Universität Basel
Wirtschaftswissenschaftliche Fakultät

WWZ forum

May 2018

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WWZ Working Paper 2018/18

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A publication of the Center of Business and Economics (WWZ), University of Basel.

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The Joint Distribution of Wealth and Income Risk: Evidence from Bern*

Matthias Krapf†

May 8, 2018

Abstract

Using detailed tax data from the Swiss canton of Bern, I examine how changes in wealth are related to income risk. I find that only among elderly individuals high kurtosis of income risk may be positively correlated with wealth accumulation. Additionally, I document that a substantial share of taxpayers have negative net wealth. While wealth and income are positively correlated for positive net wealth taxpayers, this correlation is negative for negative net wealth taxpayers. These negative net wealth investors experience sharp increases in wealth and income in subsequent periods. Finally, wealth risk is more dispersed than income risk.

*I thank Marius Brülhart, Johannes Buggle, Battal Doğan, Eren Gürer, Dan Hamermesh, Isabel Z. Martínez, Niklas Potrafke, Heinrich Ursprung, as well as seminar participants at the University of Konstanz, UC Dublin, and ifo Institute for useful comments and suggestions. I acknowledge funding through SNSF grant 166618.

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1 Introduction

The rise in both wealth inequality (Piketty, 2014; Piketty and Zucman, 2014; Saez and Zucman, 2016) and income inequality (Atkinson et al., 2011) since around 1980 has spurred new interest in the relationship between income and wealth distributions. A central finding of this literature is that wealth is more unequally distributed than labor earnings and income, as first documented by Pareto (1896). The theoretical literature on wealth accumulation, which was recently surveyed in De Nardi (2016) and Benhabib and Bisin (forthcoming), has long failed to replicate the long tail of the wealth distribution.

Recent models of wealth accumulation broadly rely upon two different mechanisms. The first, which builds upon a literature that goes back to Bewley (1977), links wealth inequality to income inequality and argues that high-income individuals accumulate wealth to insure against earnings risk, which tends to be more pronounced for top earners (Castaneda et al., 2003). According to the second explanation, the wealth of individuals at the top of the wealth distributions tends to grow at a higher rate than the wealth of those at the bottom, either because of high and heterogeneous returns to capital (Fagereng et al., 2016) or because the wealthy have a preference for higher saving rates (Benhabib et al., 2015). The leaves the question whether and how the income wealth distributions are connected unanswered.

In this paper, I empirically assess these potential mechanisms behind the wealth accumulation process. I use tax data from Bern, Switzerland's second largest canton, that include information on both wealth and income for years 2001 to 2015. First, I document a discontinuity in the correlation between net wealth and net income, which is positive for positive net wealth, but negative for negative net wealth.[1] This finding suggests that there are likely two types of people with little wealth, the first consisting of those who actually have very little and a second group of people who are highly leveraged. The share of highly leveraged high-income earners, who borrow and invest appears to be strictly increasing in negative net wealth. I show that individuals with negative net wealth enjoy large increases in both wealth and income in subsequent years. The existing literature has

[1]The empirical literature on the joint distribution of wealth and income is sparse. Foellmi and Martínez (2017a) discuss the correlation of wealth and income at the top of the distributions based on data for the Swiss canton of Obwalden. Kuhn et al. (2017) present evidence for the US based on the Survey of Consumer Finances that income inequality rose earlier than wealth inequality.

so far largely ignored the distributional properties of wealth below zero or below some positive minimum wealth threshold, either because of data limitations or because it used a "reflection barrier" to guarantee a stationary Pareto distribution (Wold and Whittle, 1957).

I further show that, when risk measured by the standard deviation of log changes,[2] wealth risk is larger than income risk, which in turn is larger than earnings risk. Above zero net wealth and net income, I show that wealth growth, i.e. log changes in net wealth, is slightly increasing in initial net wealth and that income growth is slightly increasing in initial net income. These correlations do, however, not hold for very young taxpayers, for whom wealth growth tends to decrease in initial net wealth and for whom income growth tends to decrease in initial net income. I, furthermore, examine how higher-order moments evolve across the wealth and income distributions and find evidence that, if anyone, only older generations accumulate wealth to insure against income risk.

These empirical patterns are in line with relatively stable wealth and income distributions and do not reflect the recent experience in the US, in line with evidence that the recent rise in inequality has been less pronounced in Switzerland than in other countries (Foellmi and Martínez, 2017a,b). Switzerland is also different from the US in that, while top wealth is as concentrated in Switzerland as in the US, incomes are distributed much more equally in Switzerland than in the US. According to the Federal Reserve's Survey of Consumer Finances, the wealth share of the top 1 percent has increased from 36.3 percent in 2013 to 38.6 percent in 2016, whereas the income share of the top 1 percent has increased from 20.3 percent in 2013 to 23.8 percent in 2016.[3] In Bern, I report wealth shares for the top 1 percent of 36.3 percent in 2001 and 35.1 percent in 2015 percent, and income shares for the top 1 percent of 7.9 percent in 2001 and 8 percent in 2015.[4]

The study most closely related to mine is Guvenen et al. (2015a). Using data from the U.S. Social Security Administration, Guvenen et al. (2015a) examine how earnings risk, i.e. higher-order moments of earnings growth, varies across the earnings distribution. In contrast to their data set mine provides information on wealth. This allows me to extend

[2] In the following, wealth and income growth will be defined as log changes in wealth and income over three years. I will use moments 2 to 4 of growth as measures of wealth risk and income risk and, for sake of brevity, refer to these e.g. as "the standard deviation of income risk" or "the kurtosis of wealth risk."

[3] See `https://www.federalreserve.gov/publications/files/scf17.pdf`.

[4] This is below the national Swiss average, where the top 1% share rose from approximately 10% to 11% over the first decade of the century.

their analysis in several directions. I can compute measures of growth and risk of both wealth and income, and will examine how these vary across both the wealth and income distribution. The emerging literature that documents a positive link between wealth and returns on financial assets uses a similar methodology, too. Fagereng et al. (2016), who use Norwegian data, argue that an individual permanent component accounts for 60 percent of the variation in returns that is explained by the distribution of financial assets. Using data from Sweden, however, Bach et al. (2016) argue that higher returns achieved by wealthy household entirely compensate for higher risk exposure. The findings of the two papers are consistent for the top 5 percent of the wealth distribution. In contrast to Fagereng et al. (2016) and Bach et al. (2016), my approach uses variation in changes in net wealth across the net wealth distribution rather than variation in returns on financial assets across the distribution of financial assets.[5]

This paper is organized as follows. Section 2 describes the data and the institutional background in Switzerland. Section 3 describes the joint distributions of net wealth and net income in levels. Section 4 examines how wealth risk and income risk vary across the wealth and income distributions, how wealth and income growth and risk are related to each other. Section 5 discusses implications of my findings for public policy with a specific focus on wealth taxation. Section 6 concludes.

2 Data and institutional background

I use a data set that covers the universe of tax returns in the canton of Bern over the years 2001-2015. In total, this data set includes 9.51 million observations. All wealth and income variables used in this paper are measured before taxes. Besides wealth and income, I also use age and marital status because married couples are treated as one taxpayer and may display different patterns. Of all individuals in my data, I use all those that appear in three consecutive years and then, again, three years later, and whose marital status does not change over that period. Brülhart et al. (2016) and Roller and Schmidheiny (2017) work with the same data set to evaluate wealth tax policies and to estimate the effect of income taxation on local mobility. See also the appendix in Brülhart et al. (2016) for

[5]Bach et al. (2016) are able to rank individuals by net worth.

detailed information on this data set.

To measure household wealth, I use the variable *Reinvermögen* or net wealth, which is constructed by subtracting household debt from gross wealth. Gross wealth includes everything a taxpayer owns evaluated at market prices except household inventory. Real estate values are assessed by cantonal officers. While most wealth is self-reported and the banking secret is still in place in Switzerland, there is a 35-percent withholding tax on income from dividends and interest that is returned upon declaration of financial assets. Taxable wealth can be obtained by subtracting family deductions from net wealth, but my entire analysis relies upon net wealth.

Income is defined more broadly in Switzerland, as not only labor earnings but income from other sources such as also capital income (interest and dividends but not capital gains), pensions and other transfer payments, is subject to income taxation. Foellmi and Martínez (2017b), therefore, complement their analysis with social security data, which allow for comparisons of the distribution of labor earnings in Switzerland with corresponding distributions in other countries. The tax returns data I have access to, however, list the income components that come from dependent employment and from self-employment separately. This allows me to do robustness checks with labor earnings only. The variable I use in most of the paper is, however, *Reineinkommen*, which consists of all income net of interest and mortgage payments, health expenditure and expenditure related to income realization. To obtain taxable income, one would, again, have to subtract family deductions. The definitions of net wealth and net income have not changed over time.

This setting allows me to include retired people, who tend to be among the wealthiest individuals, in my analysis. The Swiss pension system consists of three pillars, a publicly financed pay-as-you-go scheme, a mandatory capital accumulation scheme, and optional yearly capital contributions (capped at 6,768 CHF in 2015. All pension wealth is tax exempt, but when entering retirement, Swiss taxpayers face the decision whether to annuitize or cash out their pension wealth. At current levels of interest rates and of the rate that converts pension wealth into annuities, few retirees decide to cash out their pension wealth. If they do cash out, taxable wealth can increase substantially when entering retirement. If retirees decide for annuities, these will be subject to income taxation.[6]

[6]For the incentives set by this system, see Bütler and Teppa (2007).

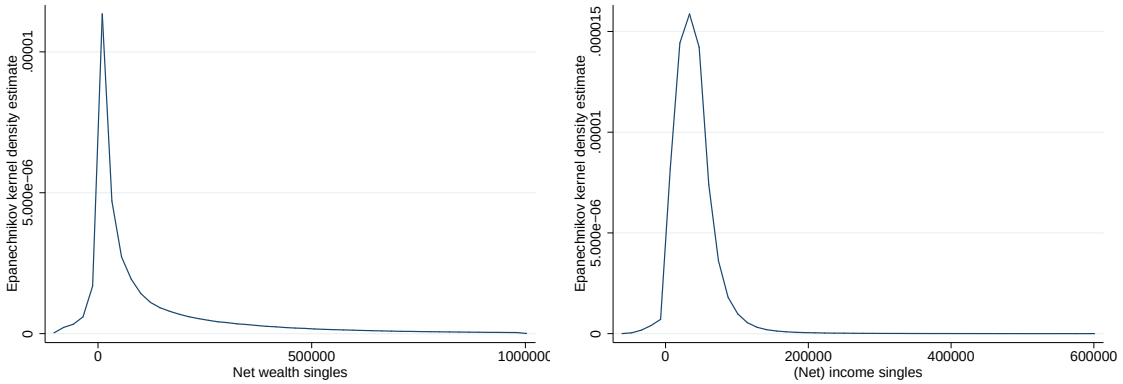

Figure 1: Kernel densities wealth and income distributions singles.

The statutory pension age in Switzerland is 65 for men and was lifted from 63 to 64 for women during my sample period in 2005.

3 Wealth and income in levels

Figure 1 visualizes part of the net wealth distribution between -100,000 and 1,000,000 CHF and part of the income distribution between -60,000 and 600,000 CHF.[7] 14 percent of all taxpayers have negative net wealth and 8 percent report zero net wealth. Net income is negative for 5 percent of all taxpayers and positive for all others. Mean net wealth is 237,500 CHF over all taxpayers and 332,600 CHF over those with positive net wealth only. Mean net income is 54,700 CHF over all taxpayers and 58,700 CHF over those with positive net incomes only. To get an idea of the long tails, consider that net wealth ranges from -157 million to 5.76 billion CHF and net incomes range from -38 million to 89 million CHF.

For comparison with other studies, I will also present results with only positive wealth and with only income above a certain threshold. Guvenen et al. (2015a) use $1,885, which is half the legal minimum wage, as a cutoff. Since there is no legal minimum wage in Switzerland, I cannot use this criterion. Given that the wage distribution is more equal in Switzerland than in the US, I go somewhat higher and, arbitrarily, choose 3,000 CHF. I include all taxpayers age 16 and older in my analysis, which is much broader than the age range used in most other studies.

[7] 1 Swiss franc (CHF) was worth about $1.04 in April 2018.

Table 1: TOP INCOME SHARES AND TOP WEALTH SHARES IN BERN.

percentiles	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	All wealth including negative wealth														
0-50	-3.11	-3.35	-3.42	-3.51	-3.30	-3.18	-2.82	-3.04	-3.07	-3.12	-3.15	-3.11	-3.06	-3.04	-3.11
50-90	29.91	32.29	31.71	31.31	30.08	29.84	27.73	28.23	29.05	29.32	29.97	29.74	29.47	29.50	30.90
90-99	36.95	39.68	39.22	39.17	38.49	38.21	35.34	34.85	35.75	35.78	36.35	36.15	35.84	35.72	37.15
99-99.9	17.37	17.70	17.86	17.89	18.23	18.38	17.24	16.25	16.86	16.99	16.72	17.14	17.36	17.48	18.24
99.9-100	18.88	13.68	14.63	15.15	16.50	16.76	22.51	23.72	21.41	21.02	20.11	20.07	20.38	20.35	16.83
	Only positive wealth														
0-50	3.98	4.02	3.86	3.75	3.56	3.48	3.11	3.49	3.85	3.93	3.99	4.02	4.00	4.04	4.14
50-90	31.78	32.38	31.64	31.22	30.06	29.52	26.18	28.61	30.43	30.40	30.67	30.47	30.10	29.94	30.24
90-99	34.15	34.58	34.00	33.91	33.22	33.05	29.61	31.80	33.59	33.47	34.19	34.03	33.76	33.48	33.65
99-99.9	16.06	15.57	15.43	15.32	15.60	15.81	14.62	15.22	16.08	16.33	16.78	17.11	17.41	17.36	17.58
99.9-100	14.04	13.45	15.07	15.80	17.57	18.14	26.48	20.88	16.04	15.87	14.37	14.37	14.73	15.18	14.39
	All incomes including negative income														
0-50	19.55	19.44	19.39	19.35	19.07	19.37	20.15	21.05	21.33	21.63	22.05	22.26	22.42	22.49	22.63
50-90	50.19	50.30	50.01	50.43	50.26	50.03	49.44	49.13	48.61	48.27	48.27	48.13	48.15	47.98	48.03
90-99	22.39	22.42	22.35	22.60	22.63	22.59	22.25	22.00	21.78	21.67	21.60	21.51	21.44	21.27	21.30
99-99.9	5.38	5.31	5.31	5.30	5.29	5.35	5.35	5.31	5.28	5.30	5.29	5.28	5.24	5.22	5.27
99.9-100	2.49	2.53	2.94	2.31	2.75	2.65	2.81	2.52	2.99	3.12	2.79	2.83	2.73	3.05	2.77
	Labor earnings above 3,000 CHF per year														
0-50	24.02	23.88	23.67	23.47	23.17	23.12	23.21	23.74	24.19	24.47	24.85	25.09	25.23	25.25	25.31
50-90	49.54	49.64	49.65	49.60	49.55	49.43	49.15	49.02	48.91	48.75	48.67	48.64	48.60	48.52	48.55
90-99	20.82	20.90	21.01	21.15	21.37	21.41	21.43	21.26	21.10	20.97	20.79	20.69	20.62	20.50	20.50
99-99.9	4.36	4.35	4.39	4.48	4.55	4.60	4.71	4.62	4.48	4.45	4.37	4.29	4.30	4.30	4.35
99.9-100	1.26	1.23	1.27	1.31	1.36	1.43	1.50	1.37	1.32	1.36	1.32	1.28	1.24	1.43	1.30

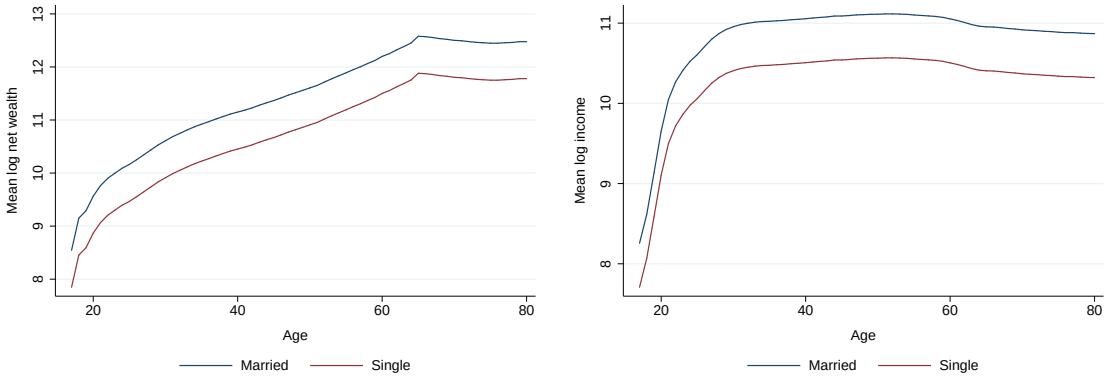

Figure 2: Log wealth and log income over age.

Table 1 reports income shares and wealth shares for different segments of the distribution in Bern for all years I have data for. The top shares are higher in my baseline measures of net wealth and net income, which include negative values in the top panel and the third panel because negative values lower the net wealth and net income shares at the bottom. If I include negative net wealth, the share of the bottom 50 percent is negative.

The top income shares in Table 1 are a bit lower than the top income shares for the entire country reported, for example, in Foellmi and Martínez (2017b), whereas the top wealth shares are in line with the numbers for the entire country. Table 1, thus, confirms that top wealth shares in Switzerland are similar to top wealth shares in the US, whereas incomes are distributed more equally in Switzerland than in the US, where the top 10 percent income share is about 40 percent.

Following the methodology in Guvenen et al. (2015a), I regress log net wealth and log net income on age dummies as well as a marriage dummy and year dummies as controls. Using the resulting coefficients on these age dummies d_h^o for $o = w, i$ indicating wealth or income and age h, I then correct for the evolution of net wealth and net income over age. First, I construct measures of recent wealth and recent income

$$\bar{y}_{i,t-1}^o = \frac{\sum_{s=1}^2 y_{i,t-s,h-s}^o}{\sum_{s=1}^2 \exp(d_{h-s}^o)}. \tag{1}$$

Given that my data cover only 11 years, this recent wealth measure is based on wealth in the preceding two periods only rather than five as in Guvenen et al. (2015a). These

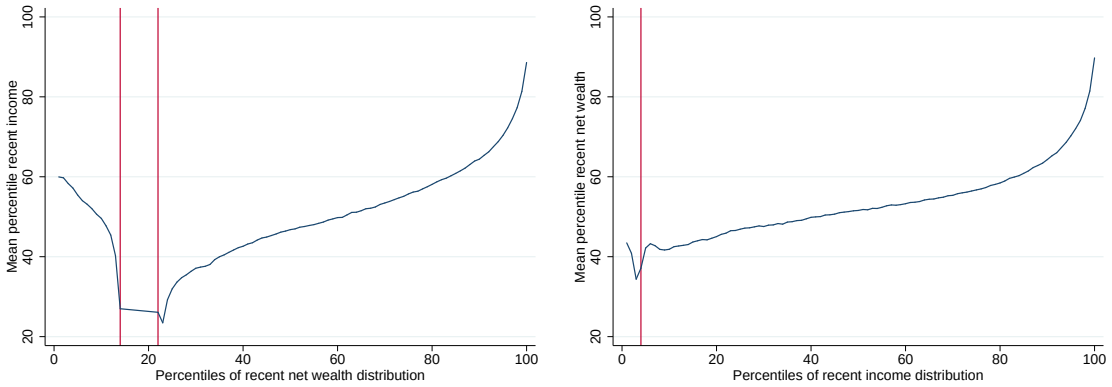

Figure 3: The contemporaneous correlation of recent wealth and income percentiles.

measures of recent wealth and recent income are also defined for negative outcomes.[8]

Figure 2 displays how log net wealth and log net incomes evolve over the life cycle. These two graphs are based on the regressions of log net wealth and log net incomes on age dummies, year dummies and marital status dummies mentioned in the paragraph above and, hence, only based on positive values for net wealth and net incomes. The small kink in log wealth at around age 65 is likely related to some people cashing out their pension wealth when entering retirement as mentioned above in Section 2. Log income reaches its maximum at age 51.

Figure 3 visualizes the contemporaneous correlation between recent wealth and recent income. The left-hand panel displays mean recent income percentiles for each recent wealth percentile in the data. All recent wealth to the left of the first vertical line is negative, all wealth to the right of the second vertical line is positive. Recent wealth and recent income are positively correlated for positive recent wealth. This correlation is highest for very small and very high positive recent wealth. The correlation between recent wealth and recent income, however, changes its sign and becomes negative for negative recent wealth. Mean recent income for the bottom of the recent wealth distribution is at the 60 percentile, which is equivalent to recent income of the taxpayers in the 84th recent wealth percentile. This indicates that taxpayers with negative wealth are not necessarily poor in a narrow sense. Negative net wealth taxpayers include a disproportionate share of

[8]Note that the age dummies were estimated based on positive outcomes only. This procedure is based on the assumption that wealth and income accumulation display the same patterns in negative space as in positive space.

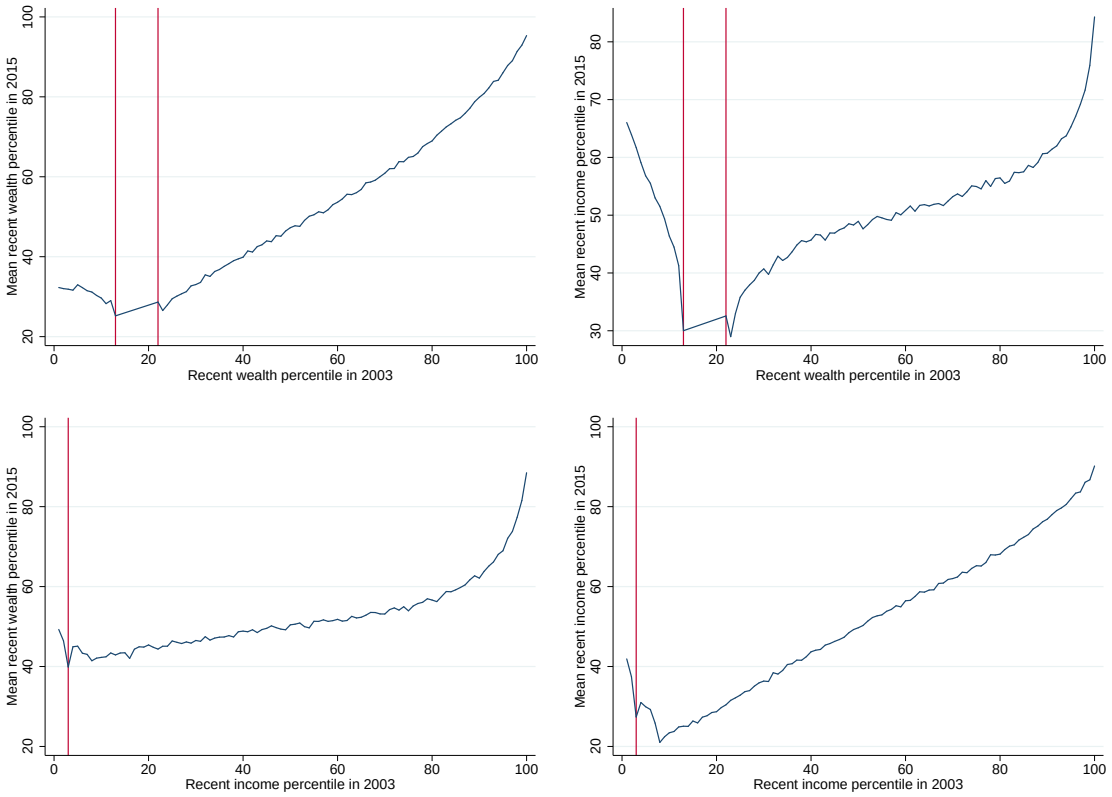

Figure 4: The evolution of recent wealth and income percentiles over eight years.

high-income people whose net wealth is low likely because they borrow and invest.[9]

In principle, net wealth of high-income households could be low because the banking secret, which is still in place in Switzerland, may allow taxpayers in Bern to underreport their wealth. There is, however, little incentive to underreport wealth if it is below the taxable wealth threshold, which increased over my sample period from 92,000 to 97,000 CHF. While the location of this taxable wealth threshold in the net wealth distribution in Figure 3 varies with age and family deductions, about a third of taxpayers in Bern have wealth that is above the threshold (Brülhart et al., 2016). But, if anything, tax evasion would provide a rationale for a discontinuity at this taxable wealth threshold and not at zero net wealth.

Figure 4 extends this analysis and compares the distributions of recent wealth and recent income in 2003 (based on net wealth in 2001 and 2002) on the x-axis to the cor-

[9]The graph on the right-hand side of Figure 3 shows no clear pattern of average for very low incomes. Related work by Halvorsen and Thoresen (2017), however, shows that a large share of the wealth tax burden in Norway falls on low-income people, thus providing further evidence for discontinuities in the correlation between income and wealth.

responding outcomes 12 years later in 2015 (based on net wealth in 2013 and 2014) on the y-axis. The graphs in the upper left panel and in the lower right panel show that a taxpayer's positions in the wealth and income distributions are highly persistent, at least over the period in my data. There is reversion to the mean, though. Individuals at the top of the income distribution fall behind about ten percentage points on average over eight years, whereas individuals at the top of the wealth distribution fell behind about half that much on average. As discussed above, the wealth and income distributions in Bern were relatively stable between 2001-2011, and stationary distributions of wealth and income are necessarily characterized by mean reversion (Champernowne, 1953)

The graph in the upper left panel of Figure 4 shows that recent wealth in 2015 is slightly negatively correlated with negative recent wealth in 2003. This suggests that negative net wealth in 2003 has, on average, become positive over the subsequent 12 years, and that taxpayers with the most negative net wealth have experienced the largest increases. One possible explanation for this observation is that people with large investments in 2003 ended up with zero net wealth later on because they defaulted on their debt and went bankrupt. If we look, however, at the correlation between recent wealth in 2003 and recent income in 2015 in the upper right panel, we find that taxpayers in the first percentile of the recent wealth distribution in 2003 are, on average, in the 66th percentile of the recent income distribution in 2011, which is equivalent to the mean recent income percentile of the 95th percentile of the recent wealth distribution in 2003 in even higher recent income percentiles than in the contemporaneous graph displayed in Figure 3. This suggests that the high incomes of negative net wealth individuals increase even more over time and that their investments, thus, pay off on average.[10]

One might assume that people with negative wealth and high incomes tend to be entrepreneurs, in which case their high incomes would result from self-employment. Since income from self-employment is listed separately in my data, I can verify if this is the case. About ten percent of taxpayers in my data have positive income from self-employment, and a bit over one percent have negative income from self-employment. Whereas there is no clear pattern of income from self-employment for positive net wealth,

[10] According to an alternative interpretation, taxpayers with negative net wealth in 2003 had assets that they did not declare in 2003 but in 2011. Note, however, that, while there was a crackdown offshore on wealth held in Swiss bank accounts, the legal situation remained unchanged for residents of Switzerland.

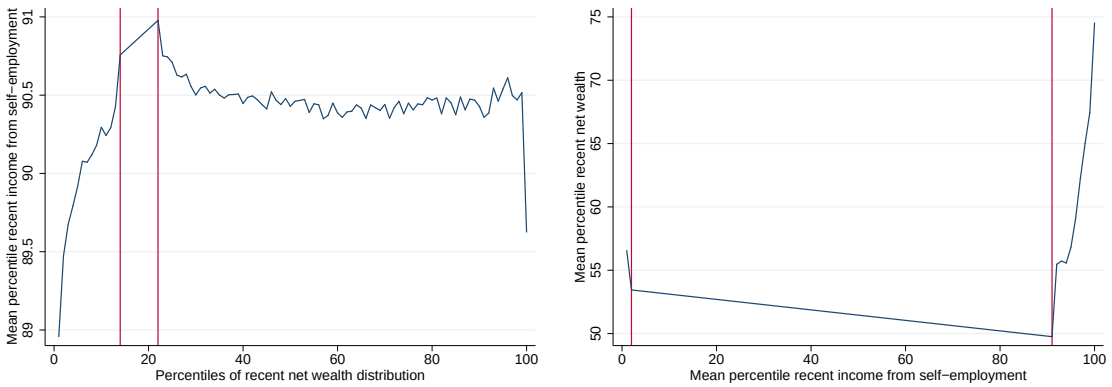

Figure 5: The contemporaneous correlation of recent wealth and income from self-employment.

it tends to be lower for taxpayers with negative net wealth than for taxpayers with positive net wealth. This suggests that negative net wealth-high income taxpayers are not entrepreneurs themselves. Moreover, the right-hand panel of Figure 5 suggests that income from self-employment alone may not be sufficient to explain the extreme tails of the wealth distribution.

4 Wealth and income growth and risk

4.1 Descriptives and measurement

Wealth growth and income growth are defined as 3-year changes in log wealth and log income, where I correct for the same age dummies as above.[11] Figure 6 shows the distributions of wealth growth, income growth and earnings growth (log changes in earnings from dependent employment and from self employment) defined over the usual positive outcomes. We see that wealth growth in the panel at the top is more dispersed than income growth and that earnings growth is even less dispersed. At first sight, this may come as a surprise because of its nature as a stock. But it is very intuitive given that asset prices fluctuate and that a larger variety of margins of adjustment is available for wealth than, especially, for labor earnings.[12]

[11] Due to limitations of my data, I am not able to distinguish between changes that are related to unanticipated shocks from changes that are related to labor supply or other conscious economic decisions.

[12] Again, one might argue that overall wealth may be stable, whereas the wealth component that is not reported to tax authorities varies a lot over the years. But even if underreporting may be easier in Switzerland than

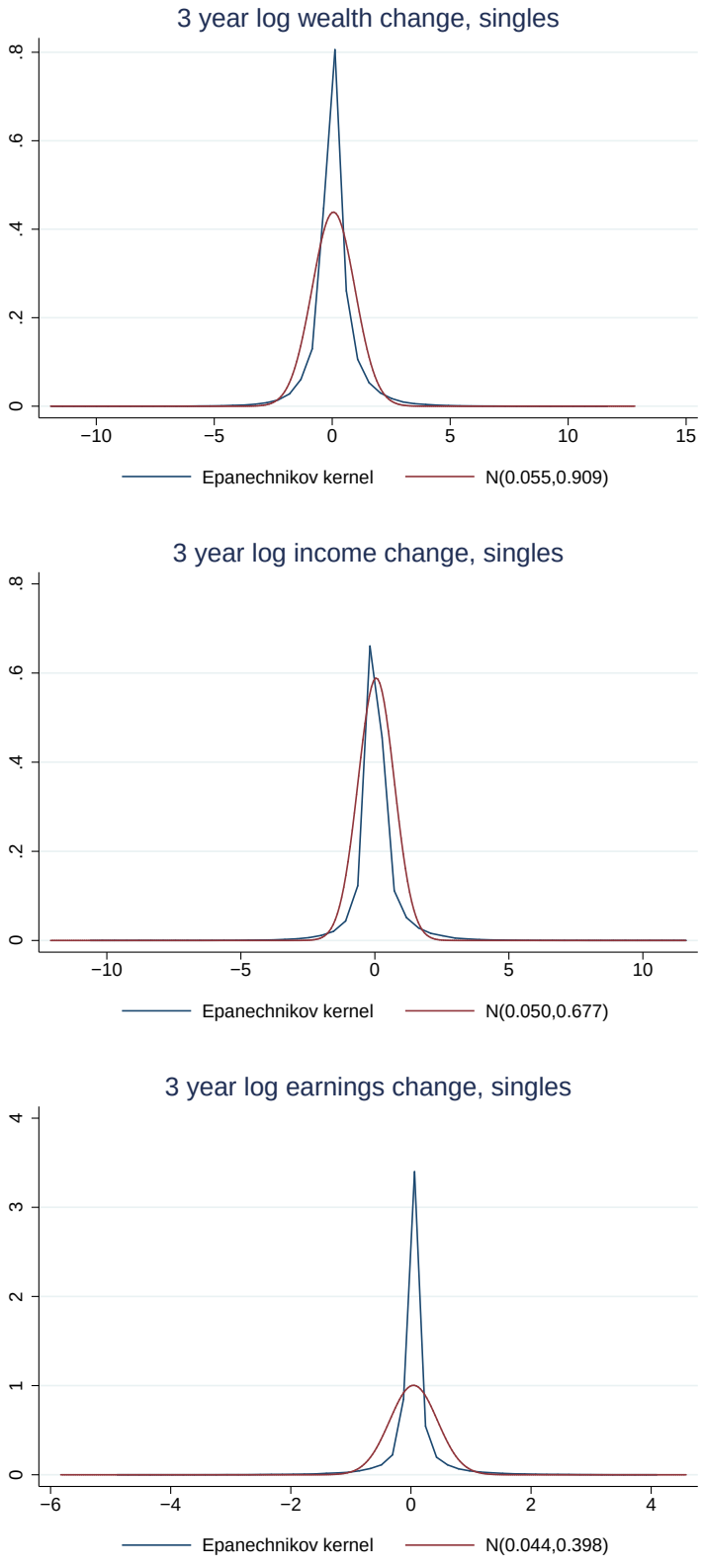

Figure 6: Wealth, income and earnings growth with corresponding normal distributions.

To obtain measures that are not only defined for positive outcomes, I have to distinguish cases, in which at least one outcome is zero or negative, or becomes zero or negative. I thus from now on define wealth growth and income growth as

$$\begin{aligned} \triangle \ln y^o_{i,t} &= \left(\mathcal{I}_{\{y^o_{i,t+3}>0\}} - \mathcal{I}_{\{y^o_{i,t+3}<0\}}\right) \cdot \ln(|y^o_{i,t+3}|) \\ &\quad - \left(\mathcal{I}_{\{y^o_{i,t}>0\}} - \mathcal{I}_{\{y^o_{i,t}<0\}}\right) \cdot \ln(|y^o_{i,t}|) - \triangle d^o_h, \end{aligned} \tag{2}$$

where the indicator function $\mathcal{I}$ equals one if the argument in curly brackets is true and zero otherwise, and $\triangle d^o_h = d^o_{h+3} - d^o_h$. This specification treats reductions in absolute negative net wealth and income the same as corresponding increases in positive net wealth and income. If, for example, net wealth changes from -2,000 to -1,000 CHF, wealth growth will, conditional on age dummies being the same, be the same as if it increases from 1,000 to 2,000 CHF.[13] If either the initial value or the value in $t + 3$ was zero, I replace it with either 1 or -1 if it was negative to be able to apply log transformation. If net wealth or net income change form negative to positive or vice versa, I add up the change between the negative value and -1 CHF and the change between 1 CHF and the positive value, thus ignoring the discontinuity of the function in Equation (2) between -1 and 1.

The distributional characteristics of both, wealth and income growth and risk, will vary across the distributions of both, recent wealth and recent income. Since recent wealth and recent income are correlated with each other, too, I back out realizations of wealth growth and income growth that would have obtained if taxpayers were in the 50th percentiles of either the recent wealth or the recent income distributions. To obtain values of wealth growth and income growth that hold one of the two distributions constant, I regress $\triangle \ln y^o_i$, $o = w, i$ on year dummies, marriage dummies and dummies indication percentiles in either the recent wealth or recent income distributions. I then extract the resulting dummy coefficients, subtract them from the respective growth and risk measures used as dependent variables and plug in the dummy for the 50th percentile of the corresponding distribution. This procedure results in four measures $\triangle \ln \hat{y}^{o,o}_i$, $o = w, i$, where $\triangle \ln \hat{y}^{w,w}_i$ is wealth growth assuming a taxpayer is in the 50th percentile of the recent

in other countries, it is still illegal and variation over the years would increase the risk of detection.

[13] Note that, as before, the age dummies were estimated using only positive net wealth.

wealth distribution, $\triangle \ln \hat{y}_i^{w,i}$ is wealth growth assuming a taxpayer is in the 50th percentile of the recent income distribution, $\triangle \ln \hat{y}_i^{i,w}$ is income growth assuming a taxpayer is in the 50th percentile of the recent wealth distribution and $\triangle \ln \hat{y}_i^{i,i}$ is income growth assuming a taxpayer is in the 50th percentile of the recent income distribution. When, in the following Section 4.2, I examine, for example, how wealth growth varies across the recent income distribution, I will do so using $\triangle \ln \hat{y}_i^{w,w}$ rather than $\triangle \ln y_i^w$, thus holding recent wealth constant. Appendix A presents corresponding figures for the uncorrected growth measures $\triangle \ln y_i^w$ which are, in fact, fairly similar.

While Swiss tax law treats married couples and singles the same, it may make a difference if a taxpaying unit consists of one or two people. In the following, I will focus on singles. Appendix B shows corresponding graphs for married couples. Appendix C repeats the analysis using the more traditional measures labor earnings and positive wealth, whereas Appendix E drops observations at the other end and displays patterns for taxpayers below the taxable wealth threshold because the presence of wealth taxes may affect the outcomes.

4.2 Moments across the distributions

The recent theoretical literature on the mechanisms behind increasing wealth inequality can be divided into two strands. The first relates the wealth distribution to the income distribution and has, in particular, focused on the effect of labor-market shocks and uninsurable income risk on wealth accumulation Bewley (1977); Aiyagari (1994); Castaneda et al. (2003) and on portfolio choice (Fagereng et al., forthcoming). The second literature has focused on heterogeneity in bequests (De Nardi, 2004), savings rates Benhabib et al. (2015) and financial returns (Gabaix et al., 2016; Fagereng et al., 2016) across the wealth distribution.[14] The theorems by Grey (1994) and Kesten (1973) reviewed in Benhabib and Bisin (forthcoming) and in Fagereng et al. (2016) imply that the tail of the wealth distribution is determined by either the tail of the income distribution or by return heterogeneity, but not by both.

[14] Kuhn et al. (2017) present supporting evidence for the importance of household portfolios, in particular real estate, based on the Survey of Consumer Finances. Saving rates have been related to capital income risk as in Benhabib et al. (2015) or to impatience and heterogeneous preferences for thrift (Krusell and Smith Jr., 1998).

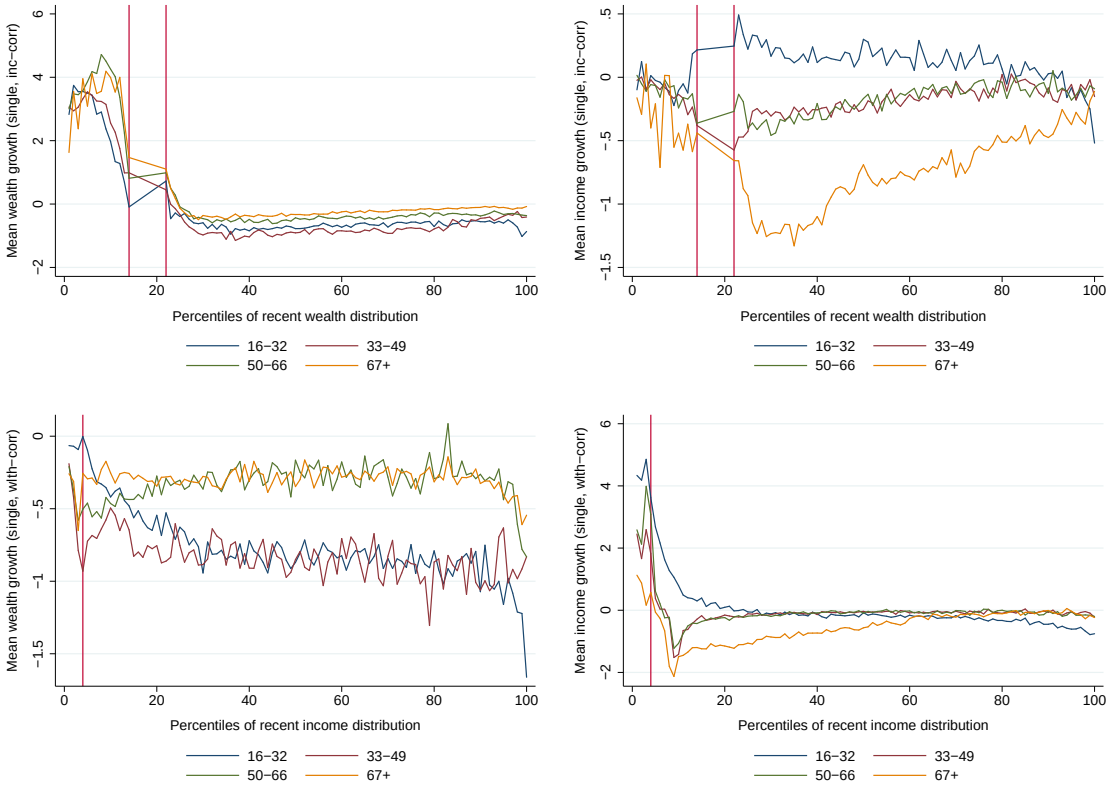

Figure 7: Mean wealth and income growth across the wealth and income distributions.

To empirically assess these links, I will examine how wealth growth and risk as well as income growth and risk vary across the recent wealth and recent income distributions. If the former set of explanations holds, then wealth growth and income risk should vary systematically across the recent income distribution. If the latter set of explanations holds, then wealth growth should vary across the recent wealth distribution. I will use the observed variation across individuals within a given wealth or income percentile as a proxy for the risk faced by the average individual in this percentile. Note that my analysis does not allow me to make decisive conclusions regarding increasing wealth concentration because the tail of the wealth distribution in Bern was determined long before the period that I have data for.

I will first investigate how the moments one through four of wealth and income growth differ across the wealth and income distributions. I will divide the taxpayers in my data into four age groups, 16-32, 33-49, 50-66, 67 and older, and then examine each of these age groups separately. A special focus in this paper is on the youngest and oldest age groups. Members of these two age group are not necessarily employed and are more

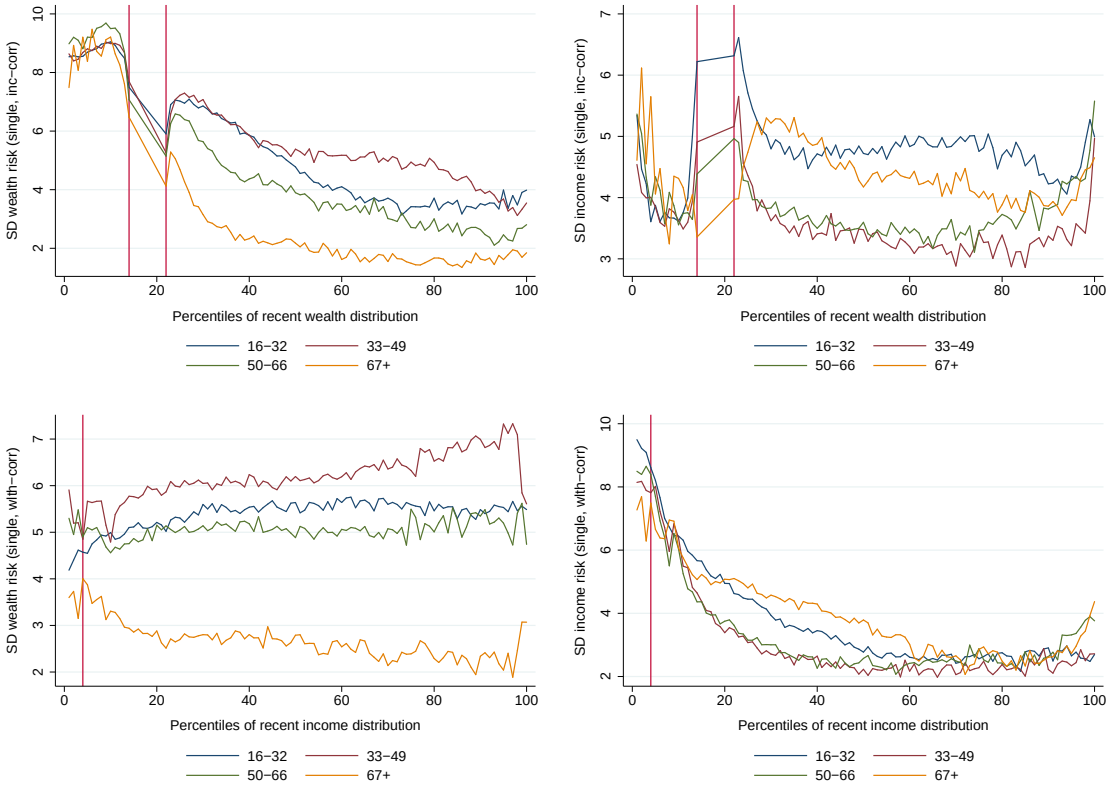

Figure 8: S.D. wealth and income risk across the wealth and income distributions.

likely to be taxpayers in Switzerland than in other countries because of Switzerland broad definition of the tax base. As I will show, these two groups display patterns that are of particular interest. In the following Section 4.3, I will then look for consistent patterns in the distribution of income risk across the income distribution that may affect wealth growth.

Both wealth and income of the youngest age group 16-32 tend to revert to the mean as shown in the upper-left and lower-right panels of Figure 7. Mean reversion is less pronounced for the older age groups. The graph in the upper right panel shows that, conditional on recent wealth being positive, income growth is negatively related to position in the wealth distribution for taxpayers in the youngest age group, but positively for taxpayers in the oldest age group. This is intuitive given that the youngest are most likely to accumulate wealth, whereas the oldest are most likely to dissave. The lower-left panel of Figure 7 confirms that wealth growth tends to be higher for younger age groups than for older age groups, but there is no obvious pattern along the recent income distribu-

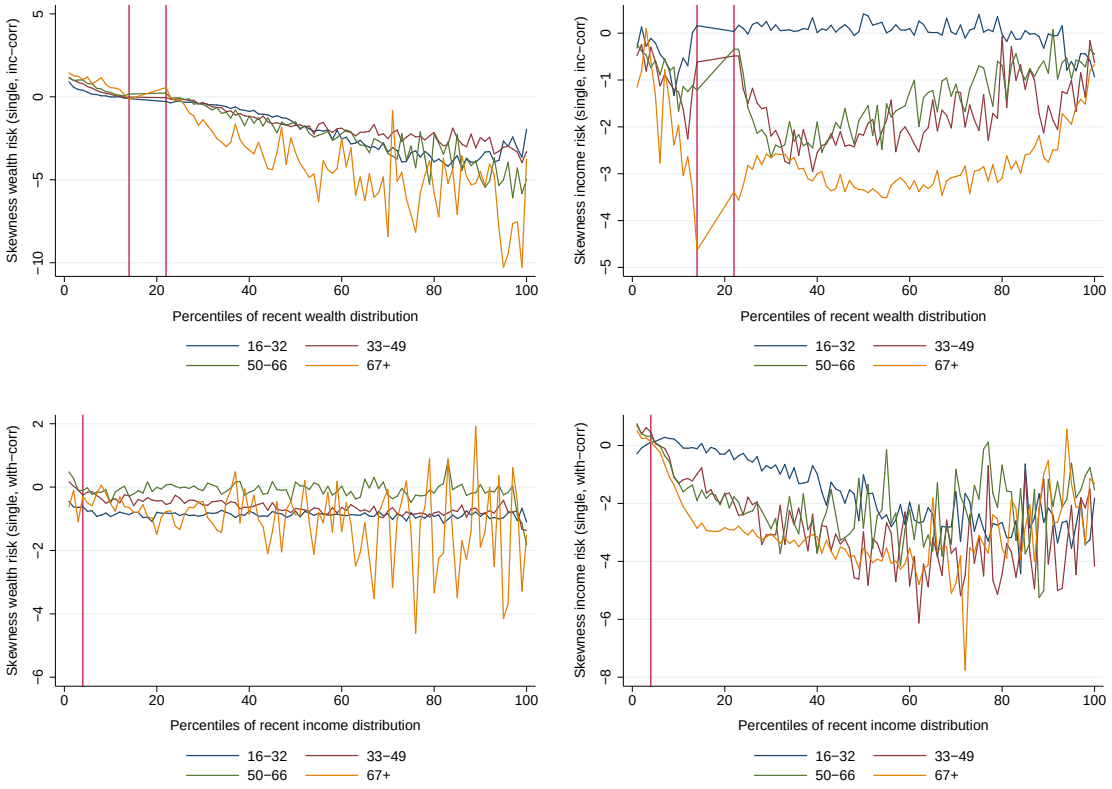

Figure 9: Skewness wealth and income risk across the wealth and income distributions.

tion.[15] Wealth and income both increase most strongly for individuals for whom they were initially negative.

Figure 8 plots standard deviations of wealth growth and income growth by age group and recent wealth and income percentiles as second moment measures of wealth and income risk. The standard deviation of wealth risk over recent wealth in the upper-left panel drops substantially at the 22nd percentile, which includes all individuals with zero recent wealth, because the wealth of many of them remains zero over the subsequent three years. For positive wealth, it follows a U-shaped pattern for the youngest age group, too, whereas for the older age groups it is mostly decreasing. After age 50, the standard deviation is also decreasing in age. This difference in levels across age groups in not visible for negative wealth. The standard deviation of income risk by recent income in the lower-right panel displays the same U-shape pattern as in Guvenen et al. (2015a).

[15]This is in contrast to the pattern that emerges if non-positive wealth is truncated and if we only consider labor earnings above 3,000 CHF per year in Appendix C. Here, wealth growth increases steeply in the position in the recent earnings distribution, see the third panel from the top on the left-hand side of Figure C.1.

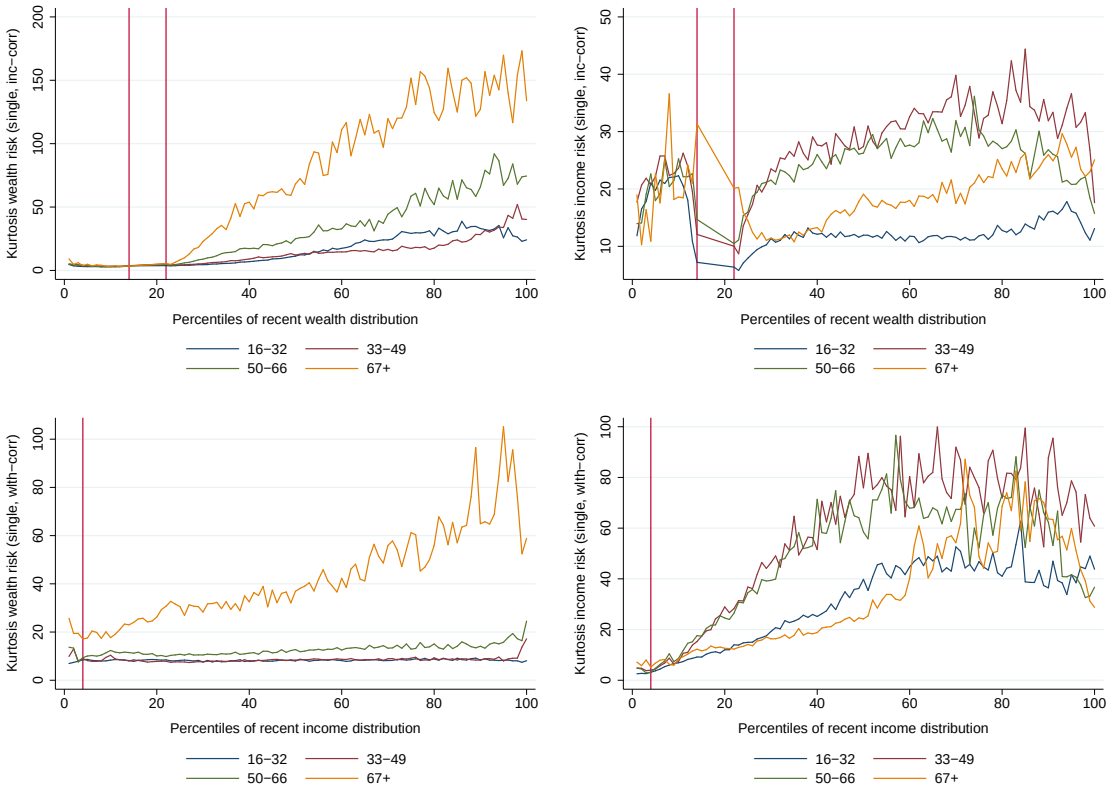

Figure 10: Kurtosis wealth and income risk across the wealth and income distributions.

The increase for higher percentiles is, however, less pronounced than in their US data. The increase in the standard deviation of income risk for higher percentiles of the recent income distribution is sharpest for the oldest age group, presumably because of a high share of capital income.

The negative skewness of wealth risk, displayed in the upper-left panel of Figure 9, gets more negative as recent wealth increases for all age groups. As already documented with US data in Guvenen et al. (2015a), income risk is negatively skewed, and this negative skew follows a U-shaped pattern over recent income. The lower-right panel of Figure 9 confirms that this is true in my data as well. This means that the distribution of income risk is characterized by a long left tail with taxpayers whose incomes fall steeply. This negative skew is most pronounced between around the 70th and 80th percentiles. The lines in my graph are more bumpy, though, because I have fewer observations. The negative skew of wealth risk is, however, strictly becoming more negative with recent wealth as shown in the upper-left panel. As shown in the lower-left panel, the skewness of wealth risk tends to become more negative across recent income percentiles, too, especially for

the oldest age group.

The kurtosis of wealth risk is large and increases over the recent wealth distribution as can be seen in the upper-left panel of Figure 10, in particular for the oldest age group. The higher the kurtosis of a distributions, the fatter its tails. This implies that the older and the richer a group of taxpayers in this graph, the more it is characterized by a large share of taxpayers whose wealth does not change much at all on the one hand, and a small share of taxpayers whose wealth changes substantially on the other hand. The kurtosis of income risk over income is not strictly increasing, but follows an inverse U-shaped pattern as shown in the lower-right hand panel of Figure 10. The kurtosis of wealth risk in the oldest age group also increases over recent income percentiles, whereas it is mostly flat for the younger age groups.

4.3 Patterns across wealth and income risk

The analysis of the effects of higher-order moments of the distribution of income risk on wealth accumulation was pioneered by Guvenen et al. (2015a). They review a number of theoretical models that provide mechanisms for how higher-order moments of the income risk distribution can generate highly unequal wealth distributions. Lise (2013), for example, shows that negatively skewed income risk can result in a very unequal wealth distribution, and Castaneda et al. (2003) show that the same is true if income risk displays high kurtosis. Even though I cannot observe the precise mechanisms behind wealth concentration because wealth inequality did not increase between 2001 and 2015, I can examine whether there is a correlation between households' wealth accumulate and the tails of the income risk distribution.

Figure 11 show scatter plots with higher-order moments of income risk on the x-axis and mean wealth risk by recent income percentile on the y-axis for the youngest age group in my analysis. All observations in this figure are the same as in Section 4.2 above. The numbers next to each observation in these graphs indicate recent wealth or recent income percentiles. The left-hand side panels use moments calculated by recent income percentile, the right-hand side panels use moments calculated by recent wealth panels.

Among the young in my sample, who are more likely to accumulate and thus display

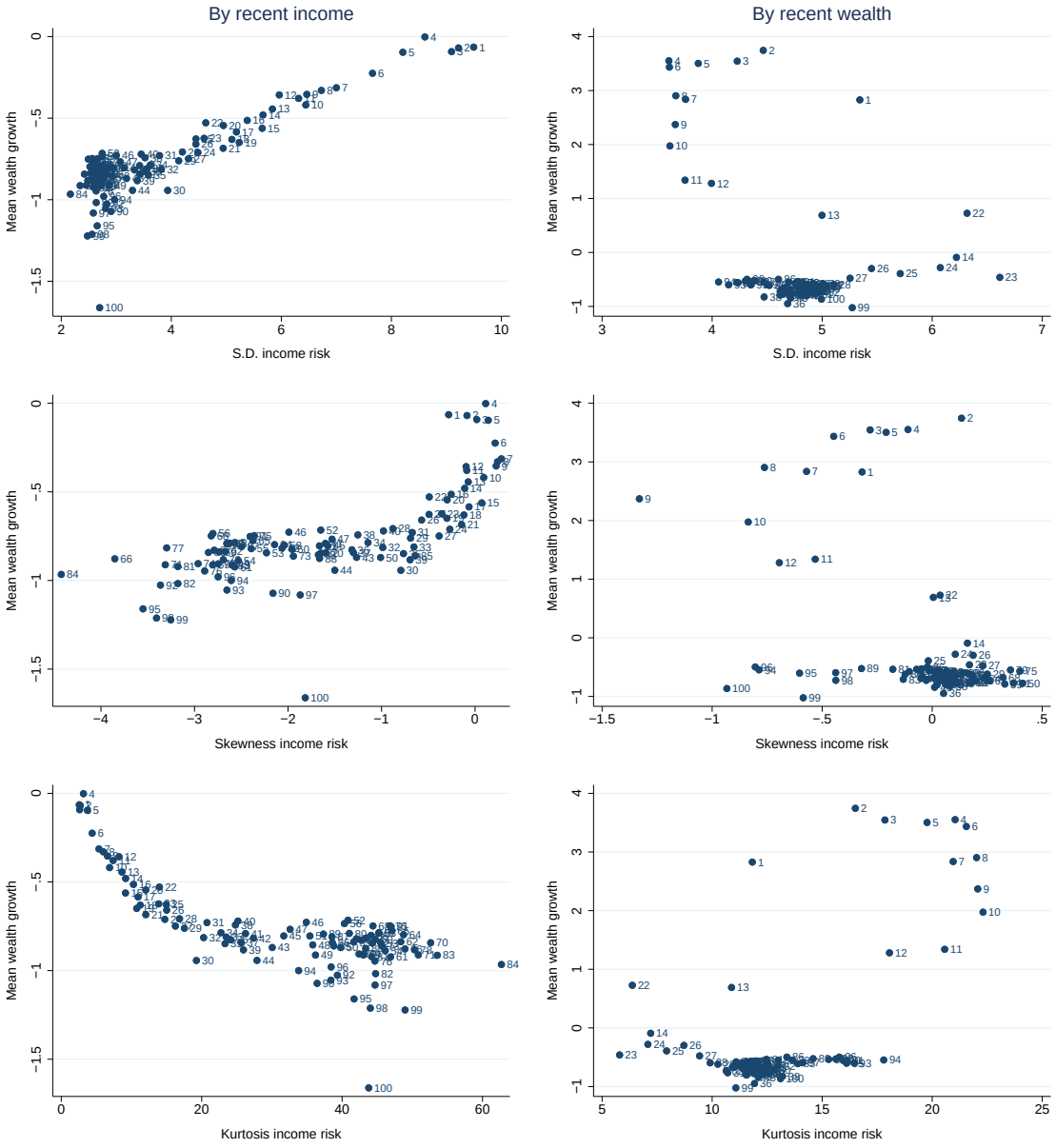

Figure 11: Mean wealth growth and higher moments income risk for age 16-32, by recent wealth and recent income percentile respectively.

positive wealth growth, mean wealth growth per recent income percentile is positively correlated with the standard deviation and with skewness of income risk per recent income percentile, but negatively correlated with the kurtosis of income risk per recent income percentile. These signs on skewness and kurtosis are the opposite of what one would expect if the young did accumulate wealth as insurance again tail income risk. By recent wealth, no clear patterns can be seen immediately. It becomes, however, obvious that we need to distinguish between zero or negative recent wealth on the one hand, and positive recent wealth on the other.[16]

To examine how the moments of the income risk distribution map into wealth growth in more detail, I turn to the individual data. I merge the empirical moments of the income risk distribution that an individual may expect conditional on their position in the recent income distribution and examine how this is related to wealth accumulation. More specifically, I will run regressions of individual wealth growth on moments of the income risk distribution by recent income percentile

$$\begin{aligned}\Delta \ln \hat{y}_{itp}^{w,w} &= \alpha + \beta_1 \cdot mn_p^{ir} + \beta_2 \cdot sd_p^{ir} + \beta_3 \cdot sk_p^{ir} + \beta_4 \cdot ku_p^{ir} + \beta_5 \cdot mn_p^{wr} + \beta_6 \cdot sd_p^{wr} \\ &\quad + \beta_7 \cdot sk_p^{wr} + \beta_8 \cdot ku_p^{wr} + \gamma \cdot married_{it} + \delta \cdot age_{it} + \lambda_t + \varepsilon_{it},\end{aligned}$$

where $\Delta \ln \hat{y}_{itp}^{w,w}$ is the 3-year change in log wealth of individual i in year t and percentile p of the recent wealth distribution, mn, sd, sk and ku are the percentile-specific first through fourth moments of income growth and risk ir and wealth growth and risk wr, $married$ is a marriage dummy, age is a vector of age dummies and λ_t is a year fixed effect. Table 2 shows the resulting output. I include specifications that do not control for higher-order moments of the wealth risk distribution, which substantially affect the interpretation.[17] There emerges a pattern, where taxpayers in recent income percentiles with more positive income shocks also tend to accumulate more wealth. This holds across all age groups and regression specifications. For the oldest age group, I observe that higher dispersion in income risk tends to be associated with higher wealth growth.

The coefficients on skewness and kurtosis of income risk give an idea whether the

[16] Corresponding graphs for older age groups yield less clear pictures.

[17] Note that the dependent variable is included when calculating the income percentile-specific moments of wealth risk. But given the number of observations, this is not likely to bias the results.

Table 2: WEALTH GROWTH PATTERNS BY RISK MOMENTS BY PERCENTILES RECENT INCOME IN INDIVIDUAL DATA.

	16-32		33-49		50-66		67 +	
Mean inc growth by inc	0.1465***	0.0530***	0.0534**	0.0273**	0.1054***	0.0479***	0.0650***	0.0231*
	(0.0275)	(0.0157)	(0.0209)	(0.0136)	(0.0215)	(0.0178)	(0.0127)	(0.0128)
S.D inc risk by inc	-0.0115	-0.0028	-0.0014	-0.0415***	-0.0405***	-0.0193**	0.0578***	0.0336***
	(0.0242)	(0.0155)	(0.0106)	(0.0096)	(0.0131)	(0.0097)	(0.0070)	(0.0087)
Skewn. inc risk by inc	0.0232	0.0155**	0.0066	-0.0022	0.0022	-0.0042	-0.0005	-0.0047*
	(0.0150)	(0.0107)	(0.0090)	(0.0050)	(0.0071)	(0.0037)	(0.0028)	(0.0027)
Kurt. inc risk by inc	-0.0075***	-0.0024*	-0.0043***	-0.0026***	0.0003	0.0001	0.0014***	0.0010***
	(0.0016)	(0.0012)	(0.0005)	(0.0004)	(0.0005)	(0.0003)	(0.0002)	(0.0001)
S.D wealth risk by inc		-0.3641***		-0.0183		0.1049***		0.1280***
		(0.0596)		(0.0293)		(0.0373)		(0.0257)
Skewn. wlth risk by inc		0.7805***		0.7783***		0.3619***		0.0428***
		(0.1252)		(0.0801)		(0.0236)		(0.0041)
Kurt. wlth risk by inc		0.1169***		0.0651***		0.0055*		0.0030***
		(0.0334)		(0.0115)		(0.0030)		(0.0003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	838,506	838,506	1,240,076	1,240,076	1,232,671	1,232,671	917,599	917,599
R^2	0.0060	0.0064	0.0015	0.0016	0.0016	0.0019	0.0009	0.0011

Notes: Income risk moments and wealth risk moments are measured by recent income percentiles. Other controls include age and year dummies as well as a dummy indicator for marital status. Standard errors clustered at recent income percentiles. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

mechanisms outlined in Guvenen et al. (2015a) hold in my data. Only for the oldest age group are the signs on skewness and kurtosis of income risk as expected. That individuals accumulate wealth as insurance against tail risk in the income distribution may thus hold for older age groups, but not for younger age groups, and the evidence for an effect of kurtosis appears to be stronger. Hence, high kurtosis of income risk may lead to high wealth growth among older age groups.

Table 3 repeats the same analysis as before, but this time all moments of the recent wealth and recent income distributions are calculated conditional on recent wealth percentiles. Here, I distinguish whether recent income was negative or positive, and always include controls for percentile-specific moments of the wealth risk distribution. The estimates in this table confirm that there is little evidence in my data that wealth accumulation is related to the tails of the income risk distribution. The signs, magnitudes and levels of statistical significance on the skewness and kurtosis of income risk vary substantially across age groups and positive and negative recent wealth samples. The coefficients in Tables 2 and 3 remain unchanged if I include moments by recent wealth percentiles and by recent income percentiles in the same regression. Finally, Appendix D show results of regressions that explain income growth with percentile-specific expected moments of the wealth risk distribution. No clear patterns emerge from the results in Tables D.1 and D.2.

Concerning the literature that relates rising wealth concentration to differences in returns to financial assets (Fagereng et al., 2016; Bach et al., 2016), bequests (De Nardi, 2004) or saving rates Benhabib and Bisin (forthcoming) across the wealth distribution, my data do not yield a clear conclusions. First, the highest increases in wealth are achieved by individuals who started out with negative wealth. Among individuals with positive wealth, Figure 7 shows a very slight upward trend in mean wealth growth for recent wealth above around the 30th percentile. But note that this does not hold for the youngest age group and neither if I only consider positive recent wealth as shown in Appendix Figure C.1.

The presence of wealth taxation may affect link between income risk and wealth accumulation (Krueger and Ludwig, 2018). Appendix E, therefore repeats the analysis in this and the previous section eliminating all wealth tax payers. The results in Table E.1 do not change substantially compared to Table 2. The relation between wealth growth and recent income-specific kurtosis of income risk becomes stronger for the 50-66 age group,

Table 3: WEALTH GROWTH PATTERNS BY RISK MOMENTS BY PERCENTILES RECENT WEALTH IN INDIVIDUAL DATA.

	16-32		33-49		50-66		67 +	
	RW ≤ 0	> 0	≤ 0	> 0	≤ 0	> 0	≤ 0	> 0
Mean inc growth by wlth	0.4526	0.6516***	1.1443	0.3849	-1.1250	0.6580**	-0.5089*	0.1516***
	(1.3541)	(0.2027)	(1.5076)	(0.3979)	(2.3593)	(0.2686)	(0.2778)	(0.0425)
S.D inc risk by wlth	-0.4091	0.2921***	0.6282	0.2384*	1.0287**	0.1038	-0.2977**	-0.0737
	(0.3292)	(0.0528)	(0.3970)	(0.1279)	(0.3661)	(0.0958)	(0.1076)	(0.0582)
Skewn. inc risk by wlth	-0.3042**	0.0227	0.0804	0.0202	0.1117	0.0307	0.0587*	0.0172
	(0.1081)	(0.0177)	(0.2224)	(0.0246)	(0.1765)	(0.0199)	(0.0303)	(0.0104)
Kurt. inc risk by wlth	0.0056	-0.0018	0.0374	-0.0049**	0.0439***	-0.0055***	-0.0112	0.0004
	(0.0125)	(0.0021)	(0.0209)	(0.0024)	(0.0136)	(0.0019)	(0.0092)	(0.0013)
S.D wealth risk by wlth	-0.8015***	-0.1204***	-0.2966	-0.2924***	0.2340	0.0715***	0.3565***	0.0783
	(0.2381)	(0.0347)	(0.2453)	(0.0283)	(0.1501)	(0.0188)	(0.0700)	(0.0431)
Skewn. wlth risk by wlth	3.8569***	0.5640***	2.5170***	0.3258***	2.1964***	0.0605***	1.3115***	0.0082**
	(0.7685)	(0.0733)	(0.5489)	(0.0516)	(0.4209)	(0.0179)	(0.3686)	(0.0032)
Kurt. wlth risk by wlth	-1.4422***	0.0610***	-1.3396***	0.0072**	-1.5374***	0.0034***	-0.5732***	0.0010***
	(0.4968)	(0.0062)	(0.3172)	(0.0030)	(0.2816)	(0.0009)	(0.1809)	(0.0003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	171,912	666,594	318,835	921,241	216,305	1,016,366	51,434	866,165
R^2	0.0162	0.0114	0.0154	0.0053	0.0362	0.0028	0.0243	0.0020

Notes: Income risk moments and wealth risk moments are measured by recent wealth percentiles. Other controls include age and year dummies as well as a dummy indicator for marital status. Standard errors clustered at recent wealth percentiles. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

whereas the skewness effect changes its sign.

5 Implications for wealth taxation

In recent years, the introduction of a wealth tax has become increasingly popular as a means to address increasing inequality in the US and other countries (Piketty et al., 2013). Fagereng et al. (2016) interpret their finding that individual fixed effects account for the major share of the positive correlation between their measure of wealth, financial assets, and returns on these financial assets as support for wealth taxation. This is intuitive for two reasons. First, their finding means that the poor will miss out on high returns, and a redistribution of higher endowments from the rich to the poor may not entail huge distortions of incentives. Second, replacing a capital income tax with a wealth tax may increase efficiency because it reallocates capital from low-return to high-return individuals and gives these high-return individuals an incentive to accumulate more capital (see Guvenen et al., 2015b, for a formalization of this argument). If, however, higher risk exposure explains the positive correlation between wealth and returns as found in Bach et al. (2016) and in Fagereng et al. for the very top of the wealth distribution, the desirability of taxes on wealth (and on capital income) will depend on whether these taxes distort incentives to acquire information about financial assets.

The findings in this paper show that a wealth tax would miss out on the many high-income individuals with negative net wealth. Whereas Fagereng et al. (2016) and Bach et al. (2016) find a positive correlation between financial assets and returns on these assets, no study has, so far, been able to examine the relationship between financial assets, net wealth and returns jointly along the distribution of net wealth. While I have no information on returns to financial assets, my results suggest that the highest net-wealth individuals do not necessarily tend to have the largest increases in net wealth or in incomes. As shown in Figures 3 and 4, people with low net wealth are not necessarily poor. The negative correlation between income and net wealth below zero net wealth indicates an increasing share of high-income investors in negative net wealth.

Most importantly, the capacity to tax wealth crucially depends on how elastically wealth reacts to taxes changes. That these elasticities may differ from elasticities reported

in the literature on taxable income is not taken into account by the papers mentioned above. The empirical literature in this area is still sparse. Three recent papers (Zoutman, 2015; Brülhart et al., 2016; Jakobsen et al., 2018) suggest that the elasticity of taxable wealth is large and may even exceed the one reported in the taxable income literature.[18] As pointed out above, Figure 6 shows that wealth risk is more dispersed than income risk, which is, in turn, more dispersed than earnings risk. The emerging literature on the elasticity of taxable wealth suggests that these dispersed changes in log wealth may be not just noise, but that wealth reacts strongly to changes in wealth taxes.

Finally, my results have implications for theories of optimal wealth taxation. Jakobsen et al. (2018), for example, develop a model, which assumes that the rich, who would have to pay wealth taxes, are mostly older people who are likely interested in residual wealth, whereas the precautionary motive is assumed to be of second order. The empirical results in this paper, however, suggest that, if anyone, it is precisely older generations that care about tail income risk. Time horizon may thus affect savings differently than is generally thought. One reason why the young care less about expected tail income risk, may be that the income they receive over the subsequent three years is a smaller fraction of their expected remaining life-time income, and they may expect that income in later periods may make up for adverse shocks over the subsequent three years.

6 Conclusion

A disproportionate share of individuals whose debt exceeds their gross stock wealth and who thus have negative net wealth receive high incomes. These leveraged individuals, moreover, tend to achieve high increases in both wealth and incomes in subsequent years. Redistribution from high-wealth individuals to low-wealth individuals may, therefore, lead to opposite outcomes than redistribution from high-income to low-income individuals.

The finding that wealth risk is more dispersed than income risk may come, at first, as a surprise. After all, wealth is a stock variable, which seems to remain more constant

[18] Note mind that Seim (2017) estimates a much smaller elasticity using bunching at kinks in the Swedish wealth tax code.

over time than income, which is a flow variable. Analogies that may come to mind are rocks for stock variables and rivers for flow variables. Rivers appear to react more easily to external influences and are often diverted. But this analogy does not hold for income flows and wealth stocks. In fact income flows are more stable over time and less elastic to taxation than wealth stocks. This may explain why the elasticities reported in the literature on taxable wealth exceed the elasticities in the literature on the taxable income.

The results presented in this paper provide very little evidence that income risk helps explain wealth accumulation. If anything, wealth of individuals age 50 older including retirees tends to increase more (or decrease less) if income risk displays a distribution that is characterized by high kurtosis. The distributional properties of wealth risk and income risk I document are, however, in line with a stable wealth distribution. To examine the precise mechanisms behind the transition towards increasing inequality, one would have to conduct similar exercises with data for countries and periods that experienced increases in inequality.

My data do not allow me to link wealth accumulation to consumption, savings, returns to capital, bequests or other potential sources. Here, progress has already been made in the complementary studies by Bach et al. (2016) and Fagereng et al. (2016). Future extensions of this line of research will crucially depend on the availability of data. Similar information is not yet available for countries and episodes where inequality has increased substantially in recent decades, such as the US.

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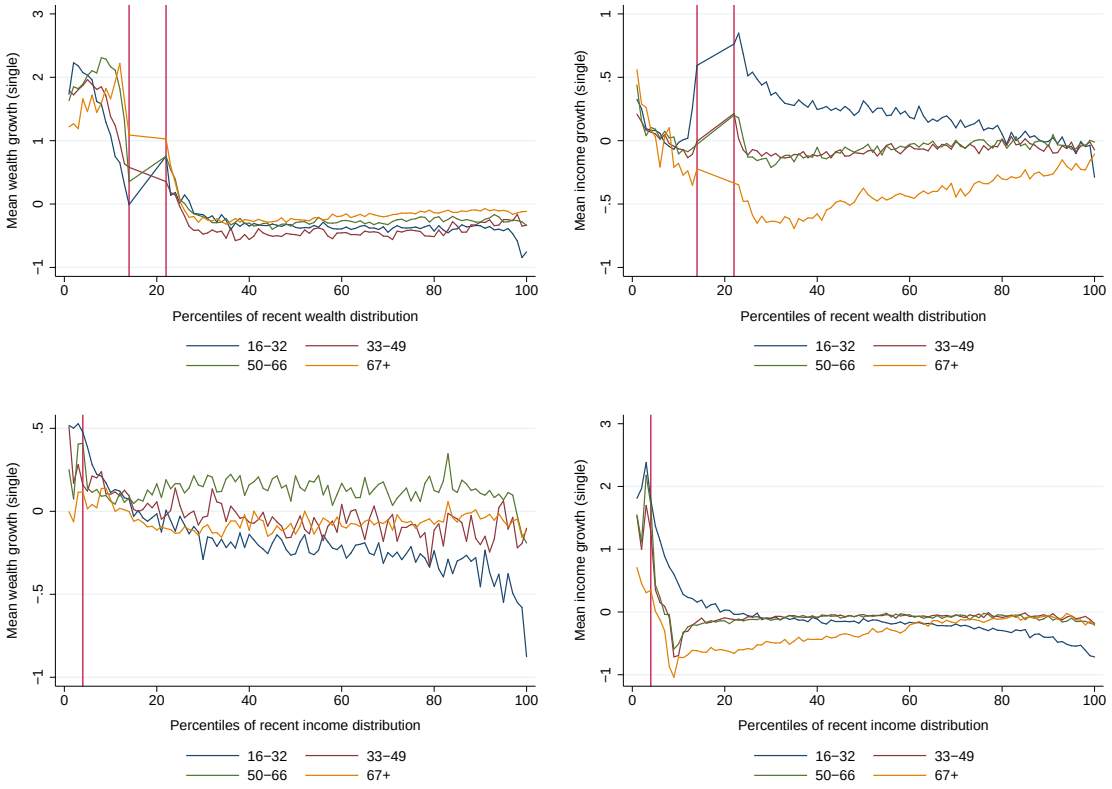

Figure A.1: Mean wealth and income growth across the wealth and income distributions.

A Uncorrected distributions

The figures in this Section are analogous to Figures 7 to 10, but do not hold growth constant at the 50th recent income percentile when examining variation across the recent wealth distribution, and do not hold growth constant at the 50th recent wealth percentile when examining variation across the recent income distribution.

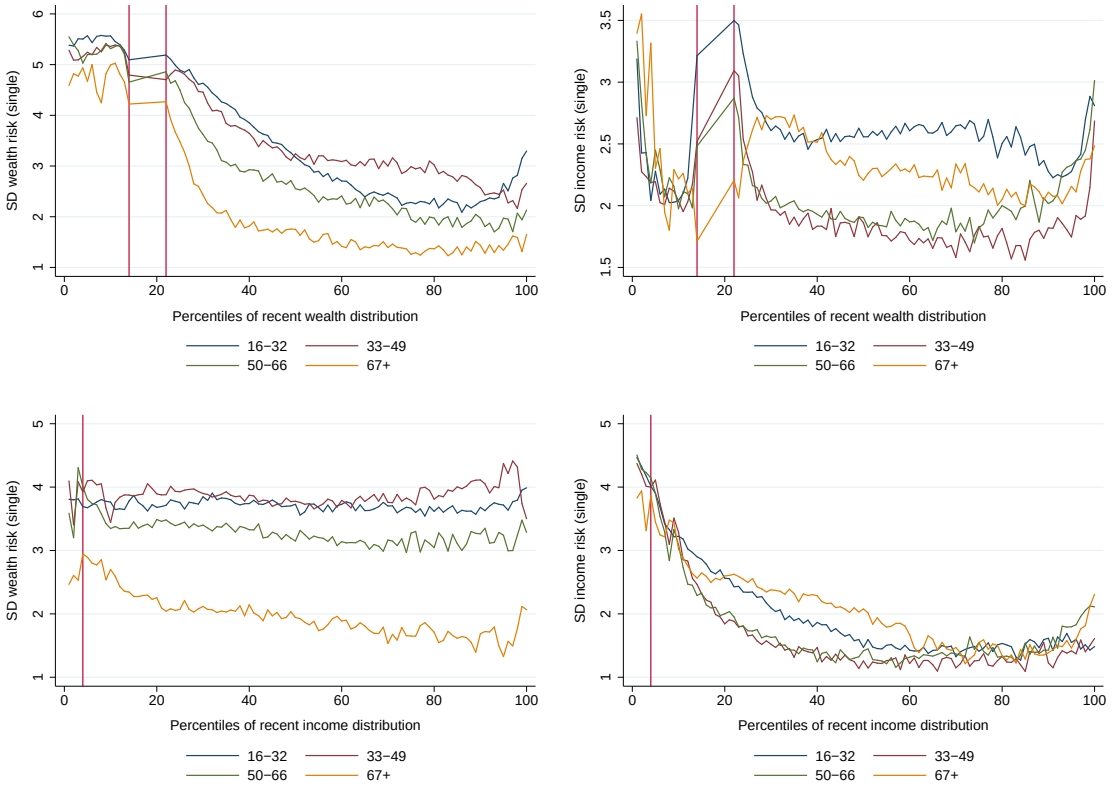

Figure A.2: S.D. wealth and income risk across the wealth and income distributions.

B Moment distributions for married couples

The figures in this Section are analogous to Figures 7 to 10, but display patterns for married households rather than for singles. Left-hand side panels are not corrected for location in the recent income distribution (when examining variation across the recent wealth distribution) and for location in the recent wealth distribution (when examining variation across the recent income distribution), whereas right-hand side panels hold these constant at 50th percentiles.

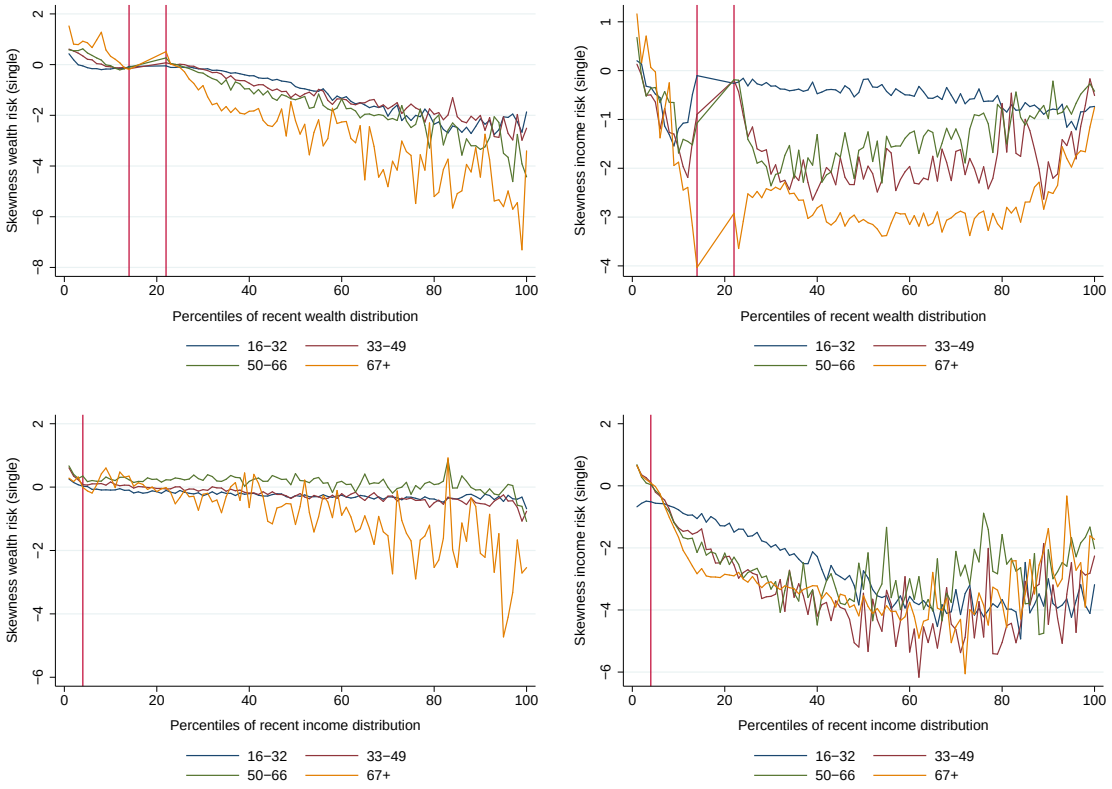

Figure A.3: Skewness wealth and income risk across the wealth and income distributions.

C Moment distributions for labor earnings and positive wealth of working-age population

The figures in this Section are analogous to Figures 7 to 10, but only consider positive wealth and labor earnings above 3,000 CHF. Left-hand side panels display patterns for singles and right-hand side panels for married households. All graphs correct for location in the recent income distribution when examining variation across the recent wealth distribution and for location in the recent wealth distribution when examining variation across the recent income distribution.

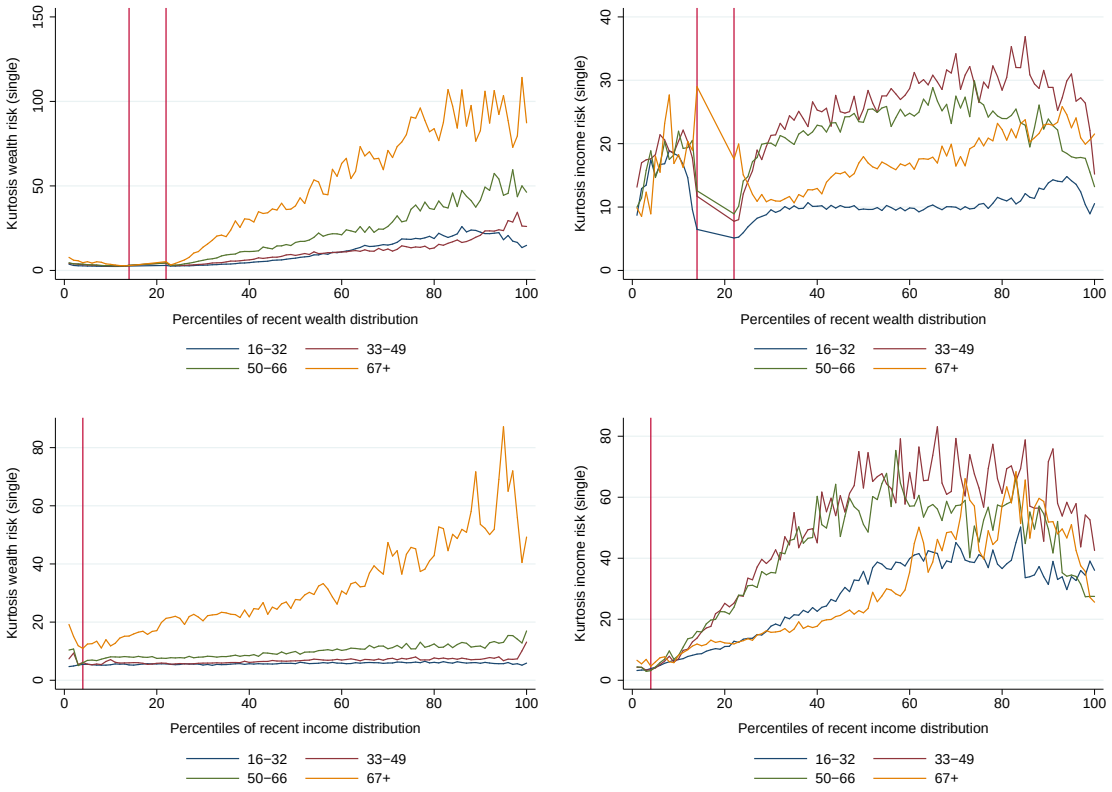

Figure A.4: Kurtosis wealth and income risk across the wealth and income distributions.

D Income growth

The tables in this section show regression output that is analogous to Tables 3 and 2, but with income growth as the dependent variable.

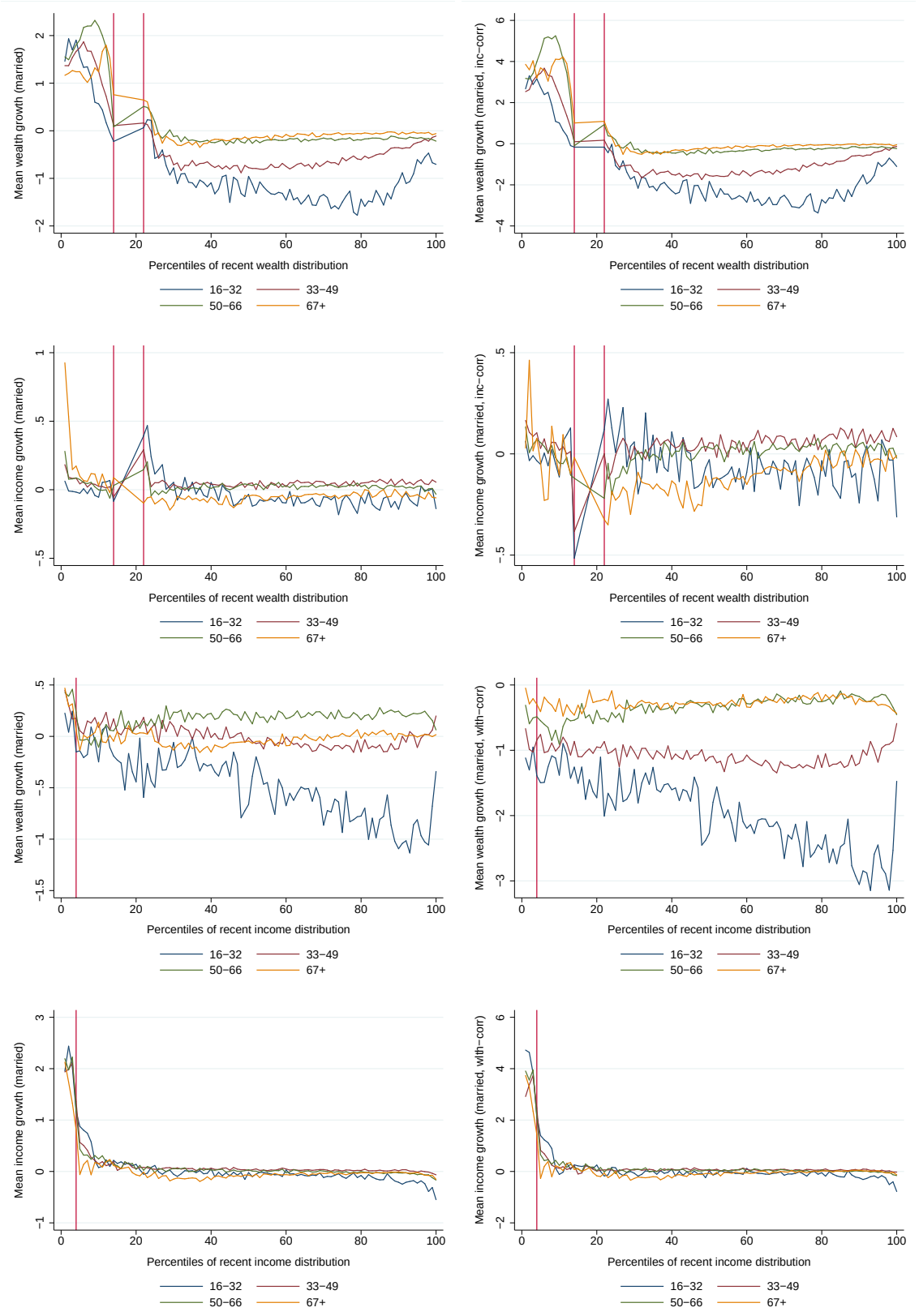

Figure B.1: Mean wealth and income growth across the wealth and income distributions.

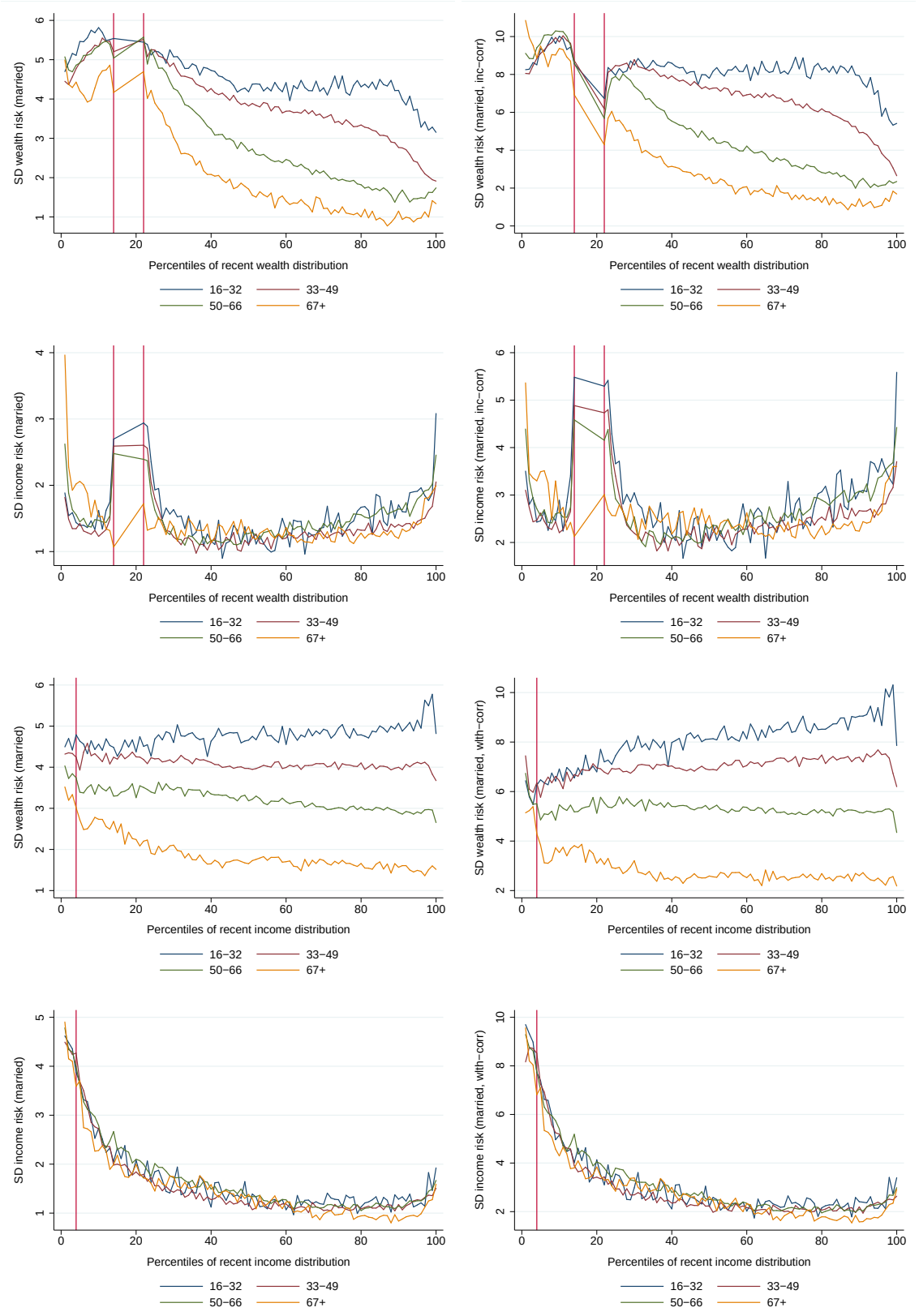

Figure B.2: S.D. wealth and income risk across the wealth and income distributions.

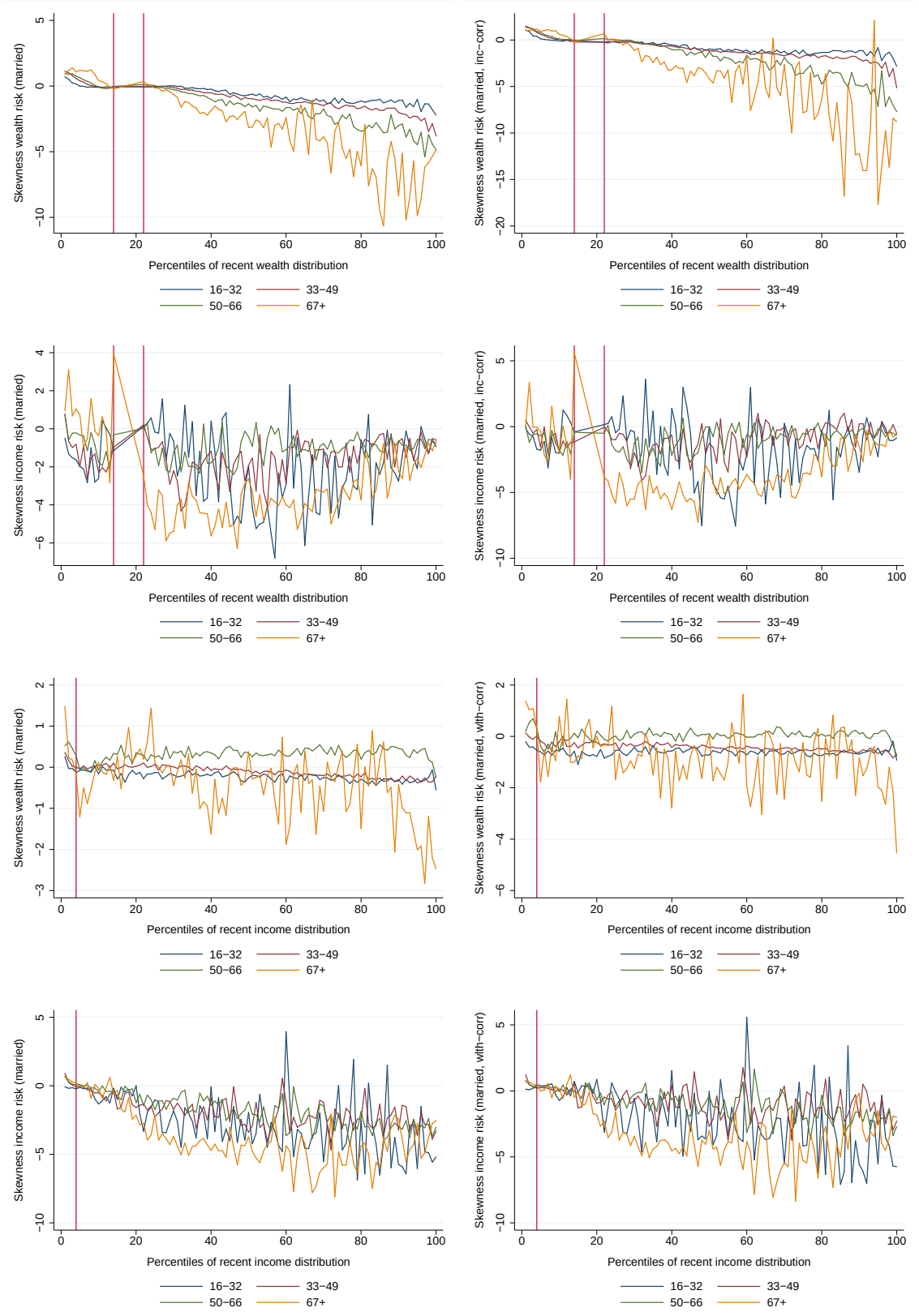

Figure B.3: Skewness wealth and income risk across the wealth and income distributions.

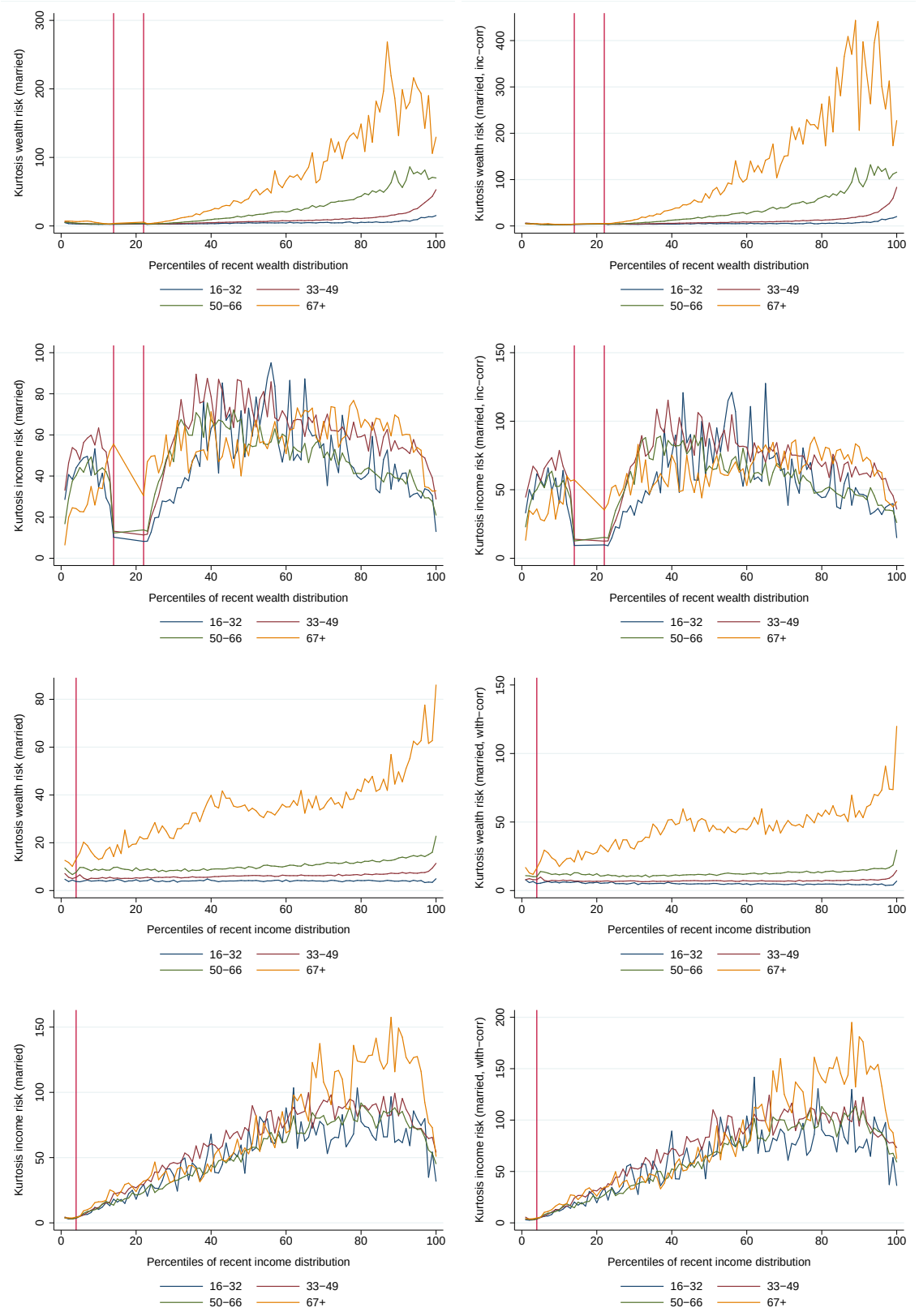

Figure B.4: Kurtosis wealth and income risk across the wealth and income distributions.

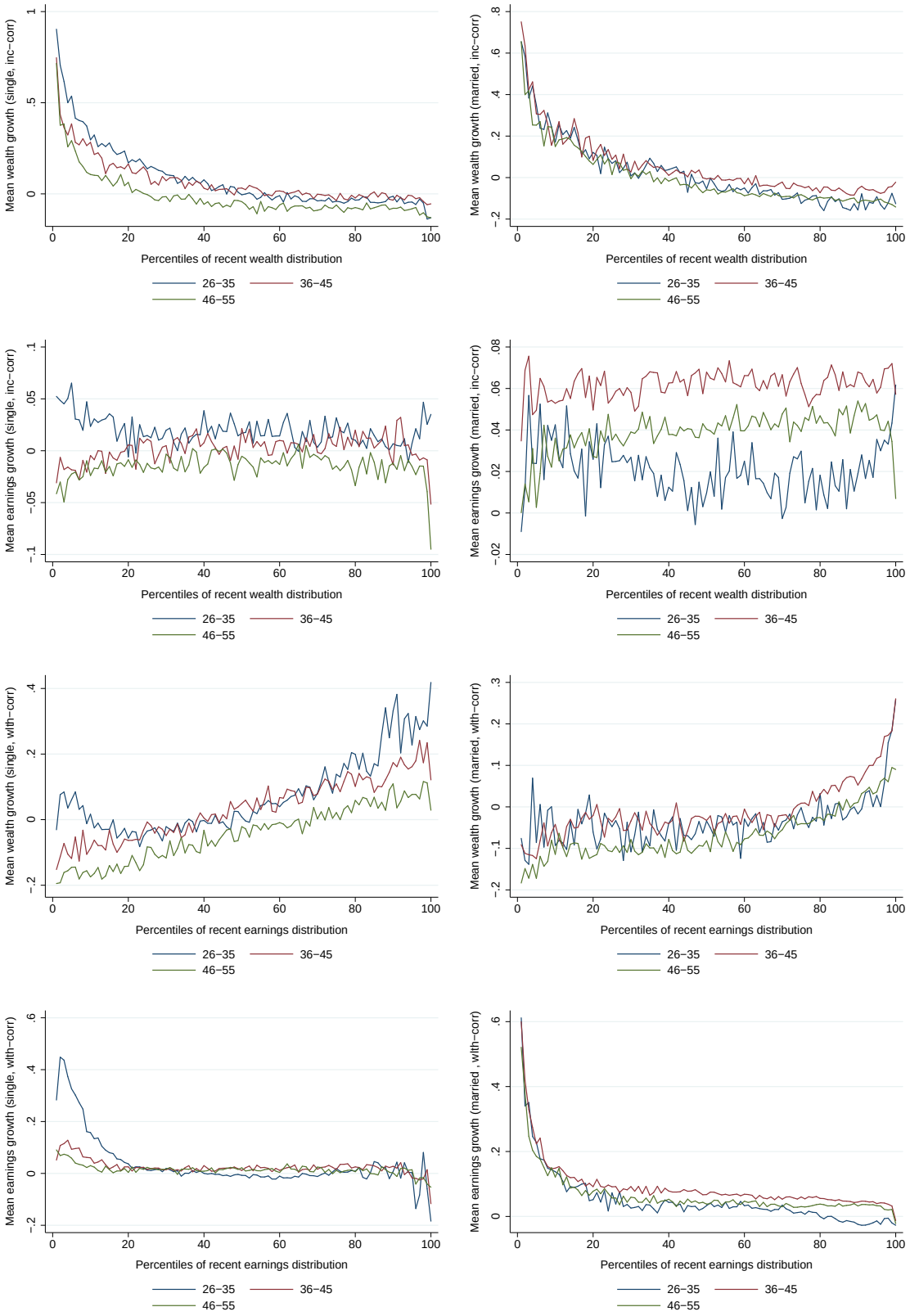

Figure C.1: Mean wealth and earnings growth across the wealth and earnings distributions.

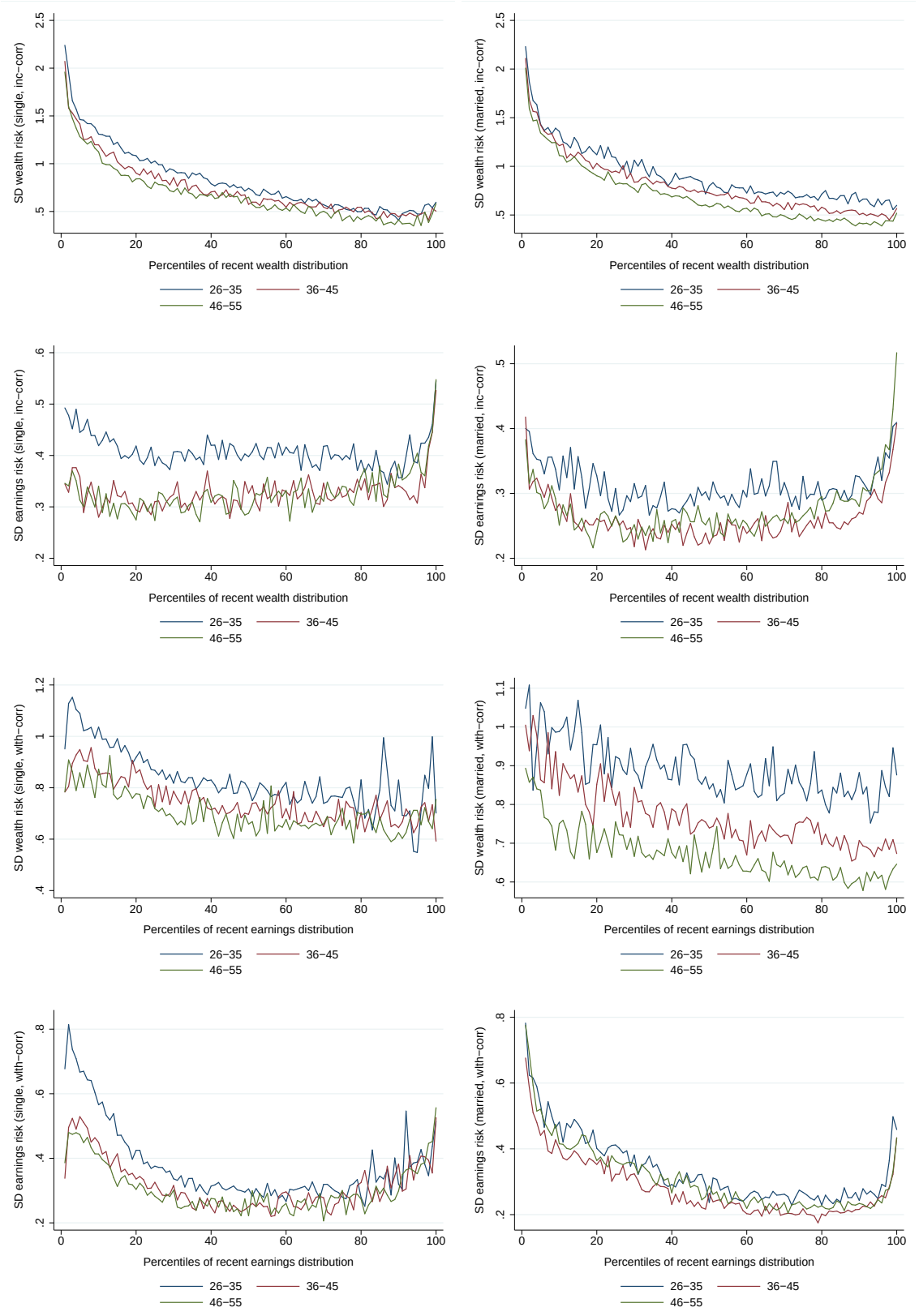

Figure C.2: S.D. wealth and earnings risk across the wealth and earnings distributions.

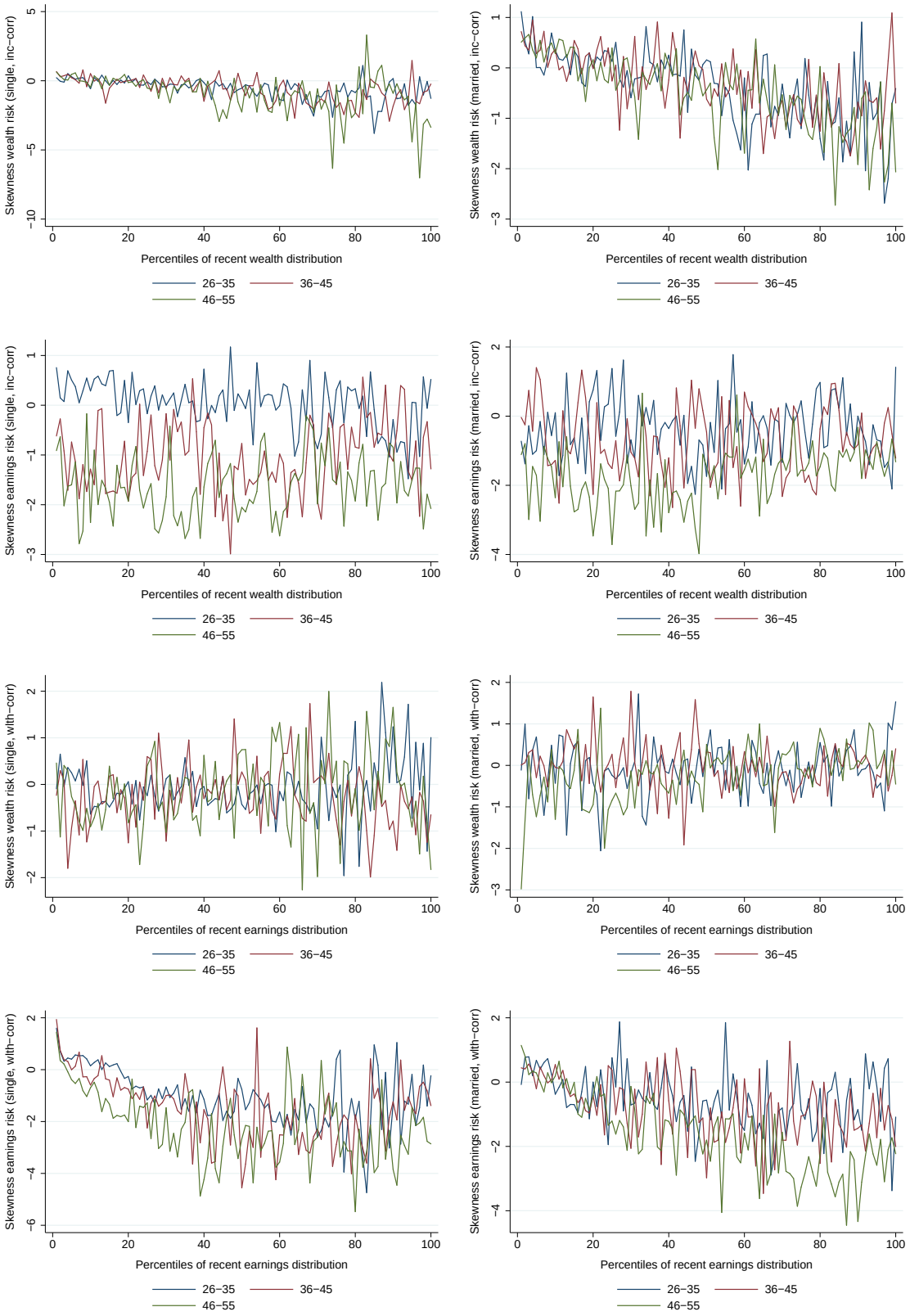

Figure C.3: Skewness wealth and earnings risk across the wealth and earnings distributions.

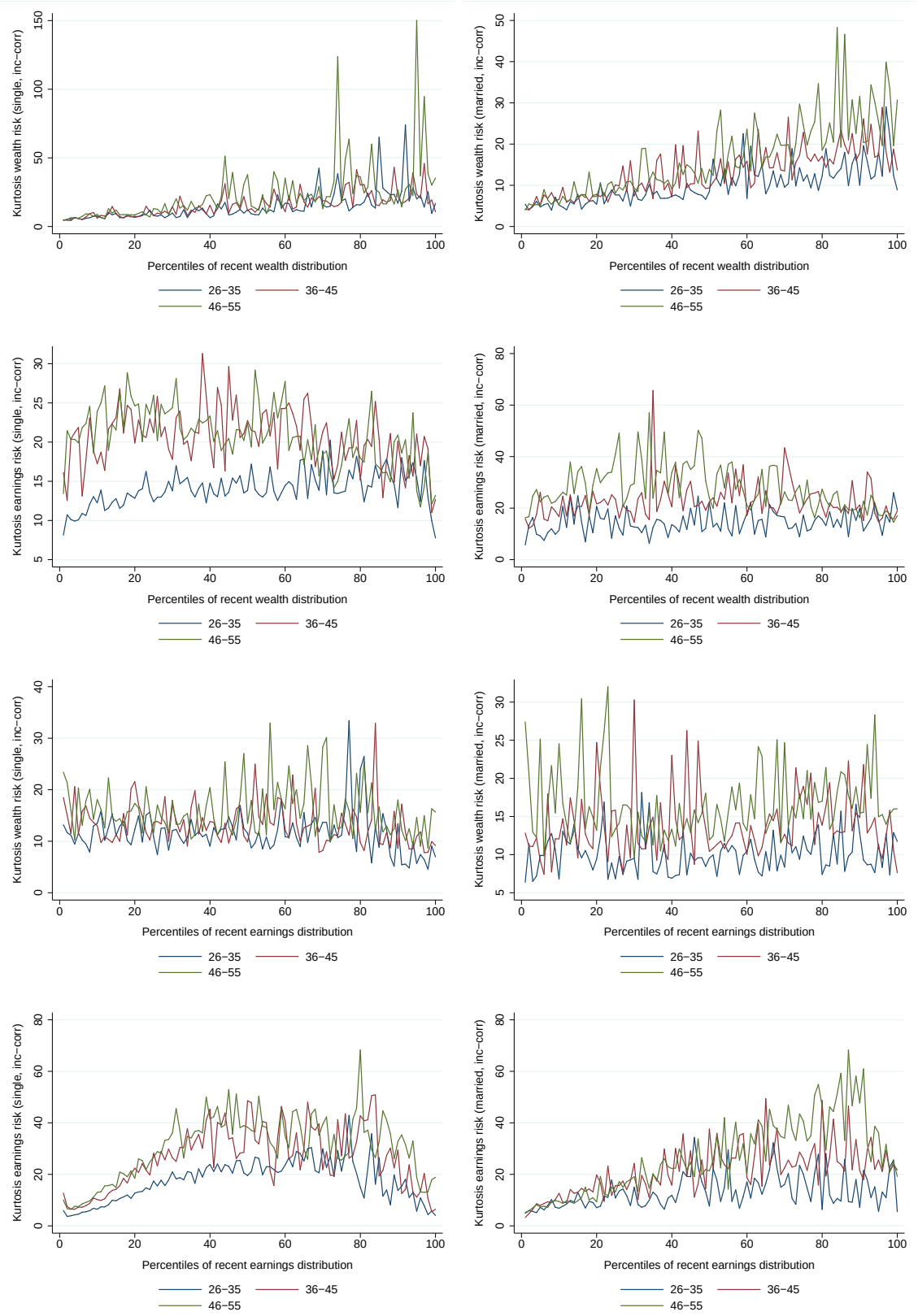

Figure C.4: Kurtosis wealth and earnings risk across the wealth and earnings distributions.

Table D.1: INCOME GROWTH PATTERNS BY RISK MOMENTS BY PERCENTILES RECENT INCOME IN INDIVIDUAL DATA.

	16-32		33-49		50-66		67 +	
Mean wlth growth by inc	1.1760***	0.3947***	-0.3691	-0.5028	-1.0310**	0.1043	0.8175	0.6162
	(0.4490)	(0.1372)	(0.5697)	(0.3876)	(0.5000)	(0.3131)	(0.6012)	(0.6856)
S.D wlth risk by inc	-1.7220***	-0.7649***	-0.2890	0.2169	1.0058**	1.1599***	0.6006*	1.1386***
	(0.2221)	(0.2090)	(0.3178)	(0.2253)	(0.4340)	(0.2614)	(0.3251)	(0.2775)
Skewn. wlth risk by inc	-0.0236	-0.0274	0.0042	-0.0042	-0.0009	-0.0081**	-0.0079***	-0.0061**
	(0.0199)	(0.0208)	(0.0095)	(0.0055)	(0.0068)	(0.0037)	(0.0025)	(0.0024)
Kurt. wlth risk by inc	-1.4680***	-0.5771***	0.0081	-0.0007	0.0079	0.0222	0.0196***	0.0168***
	(0.1757)	(0.1153)	(0.0438)	(0.0325)	(0.0250)	(0.0207)	(0.0054)	(0.0060)
S.D income risk by inc		0.6883***		0.3059**		0.4705***		-0.3215***
		(0.0794)		(0.1181)		(0.1127)		(0.0757)
Skewn. inc risk by inc		-0.0702***		-0.0001		0.0309*		0.0248*
		(0.0218)		(0.0155)		(0.0172)		(0.0146)
Kurt. inc risk by inc		0.0332***		0.0044		0.0141***		-0.0027***
		(0.0040)		(0.0028)		(0.0036)		(0.0009)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	800,537	800,537	1,207,028	1,207,028	1,211,658	1,211,658	909,324	909,324
R^2	0.0739	0.0853	0.0019	0.0071	0.0058	0.0175	0.0359	0.0377

Notes: Income risk moments and wealth risk moments are measured by recent income percentiles. Other controls include age and year dummies as well as a dummy indicator for marital status. Standard errors clustered at recent income percentiles. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D.2: INCOME GROWTH PATTERNS BY RISK MOMENTS BY PERCENTILES RECENT WEALTH IN INDIVIDUAL DATA.

	16-32		33-49		50-66		67 +	
	RW ≤ 0	> 0	≤ 0	> 0	≤ 0	>0	≤ 0	> 0
Mean wlth growth by wlth	0.0477**	0.1941***	0.0206	0.0958***	0.0266	0.2740***	0.0189	0.1831
	(0.0180)	(0.0719)	(0.0237)	(0.0211)	(0.0175)	(0.0575)	(0.0760)	(0.1436)
S.D wlth risk by wlth	0.0116	0.0696**	0.0517**	0.0528***	-0.0067	-0.0018	0.0527	-0.0551***
	(0.0317)	(0.0314)	(0.0214)	(0.0082)	(0.0130)	(0.0061)	(0.0356)	(0.0188)
Skewn. wlth risk by wlth	-0.1699	-0.0901	0.0934	-0.0611***	0.0407	-0.0204***	0.0350	-0.0022*
	(0.0995)	(0.0901)	(0.0817)	(0.0138)	(0.0499)	(0.0066)	(0.1777)	(0.0045)
Kurt. wlth risk by wlth	0.0229	-0.0197**	-0.0293	0.0004	0.0501	-0.0005	0.1853***	-0.0004*
	(0.0629)	(0.0085)	(0.0396)	(0.0009)	(0.0335)	(0.0004)	(0.0557)	(0.0003)
S.D income risk by wlth	0.4566***	0.2491***	0.3194***	-0.0861**	0.2787***	-0.0257	0.2992**	-0.5377***
	(0.0382)	(0.0636)	(0.0828)	(0.0385)	(0.0517)	(0.0283)	(0.1392)	(0.0450)
Skewn. inc risk by wlth	0.1043***	0.0434***	0.0544**	0.0400***	0.0698***	0.0555***	0.0677**	0.0817***
	(0.0294)	(0.0077)	(0.0228)	(0.0038)	(0.0191)	(0.0063)	(0.0241)	(0.0190)
Kurt. inc risk by wlth	0.0150***	0.0063***	0.0014	-0.0004	0.0080***	0.0031***	0.0161***	-0.0089***
	(0.0020)	(0.0014)	(0.0023)	(0.0008)	(0.0020)	(0.0007)	(0.0051)	(0.0012)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	155,746	644,791	303,336	903,692	208,234	1,003,424	49,894	859,430
R^2	0.0252	0.0093	0.0022	0.0016	0.0066	0.0016	0.0243	0.0358

Notes: Income risk moments and wealth risk moments are measured by recent wealth percentiles. Other controls include age and year dummies as well as a dummy indicator for marital status. Standard errors clustered at recent wealth percentiles. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

E Analysis without wealth tax payers

The figures in this Section are analogous to Figures 7 to 10, but only consider individuals and households with net wealth below the taxable wealth threshold. Left-hand side panels display patterns for singles and right-hand side panels for married households. All graphs correct for location in the recent income distribution when examining variation across the recent wealth distribution and for location in the recent wealth distribution when examining variation across the recent income distribution.

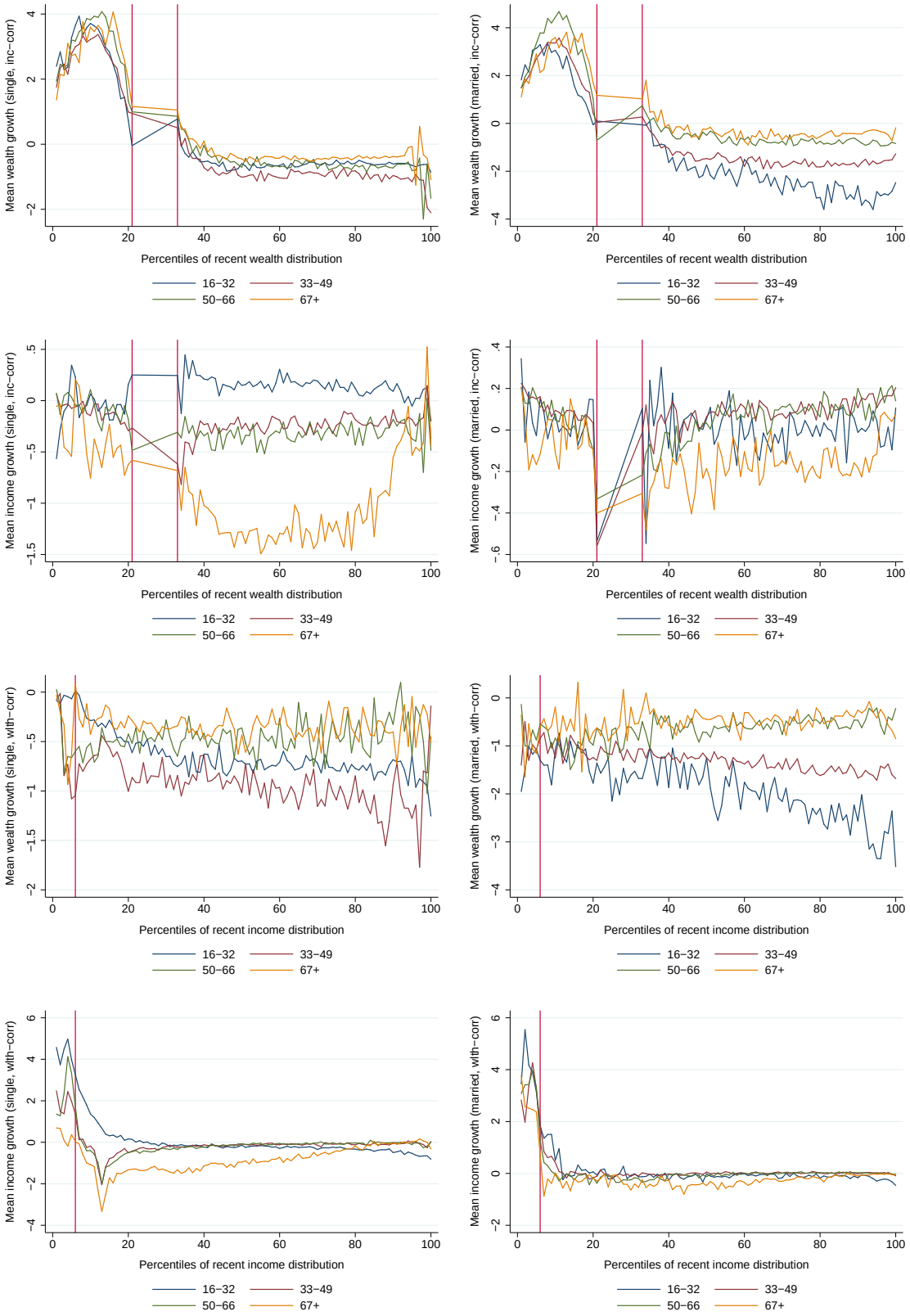

Figure E.1: Mean wealth and earnings growth across the wealth and earnings distributions.

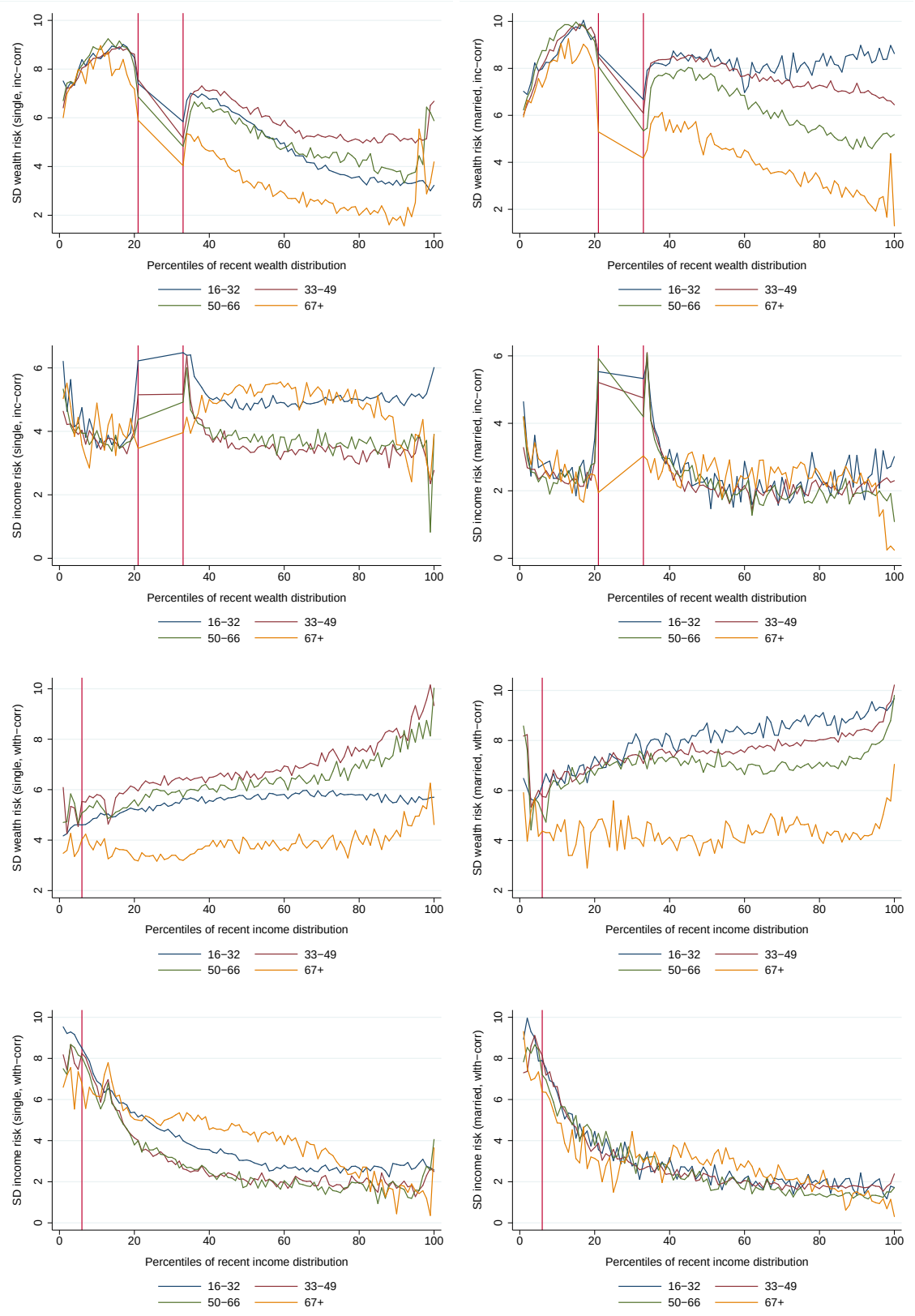

Figure E.2: S.D. wealth and earnings risk across the wealth and earnings distributions.

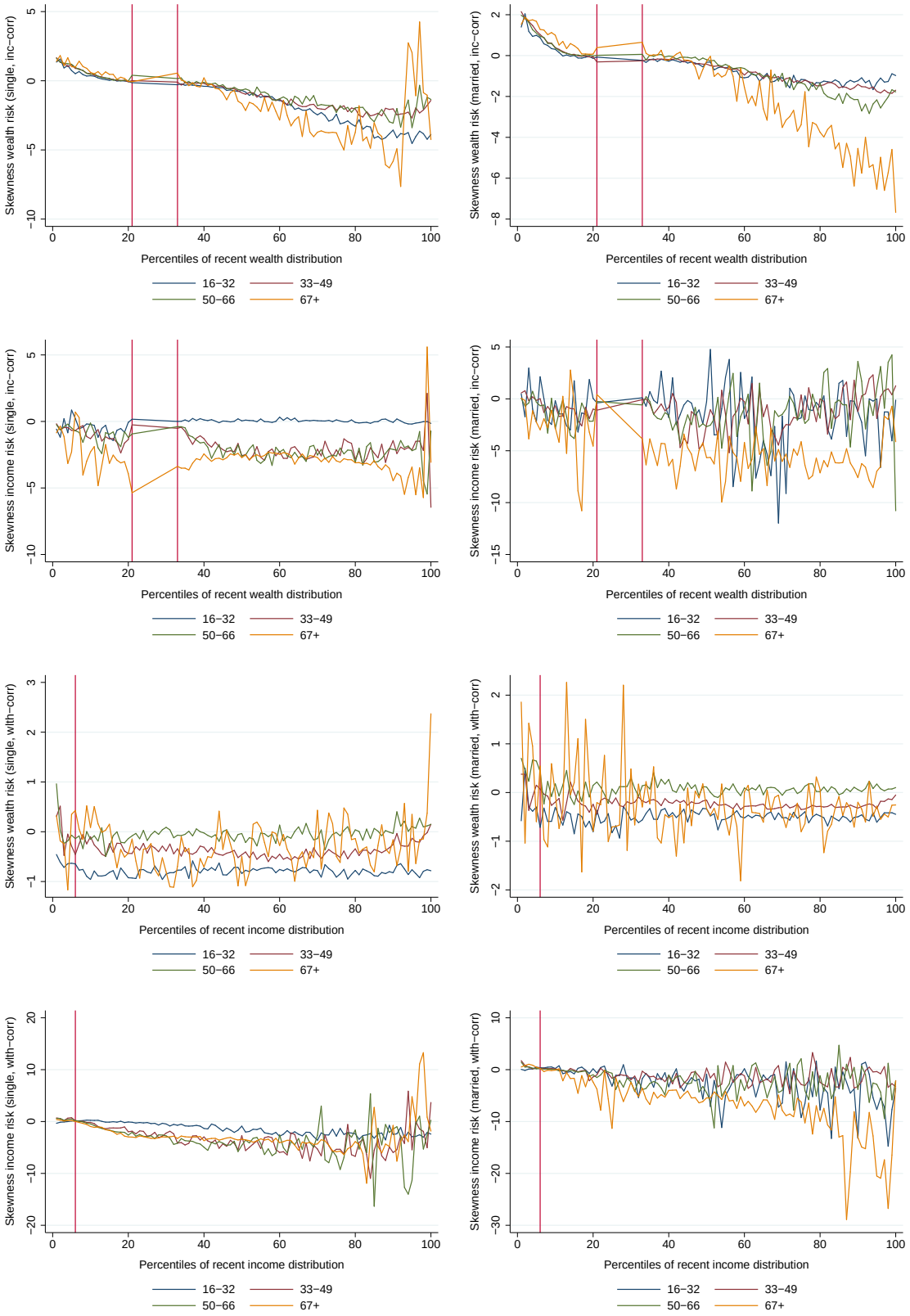

Figure E.3: Skewness wealth and earnings risk across the wealth and earnings distributions.

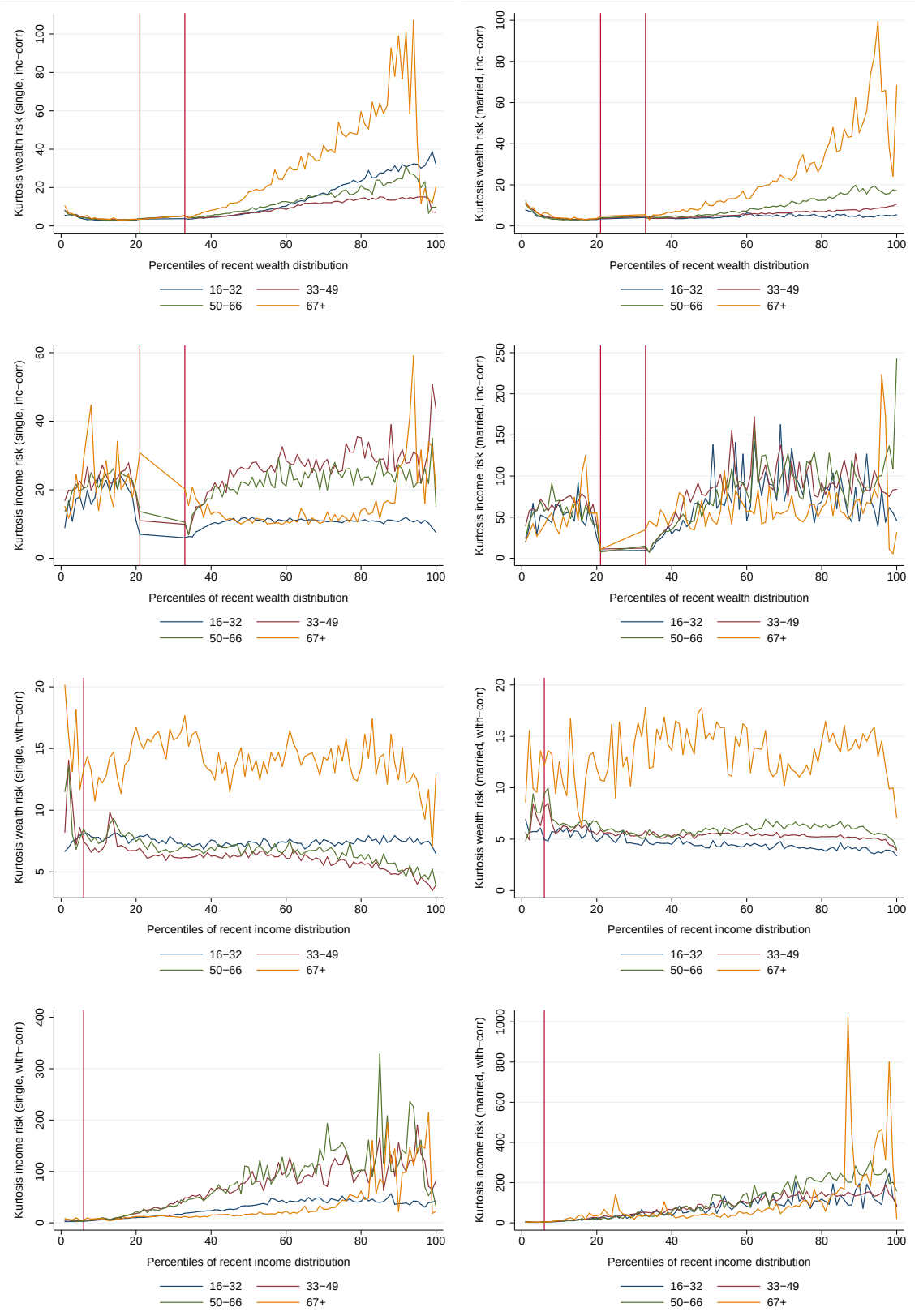

Figure E.4: Kurtosis wealth and earnings risk across the wealth and earnings distributions.

Table E.1: WEALTH GROWTH PATTERNS BY RECENT INCOME WITHOUT WEALTH TAX PAYERS.

	16-32		33-49		50-66		67 +	
Mean inc growth by inc	0.0915***	0.0552**	0.0201	-0.0269*	0.0591***	-0.0045	0.0453	-0.0338*
	(0.0167)	(0.0183)	(0.0227)	(0.0154)	(0.0207)	(0.0166)	(0.0310)	(0.0181)
S.D inc risk by inc	0.0522***	0.0078	0.0131	0.0030	-0.0411***	0.0343***	0.0263*	0.0306***
	(0.0153)	(0.0164)	(0.0109)	(0.0161)	(0.0145)	(0.0091)	(0.0154)	(0.0082)
Skewn. inc risk by inc	0.0127	0.0150	0.0035	-0.0063	-0.0048	0.0008	0.0187***	0.0094***
	(0.0151)	(0.0104)	(0.0063)	(0.0044)	(0.0084)	(0.0043)	(0.0053)	(0.0033)
Kurt. inc risk by inc	-0.0045***	-0.0015***	-0.0025***	-0.0022***	0.0006*	0.0005**	0.0008***	0.0005***
	(0.0011)	(0.0010)	(0.0004)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0001)
S.D wealth risk by inc		-0.3060***		0.0161		0.2601***		0.1289***
		(0.0696)		(0.0399)		(0.0354)		(0.0358)
Skewn. wlth risk by inc		0.7617***		1.0801***		0.7737***		0.2568***
		(0.1350)		(0.1199)		(0.0884)		(0.0181)
Kurt. wlth risk by inc		0.1870***		-0.0045		-0.0066		0.0114
		(0.0390)		(0.0432)		(0.0230)		(0.0072)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	739,150	739,150	786,160	786,160	480,890	480,890	276,565	276,565
R^2	0.0056	0.0059	0.0016	0.0018	0.0036	0.0043	0.0008	0.0016

Notes: Income risk moments and wealth risk moments are measured by recent income percentiles. Other controls include age and year dummies and a dummy indicator for marital status. Standard errors clustered at recent income percentiles. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table E.2: WEALTH GROWTH PATTERNS BY RECENT WEALTH WITHOUT WEALTH TAX PAYERS.

	16-32		33-49		50-66		67 +	
	RW ≤ 0	> 0	≤ 0	> 0	≤ 0	> 0	≤ 0	> 0
Mean inc growth by wlth	0.6909	0.9411***	1.5037	-0.1339	0.8761	0.4047	0.2614	-0.0376
	(0.8506)	(0.2957)	(1.7218)	(0.2476)	(1.7266)	(0.2718)	(0.3703)	(0.1713)
S.D inc risk by wlth	-0.5263**	0.2385***	0.5525	0.4283***	0.5971*	0.5393***	0.2389	-0.0387
	(0.2258)	(0.0749)	(0.3273)	(0.0980)	(0.3387)	(0.0790)	(0.2021)	(0.1130)
Skewn. inc risk by wlth	-0.2204***	0.0017	0.0603	0.0068	-0.0425	0.0065	-0.0143	0.0127
	(0.0747)	(0.0185)	(0.2080)	(0.0094)	(0.1129)	(0.0075)	(0.0300)	(0.0172)
Kurt. inc risk by wlth	0.0046	-0.0029	0.0372*	0.0013	0.0250**	0.0039***	0.0041	0.0000
	(0.0043)	(0.0021)	(0.0210)	(0.0012)	(0.0099)	(0.0009)	(0.0063)	(0.0008)
S.D wealth risk by wlth	-0.7923***	-0.1618***	-0.0204	-0.1312**	0.3971**	0.0482	0.4128***	0.2640***
	(0.2401)	(0.0390)	(0.2930)	(0.0630)	(0.1831)	(0.0366)	(0.0449)	(0.0468)
Skewn. wlth risk by wlth	3.0258***	0.4879***	1.5474***	0.7885***	1.1195***	0.2249***	0.6746**	0.0201*
	(0.5747)	(0.0390)	(0.3919)	(0.0808)	(0.3410)	(0.0474)	(0.2745)	(0.0119)
Kurt. wlth risk by wlth	-1.3663***	0.0441***	-0.5975***	0.1261***	-0.4518***	0.0248***	-0.2661**	0.0080***
	(0.3581)	(0.0118)	(0.1434)	(0.0193)	(0.1364)	(0.0067)	(0.0781)	(0.0014)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	169,304	569,846	300,606	485,554	191,759	289,131	49,056	227,509
R^2	0.0151	0.0114	0.0140	0.0050	0.0281	0.0039	0.0285	0.0034

Notes: Income risk moments and wealth risk moments are measured by recent wealth percentiles. Other controls include age and year dummies and a dummy indicator for marital status. Standard errors clustered at recent wealth percentiles. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.