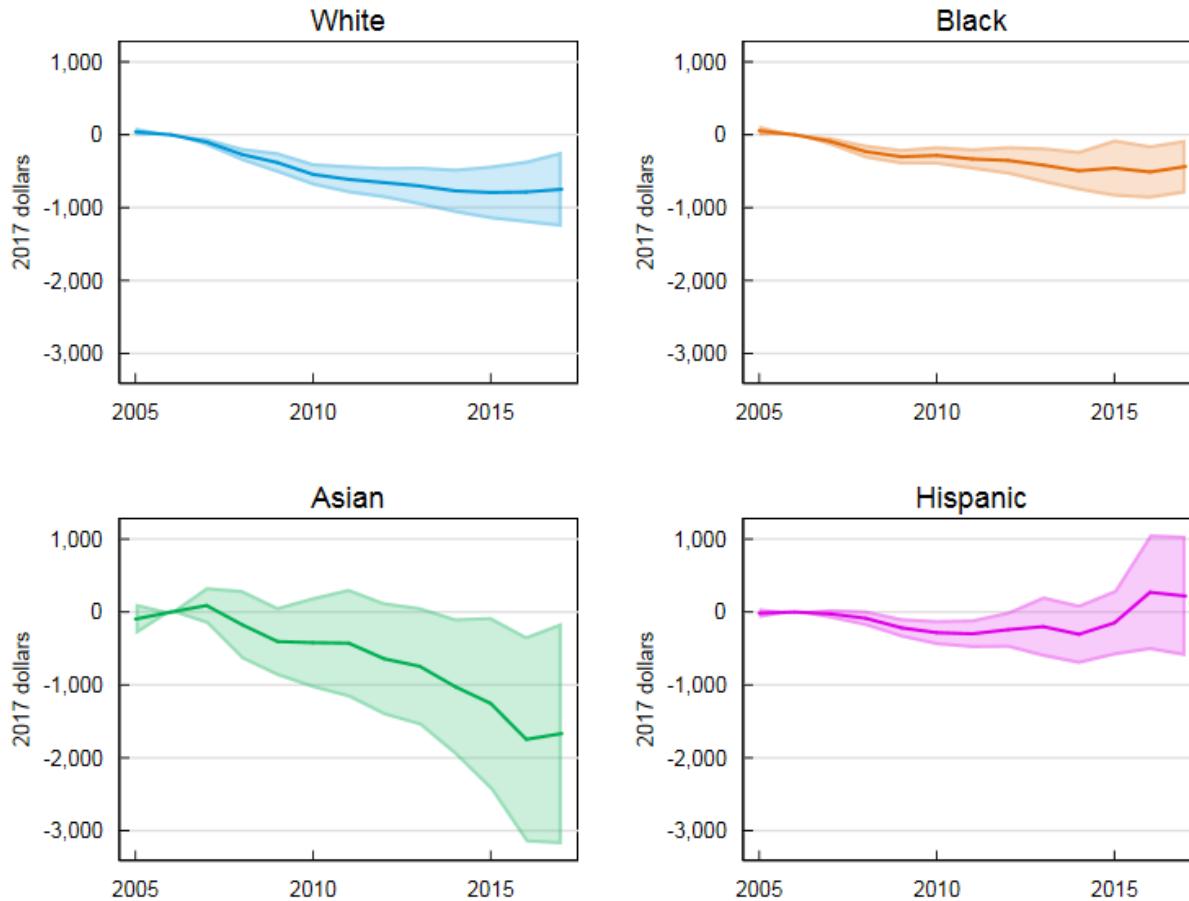
Figure E7: Effects of Local Unemployment Shocks on Employment, by Race, Millennials



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

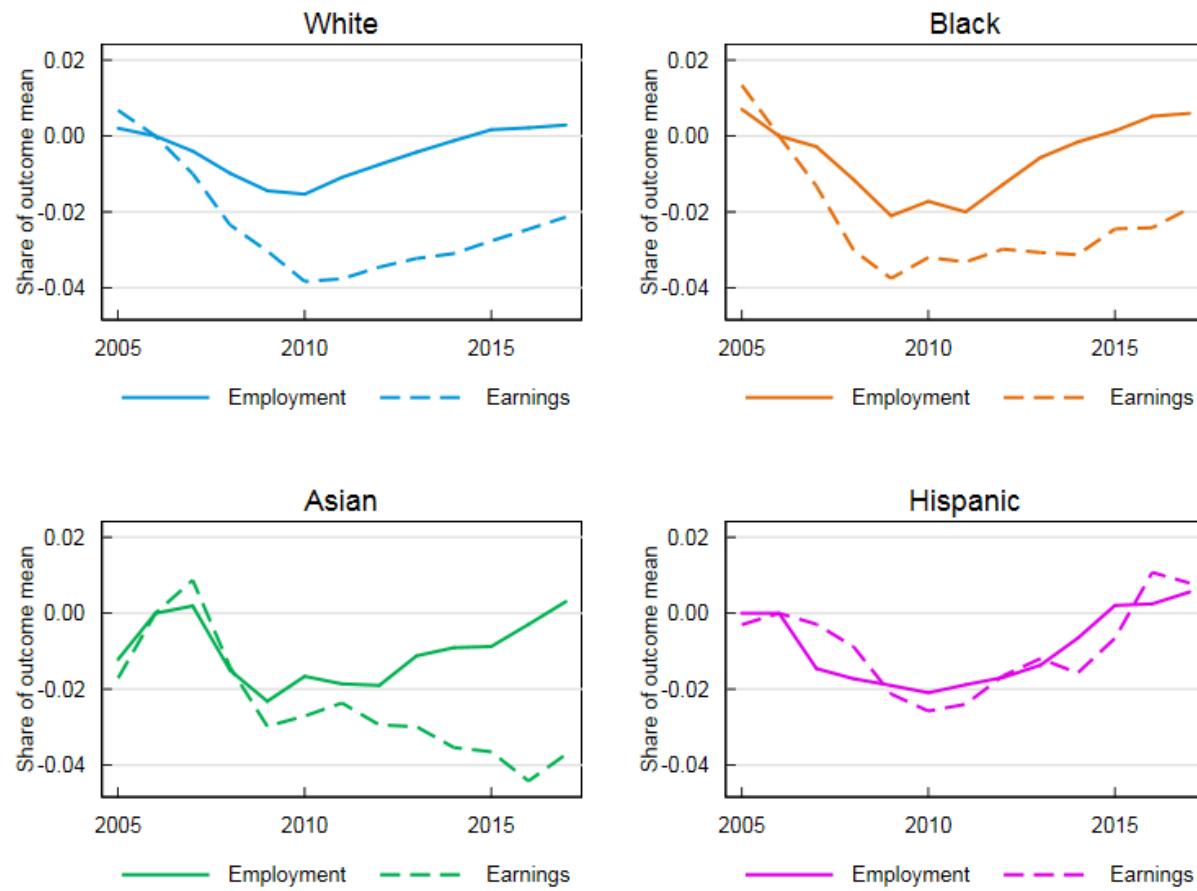
Figure E8: Effects of Local Unemployment Shocks on Earnings, by Race, Millennials



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

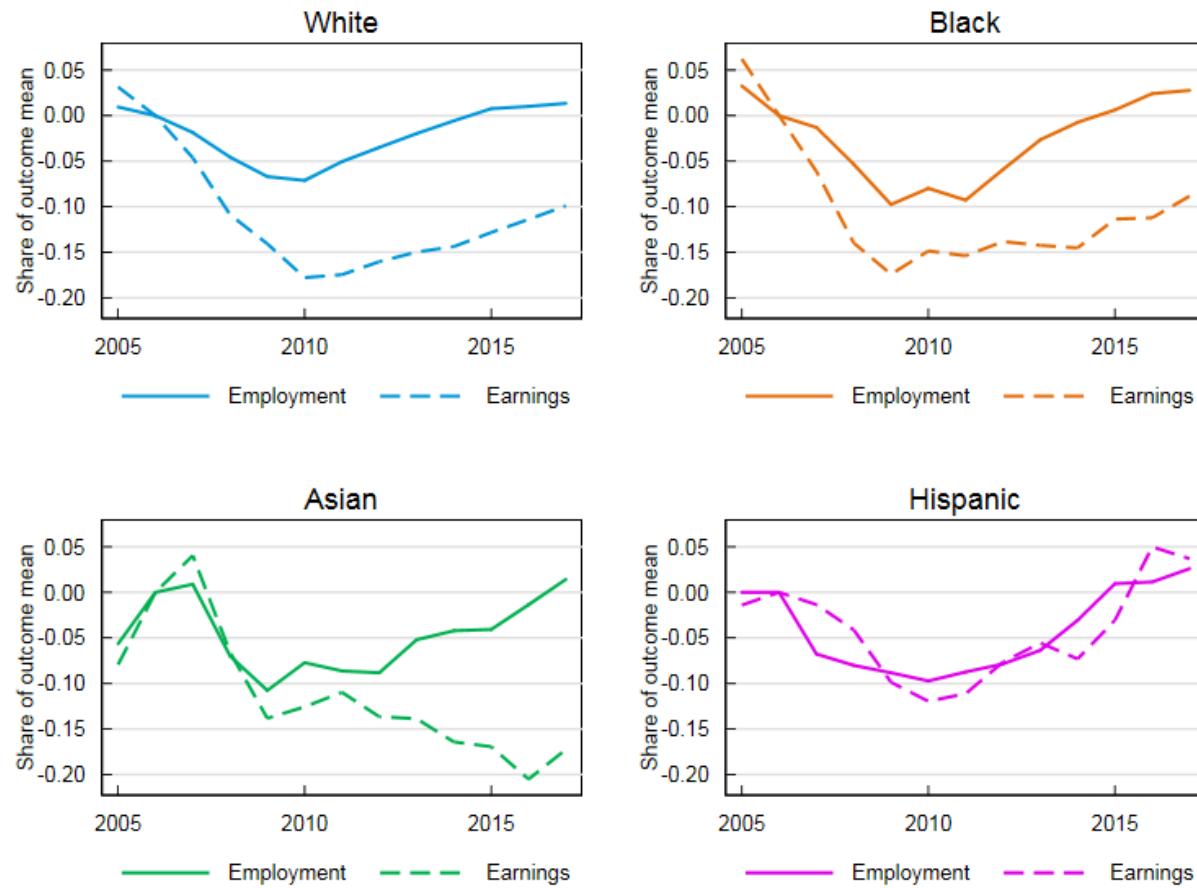
Figure E9: Effects of Local Unemployment Shocks on Employment and Earnings, Coefficients as Share of Outcome Mean, by Race, Millennials



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

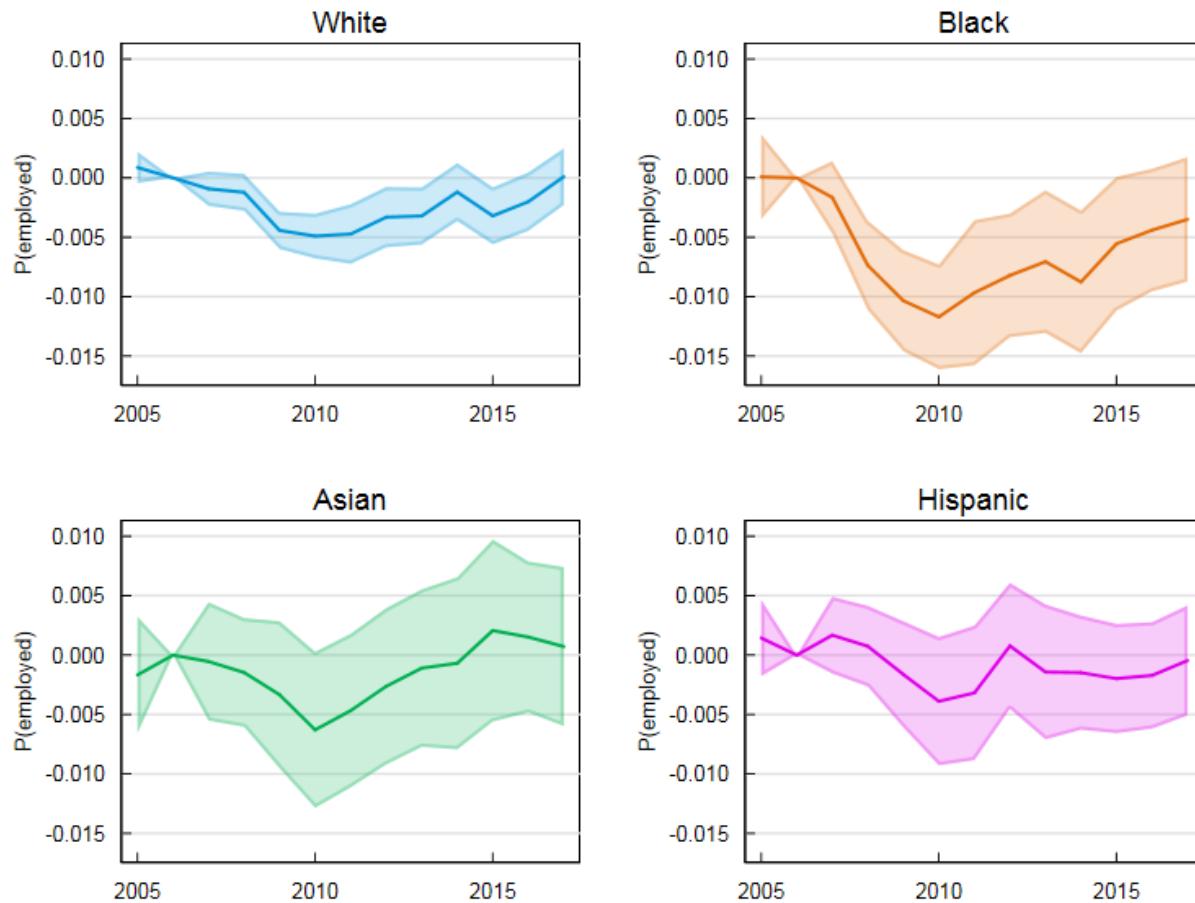
Figure E10: Effects of Local Unemployment Shocks on Employment and Earnings, Effects of Average Shock as Share of Outcome Mean, by Race, Millennials



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

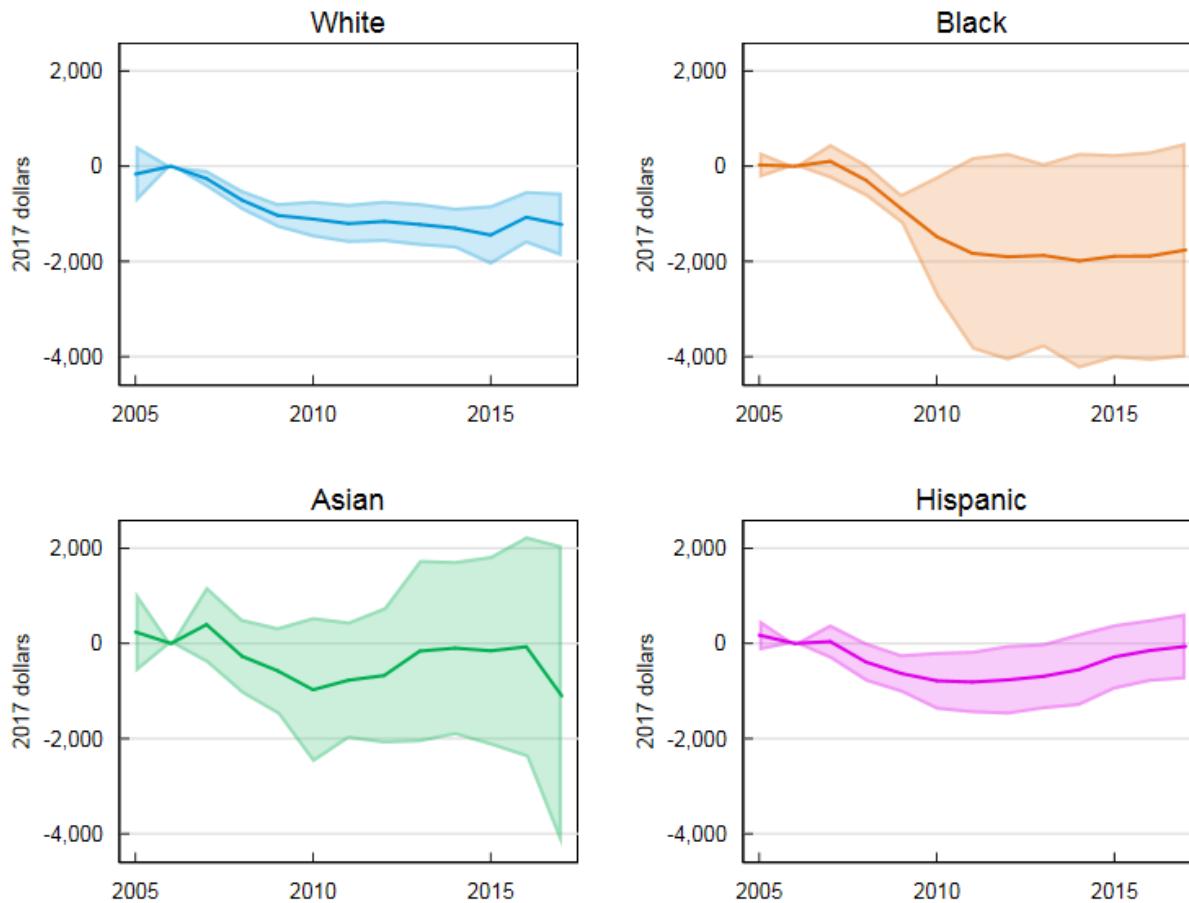
Figure E11: Effects of Local Unemployment Shocks on Employment, by Race, Generation X



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

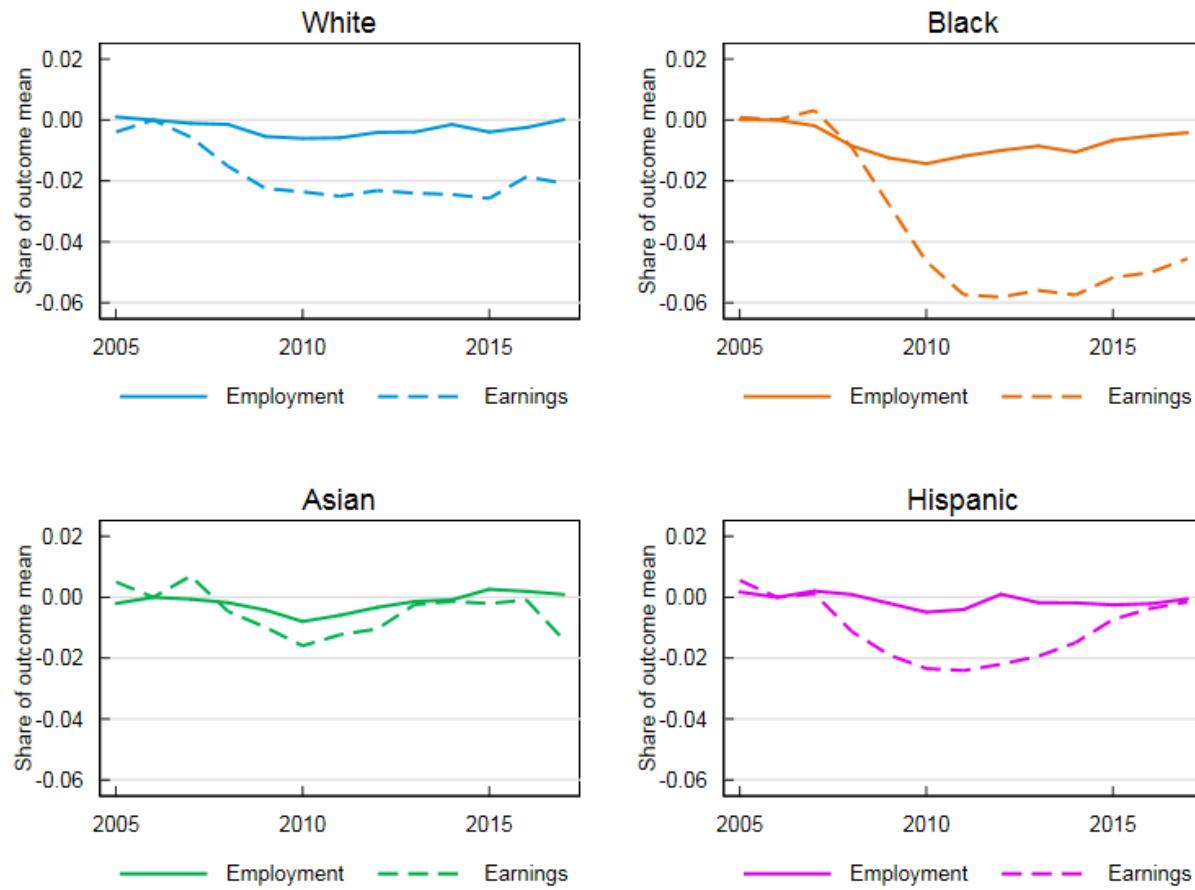
Figure E12: Effects of Local Unemployment Shocks on Earnings, by Race, Generation X



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-431.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

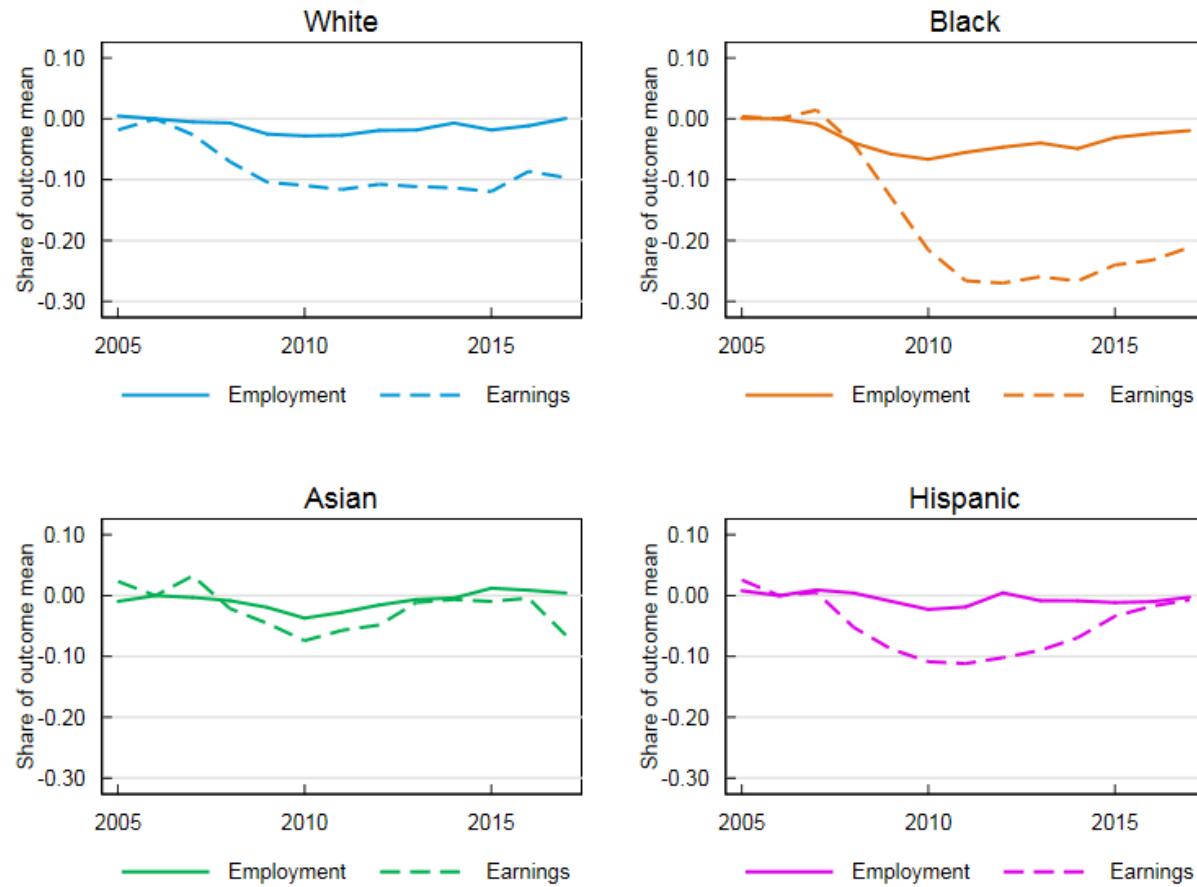
Figure E13: Effects of Local Unemployment Shocks on Employment and Earnings, Coefficients as Share of Outcome Mean, by Race, Generation X



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

Figure E14: Effects of Local Unemployment Shocks on Employment and Earnings, Effects of Average Shock as Share of Outcome Mean, by Race, Generation X

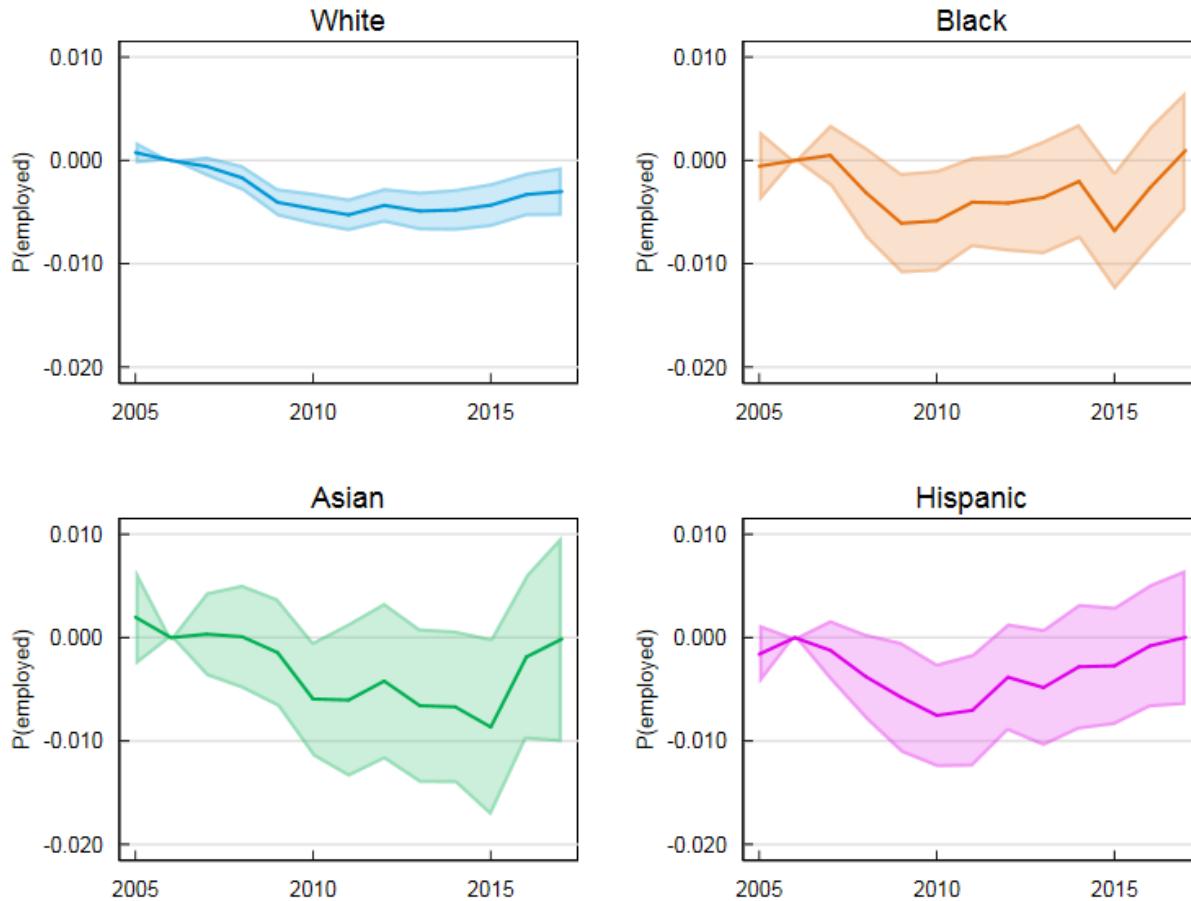


93

Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

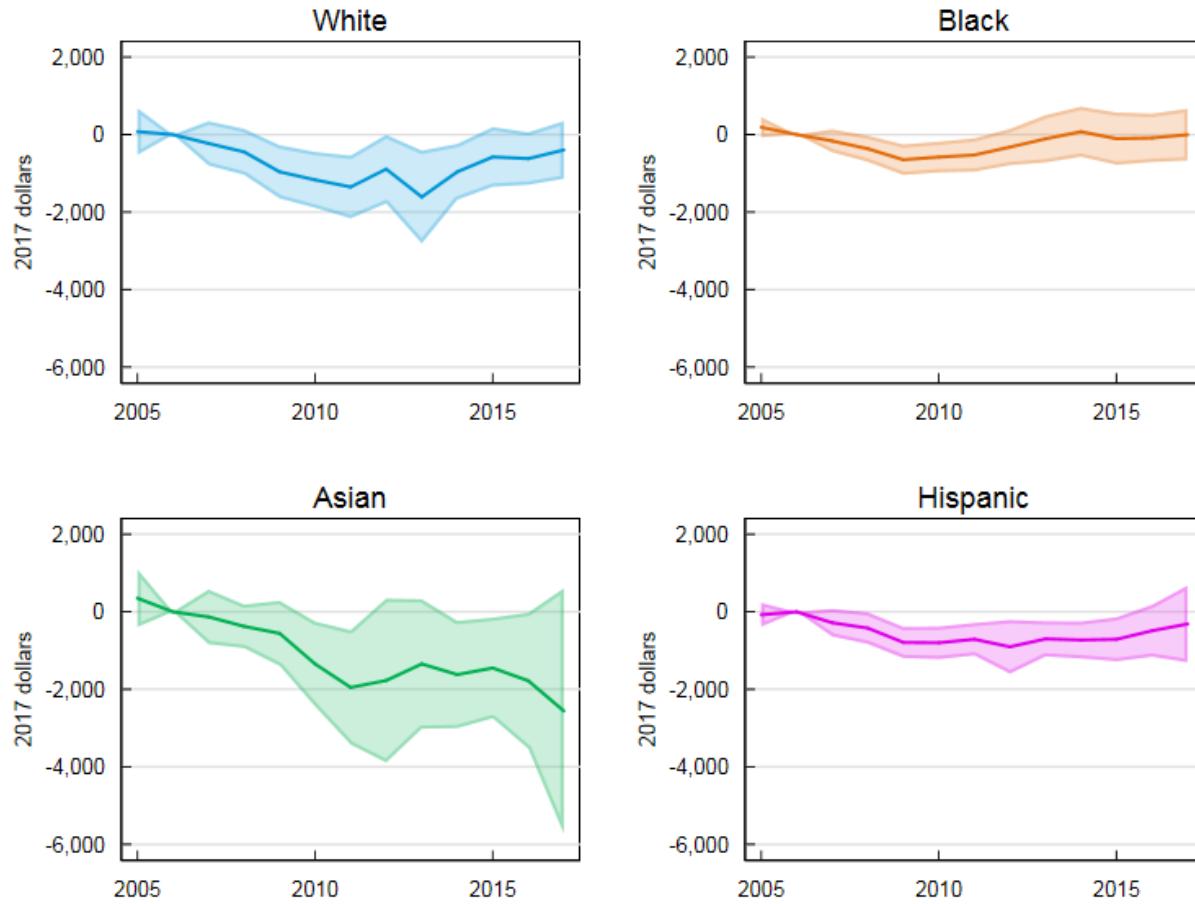
Figure E15: Effects of Local Unemployment Shocks on Employment, by Race, Baby Boomers



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

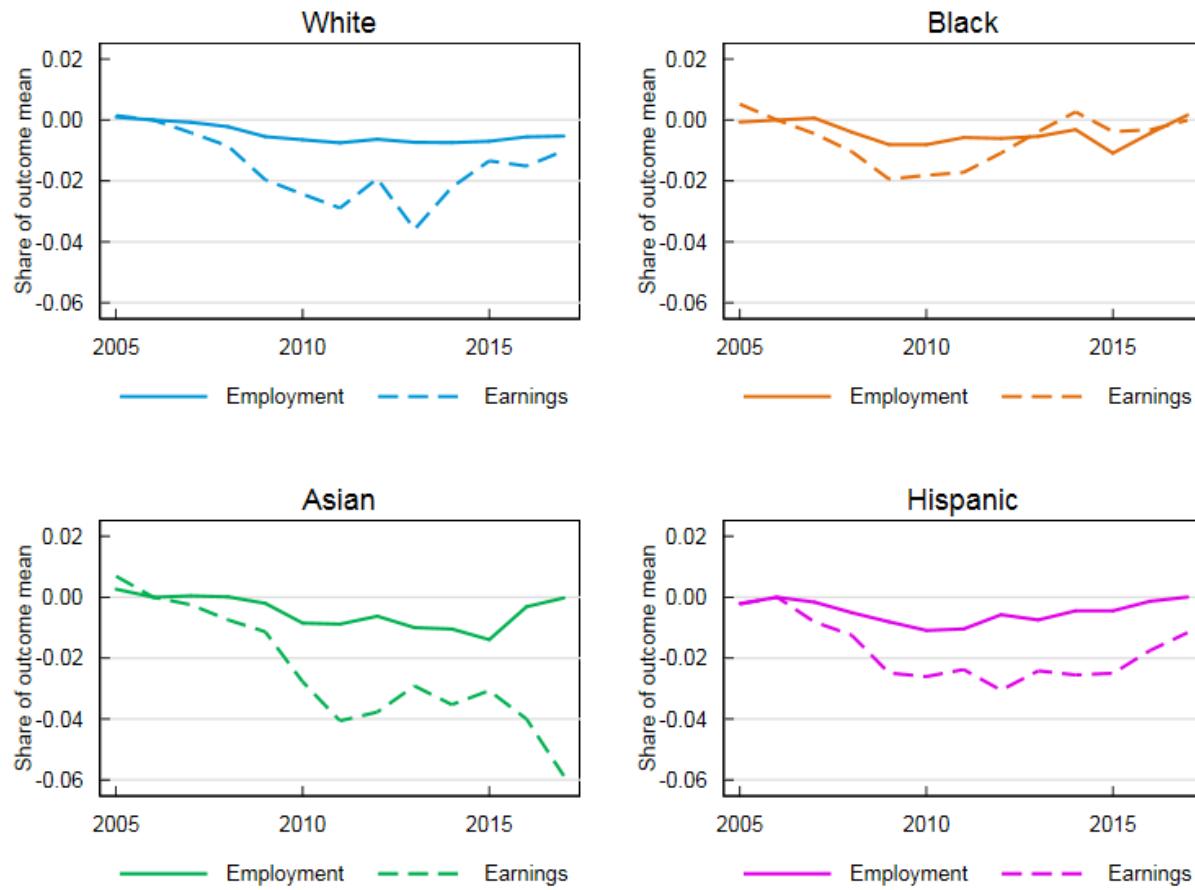
Figure E16: Effects of Local Unemployment Shocks on Earnings, by Race, Baby Boomers



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

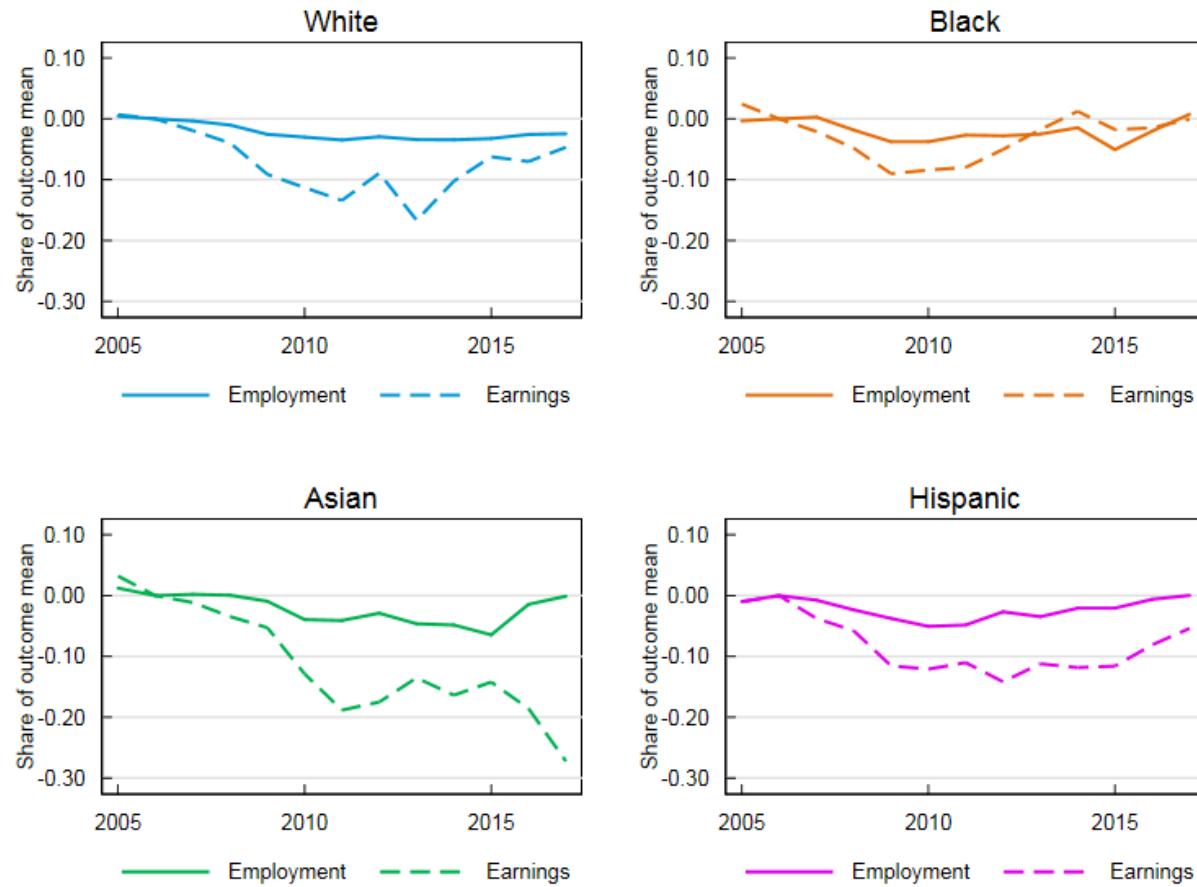
Figure E17: Effects of Local Unemployment Shocks on Employment and Earnings, Coefficients as Share of Outcome Mean, by Race, Baby Boomers



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

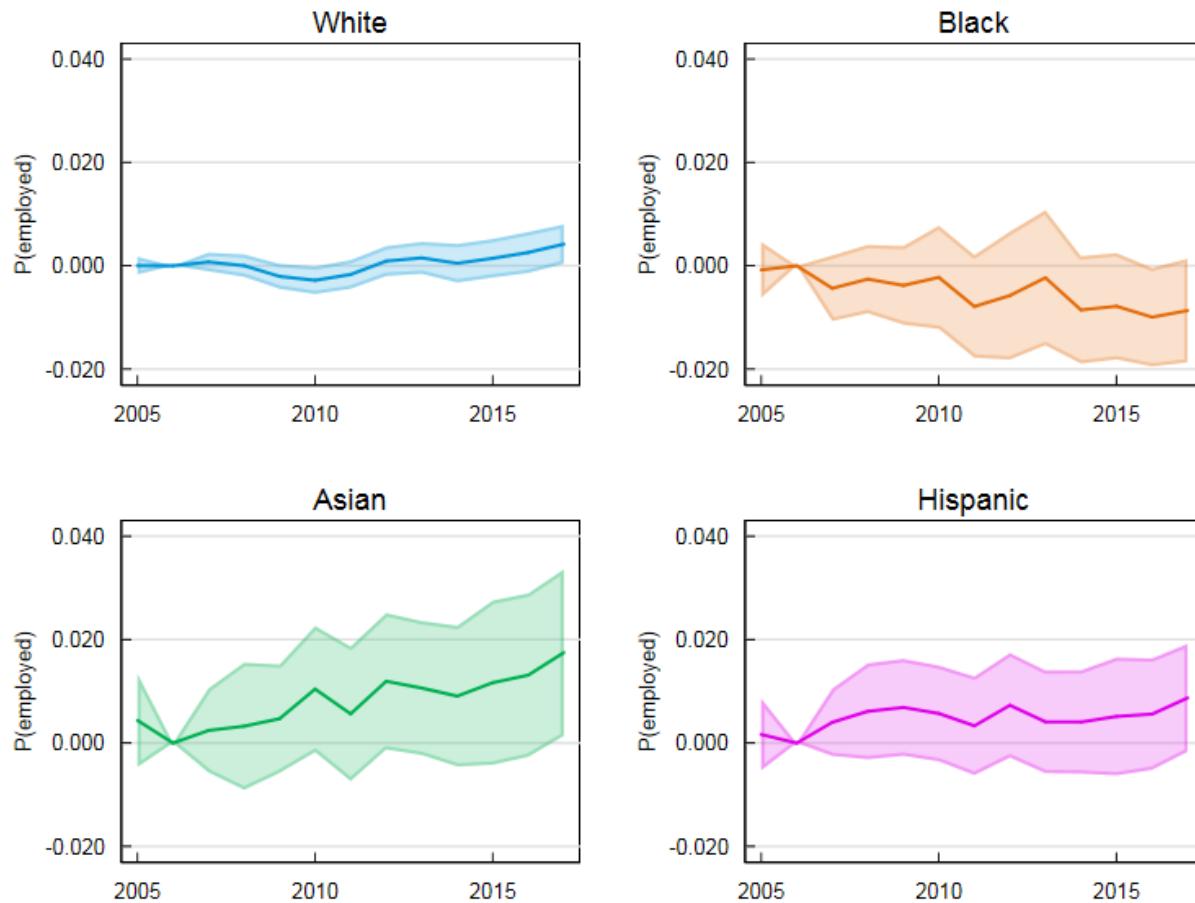
Figure E18: Effects of Local Unemployment Shocks on Employment and Earnings, Effects of Average Shock as Share of Outcome Mean, by Race, Baby Boomers



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

Figure E19: Effects of Local Unemployment Shocks on Employment, by Race, Silent Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

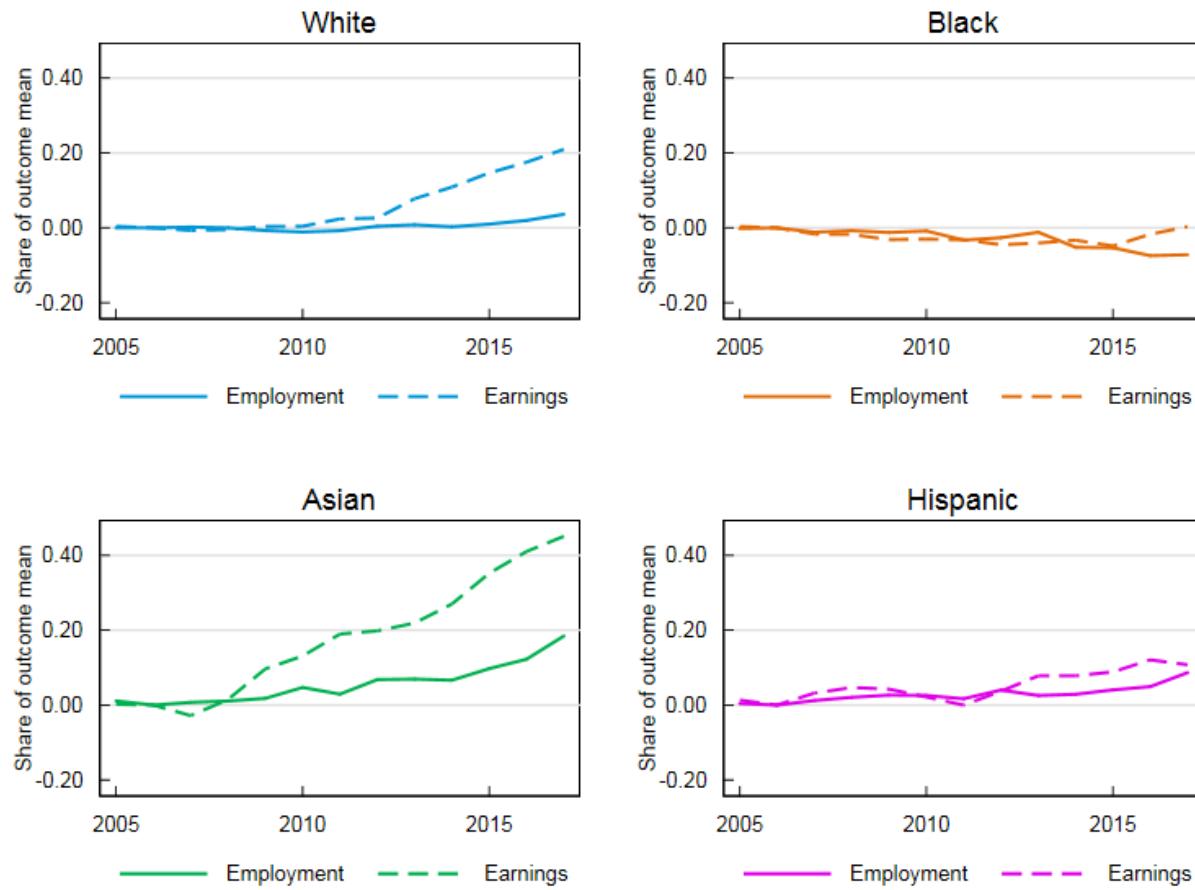
Figure E20: Effects of Local Unemployment Shocks on Earnings, by Race, Silent Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

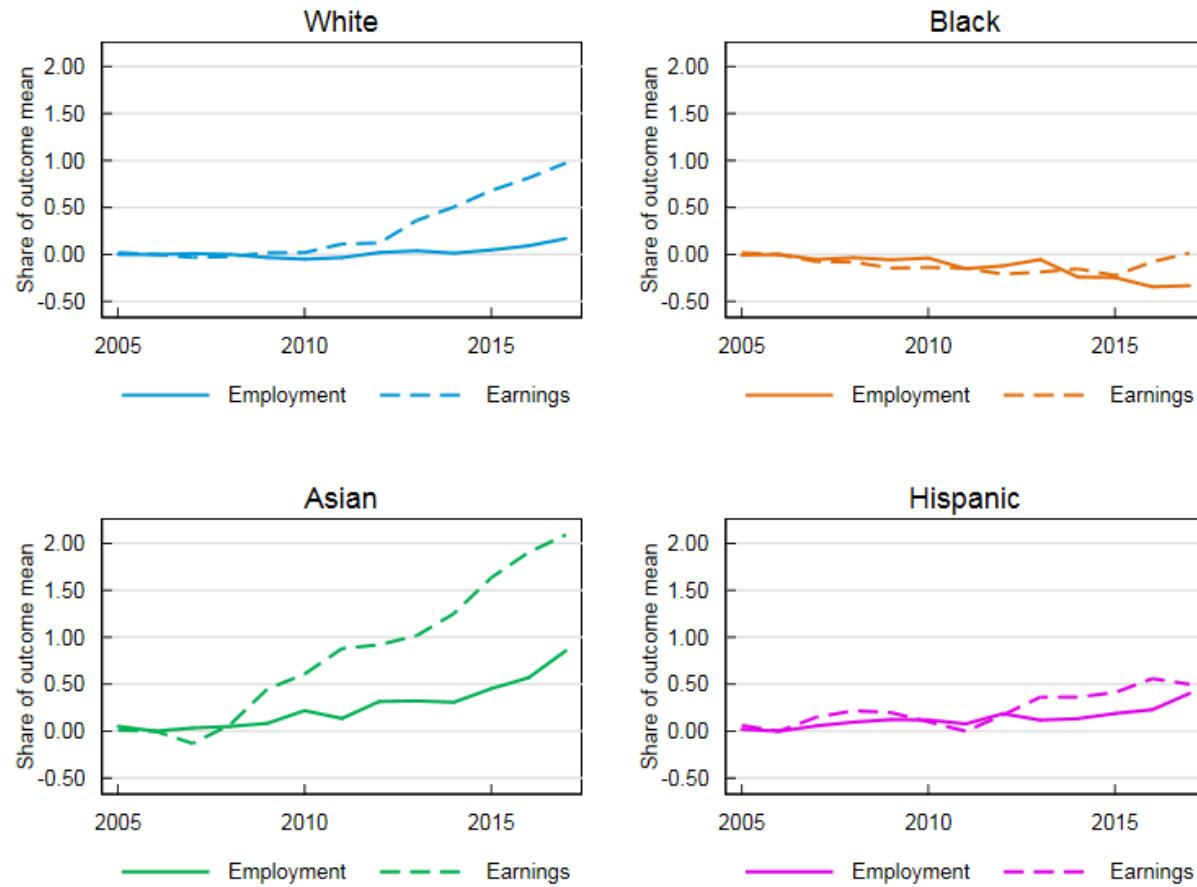
Figure E21: Effects of Local Unemployment Shocks on Employment and Earnings, Coefficients as Share of Outcome Mean, by Race, Silent Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, divided by the mean of the corresponding outcome for the relevant group and year.

Figure E22: Effects of Local Unemployment Shocks on Employment and Earnings, Effects of Average Shock as Share of Outcome Mean, by Race, Silent Generation

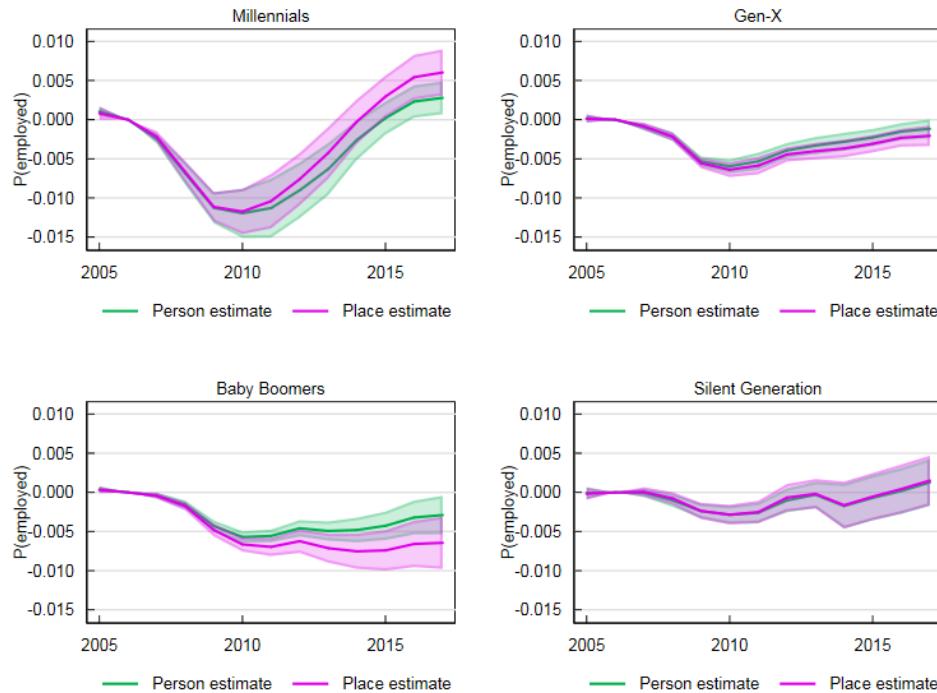


Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1, multiplied by the magnitude of the average local unemployment shock and then divided by the mean of the corresponding outcome for the relevant group and year.

## Appendix F Additional Place and Migration Estimates

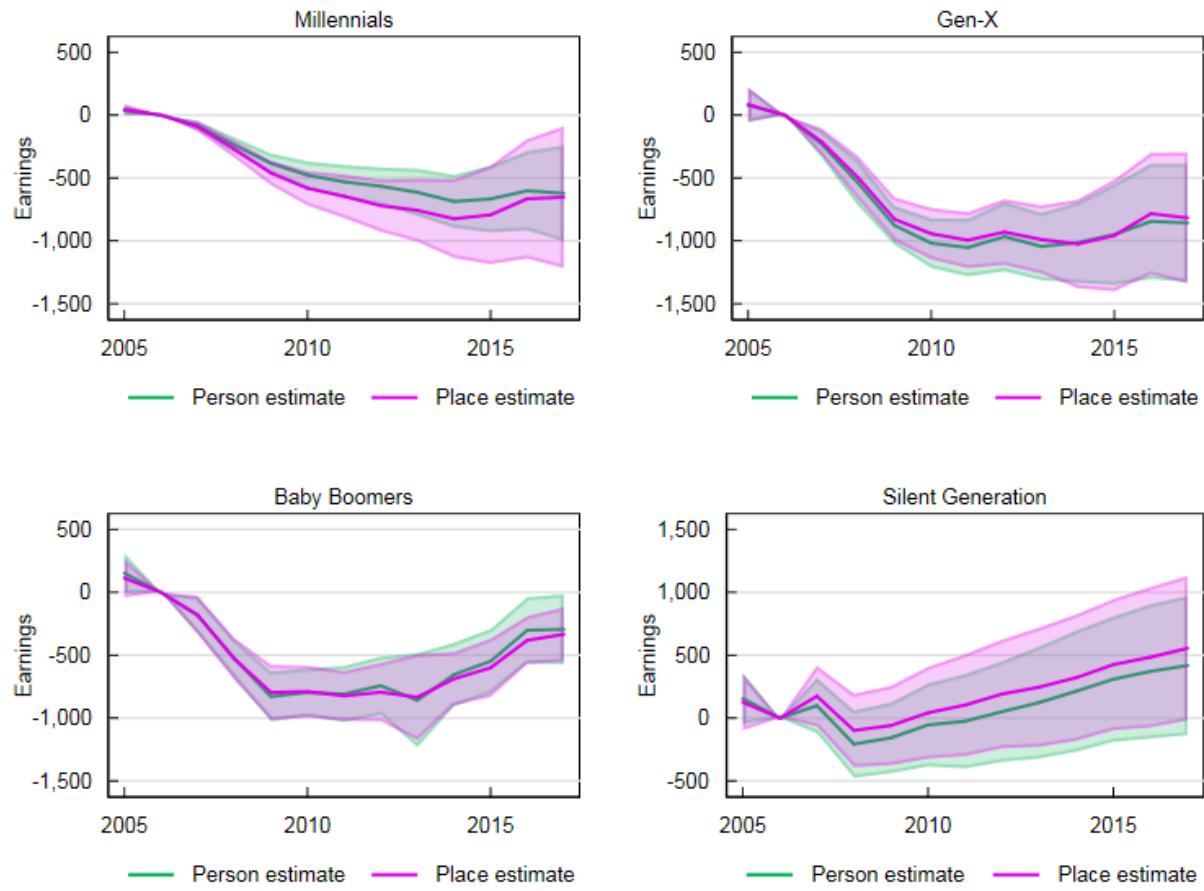
Figure F1: Person vs. Place Employment Estimates, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

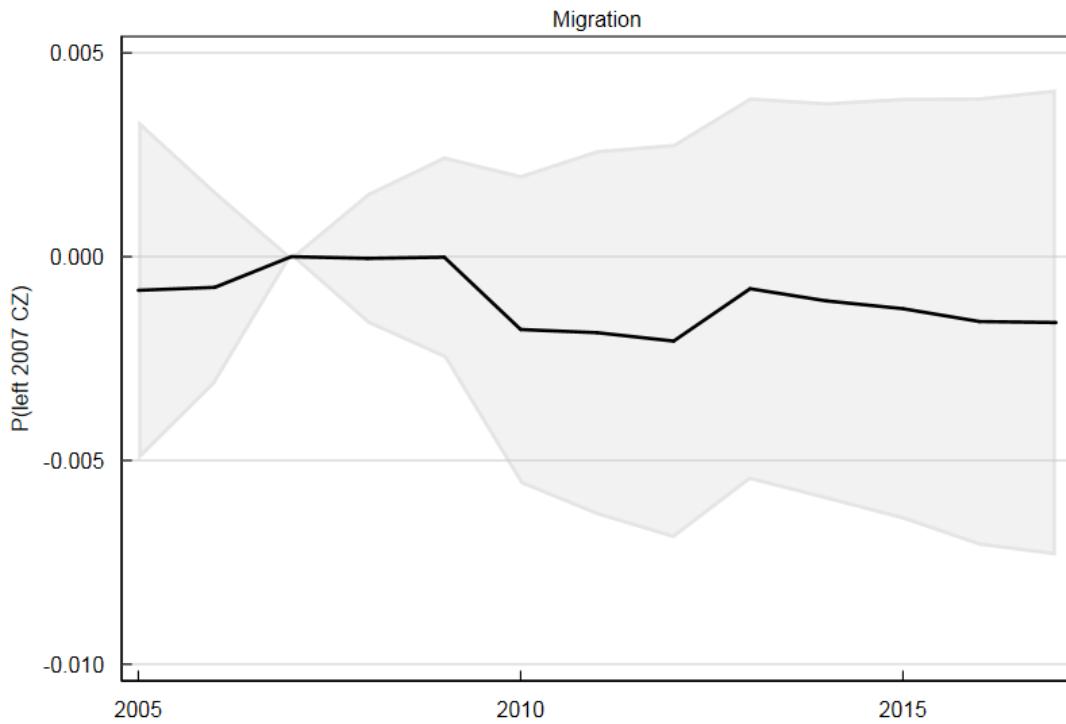
Figure F2: Person vs. Place Earnings Estimates, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY19-376.

Note: Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

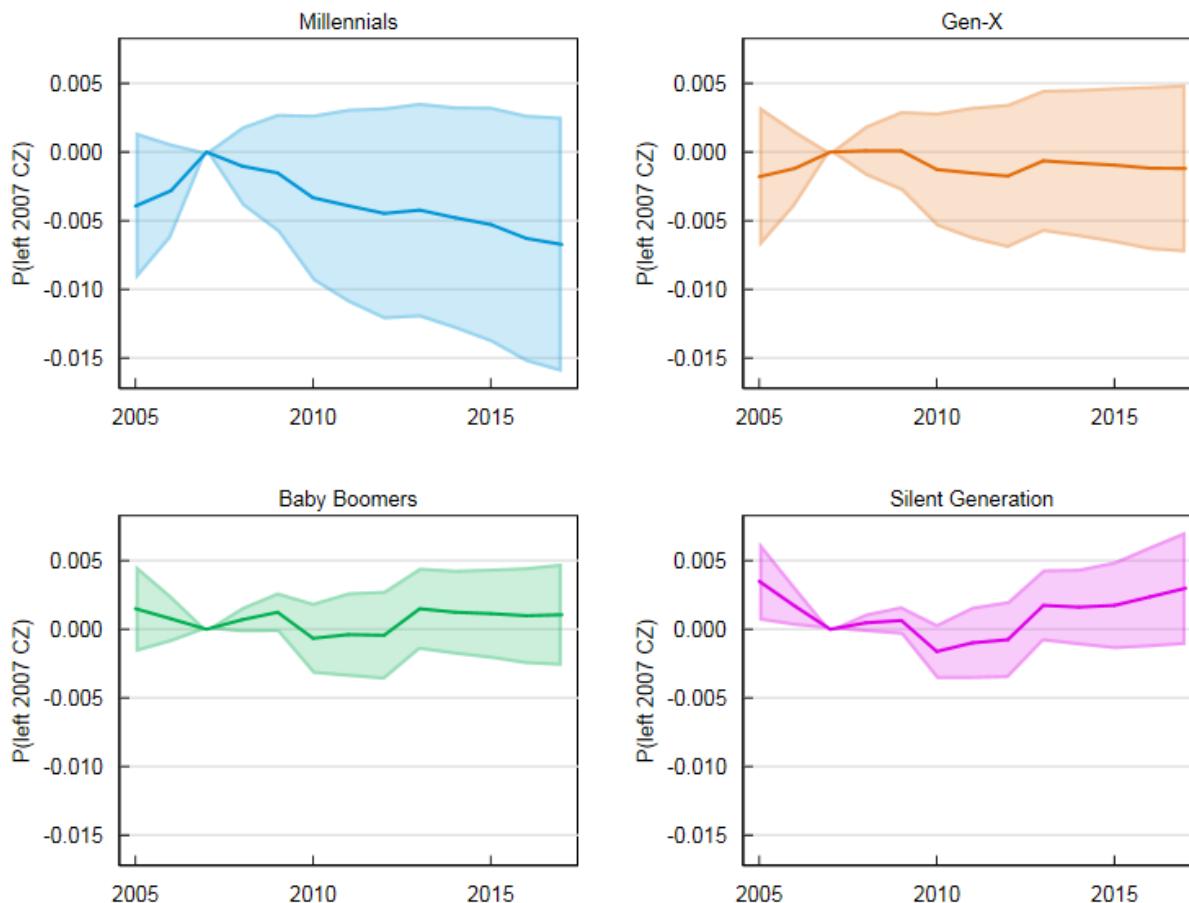
Figure F3: Effects of Local Unemployment Shocks on Migration, 1928-1996 Birth Cohorts



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY2019-CES005-013.

Note: Because the measure of migration considered here is the probability of having moved away from one's 2007 commuting zone, this regression uses 2007 as the reference year rather than 2006. Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

Figure F4: Effects of Local Unemployment Shocks on Migration, by Generation



Source: Form 1040, Form 1099, Form W-2, Census Numident, American Community Survey (2001 through 2017), Decennial Census (2000 and 2010), MAF-ARF. Release authorization number CBDRB-FY2019-CES005-013.

Note: Because the measure of migration considered here is the probability of having moved away from one's 2007 commuting zone, this regression uses 2007 as the reference year rather than 2006. Points plotted are  $\beta$  coefficients as estimated in Equation 1. Shaded regions represent 95 percent confidence intervals.

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