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SIEPR Discussion Paper No. 04-36

**A Life Cycle Perspective on Changes in Earnings Inequality  
Among Married Men and Women**

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July , 2005

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July 2005

## ABSTRACT

### A LIFE CYCLE PERSPECTIVE ON CHANGES IN EARNINGS INEQUALITY AMONG MARRIED MEN AND WOMEN

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The connection between the growth in hourly earnings inequality of individuals and changes in family earnings involves a number of issues: the movements in the employment of different family members, the association between changes in the earnings of the husband and those of the wife, and patterns of assortative mating. This paper offers a decomposition of the logarithm of the coefficient of variation in family earnings that distinguishes these issues. Unlike most of the previous research, this paper organizes the data on the dispersion of family earnings not simply over time but also by age. We focus on the impact on family earnings inequality of the growth in the relative employment and relative earnings of wives. Such growth has partly offset the effects on family earnings inequality of the increase in husbands' earnings inequality.

JEL Classification: J31, J22, D63

# A LIFE CYCLE PERSPECTIVE ON CHANGES IN EARNINGS INEQUALITY AMONG MARRIED MEN AND WOMEN

John Pencavel\*

## I. Introduction

A considerable volume of research has documented the growth in inequality in hourly earnings among American working men and women. Less work has been devoted to connecting that growth in hourly earnings inequality to changes in family earnings. The steps from changes in one person's hourly earnings to changes in annual household earnings involve several issues relating to movements in the employment of different family members, the association between changes in the earnings of the husband and those of the wife, and patterns of assortative mating. This paper identifies some of these connections and quantifies their relative importance.

An accounting framework is presented to address four principal questions. First, to what extent have changes in the dispersion of individual male earnings translated into changes in earnings inequality in families? Second, what has been the effect of the growth of women at market work on household earnings inequality? Third, what has been the effect of the increase in the relative pay of women on earnings inequality across families? Fourth, what has been the effect of changes in assortative mating in accounting for the increase in the dispersion of family earnings?

Unlike most of the previous research, this paper organizes the data on the dispersion of family earnings not simply over time but also by age. There is ample evidence certifying empirical regularities by age in earnings and work behavior and, in view of the aging of the labor force in recent decades, it is important to hold constant the effects of age. Previous empirical research on family

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\* This work has benefitted from constructive comments on an earlier draft received from Daron Acemoglu, Luigi Pistaferri, and two referees and from conscientious research assistance from Niny Khor. Support from a grant through the Stanford Institute for Economic Policy Research from the Smith-Richardson Foundation is gratefully acknowledged. [InequalityH&W.pprSR]

earnings inequality has not made full use of data on the age profiles of true cohorts to map this life cycle aspect.<sup>1</sup> We use data on earnings and work from successive March Current Population Surveys from 1968 to 2001 to construct information on birth cohorts as they age.

Because the employment-population ratios of married women have risen substantially and the earnings of women have risen relative to those of men, the earnings of wives have constituted a growing proportion of family earnings. Among all husband-wife couples at ages 38-42 years, wives' earnings constituted some 17 percent of total family earnings among the 1925-29 birth cohort, but this rose to 30 percent among the 1955-59 cohort. This growth parallels the increase in wives' employment-population ratio for these cohorts which, at this age, rose from 49 to 74 percent. Among dual-earners, there has been a similar growth that reflects the rise in the relative earnings of wives.

The questions posed in this paper have been the subject of an extensive literature. For instance, Hyslop (2001) presents a structural model of the links between family earnings inequality and the earnings and work of married women. However, his interesting research characterizes only those families in which both the husband and the wife work for pay and is limited to the six years from 1979 to 1985. By contrast, this paper considers all husband-wife families regardless of the employment status of the individuals and it draws upon over thirty years of data.

Other scholars have investigated the effects of married women's increasing market employment on the distribution of family income. Because the increasing employment of wives means that fewer women have zero earnings, prior research has concluded that the movement of wives

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<sup>1</sup>Though their emphasis is on consumption rather than earnings, Attanazio, Berloff, Blundell, and Preston (2002) for Britain and Deaton and Paxson (1994) for the U.S., Britain, and Taiwan construct explicit age profiles of family earnings inequality though for fewer cohorts than described here.

into the labor market has exerted an equalizing influence on family earnings.<sup>2</sup> The research here is consistent with this although, unlike previous work, we show that the rising relative earnings of wives has had a similar equalizing effect. The conclusions from previous research rest heavily on inferences from cross-section relationships whereas we construct the pseudo life cycle profiles of different cohorts. The covariance in the earnings of husbands and wives plays a small part in changes in family earnings inequality.

## II. Data and Selection Issues

Let  $y_{Hi}(a, c)$  denote the annual earnings of the husband aged  $a$  belonging to birth cohort  $c$  in household  $i$  and  $y_{wi}(a, c)$  the annual earnings of wife aged  $a$  in birth cohort  $c$  in household  $i$ . “Family” earnings are given by  $y_i(a, c) = y_{Hi}(a, c) + y_{wi}(a, c)$ .<sup>3</sup> Often husbands and wives are not the same age and hence, when observed in the same calendar year, they are not of the same birth cohort. Husbands and wives could be classified by the age and birth cohort of each spouse. However, this cross-classification uses up considerable degrees of freedom and, because most couples differ in age

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<sup>2</sup> Smith (1979) uses cross-section observations from the 1960 and 1970 Censuses to argue that wives’ earnings made family earnings less unequal. Cancian, Danziger, and Gottschalk (1993) and Blackburn and Bloom (1987) draw on March CPS data to arrive at a similar conclusion. Lehrer and Nerlove (1981, 1984) emphasize life cycle effects although their use of cross-section data prohibits them from distinguishing age from cohort effects. Cancian and Reed (1998) show that, in 1979 and 1989, family income distribution would have been more unequal in the absence of wives’ earnings. Recently, Daly and Valletta (2005) found that women’s growing employment offset increasing family income inequality from 1969 to 1989.

<sup>3</sup> All earnings are expressed in 1995 values using the personal consumption expenditures deflator. People are included if they are aged at least 20 years and not more than 60 years. Because of the familiar problems in measuring the labor returns to the self-employed, all couples containing a self-employed worker are excluded. This paper concerns issues connected with market work and labor earnings and other types of income are not considered. For the vast majority of families, most income comes from earnings, not from dividends, interest, and rent. The degree to which inferences are modified by consideration of nonlabor income are taken up in Pencavel (2004).

by only a few years, we proceed as if the husband and the wife are born in the same year.

We associate each couple's age and cohort with the age and cohort of the wife. This is because the employment and earnings of wives will figure prominently in the analysis. Consequently, because the husband is typically a little older than the wife, the husband's variables in this paper tend to be assigned to a younger age than his true age. This affects not only the interpretation placed on age and the husband's variables, but also the interpretation of cohort effects because the age difference between husbands and wives is smaller for more recent cohorts than for older cohorts.

Husband and wife couples from the March Current Population Surveys for 1968 through to 2001 are sorted by the age and year of birth of the wife. Each birth cohort covers a five year interval from 1910-14 to 1970-74. Table 1 lists how 281 age-cohort cells are compiled. Cells are used only when the number of underlying husband-wife pairs number at least one thousand.<sup>4</sup>

In a study of earnings dispersion using information from the CPS, the top-coding of income is problematical especially because the level at which earnings are top-coded has changed over time (Burkhauser *et al.* (2004)). To address this, as sketched in the Appendix, an imputation procedure generates earnings for people above the top-coded level based on information on the earnings structure of people just below the top-coded earnings level. As a second method to guard our inferences about dispersion from the effects of top-coding, where it was meaningful, we form measures of inequality that do not use information on the earnings of all people such as the ratio of family earnings at the seventy-fifth percentile to earnings at the twenty-fifth percentile. Our results are not driven by the issue of top-coding principally because top-coding affects only a very small fraction of people.

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<sup>4</sup> For recent cohorts, the rising age of marriage reduces the number of husband-wife observations in the youngest ages. Our threshold of 1,000 husband-wife observations explains why, for cohorts 12 and 13, our synthetic cohorts start not at age 20 but at ages 21 years and 23 years, respectively.

In studying the earnings and employment of married couples over time, we examine an increasingly selective group of the population. First, marriage has become a less common state especially at younger ages: at age 25 years, whereas 78 percent of women born in 1940-44 were married, 42 percent of the 1970-74 birth cohort were married, a remarkable drop of over thirty-five percentage points. The declines at other ages are less pronounced, but they are present also. Not merely has marriage become a less common state, but also the “quality” of married people has risen relative to unmarried people in that the schooling levels of married men and women have risen relative to the schooling of unmarried men and women.<sup>5</sup>

### III. A Decomposition of Family Earnings Inequality

#### An Initial Decomposition

This section proposes a framework for family earnings inequality that responds to the questions posed in the Introduction, namely, to assess the importance for changes in family earnings inequality of increases in husbands’ earnings inequality, of increases in wives’ relative employment and pay, and of changes in assortative mating. This accounting framework is broached not as the “correct” one but as a felicitous one that offers a convenient way to organize the factors linked to family earnings inequality. There are other ways to describe the growth of family earnings inequality and to address the questions posed; the framework outlined here constitutes one such description.

Let  $\sigma(a, c)$  be the standard deviation of family earnings  $y_i(a, c)$  and let  $\sigma_j(a, c)$  be the standard deviation of  $y_{j,i}(a, c)$  where  $j = H, W$ . Then

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<sup>5</sup> In 1967-69, the fraction of married women with 12 or fewer years of schooling (81 percent) exceeded the fraction of unmarried women with this schooling (79 percent); in 1998-2000, the fraction of married women with 12 or fewer years of schooling (45 percent) was less than the fraction of unmarried women with this schooling (50 percent).



$$\begin{aligned}\sigma^2(a, c) &= \sigma_H^2(a, c) + \sigma_W^2(a, c) + 2 r(a, c) \cdot \sigma_H(a, c) \cdot \sigma_W(a, c) \\ &= \sigma_H^2(a, c) [1 + \theta^2(a, c) + 2 \cdot r(a, c) \cdot \theta(a, c)]\end{aligned}$$

where  $\theta(a, c)$  is the standard deviation of wives' earnings divided by the standard deviation of husbands' earnings,  $\sigma_W(a, c)/\sigma_H(a, c)$ , and  $r(a, c)$  is the correlation coefficient between the earnings of the spouses. To minimize notational clutter, we drop the age,  $a$ , and cohort,  $c$ , identifiers.

To convert to a scale-invariant measure of dispersion, deflate standard deviations by mean values: let  $V$  denote the coefficient of variation in family earnings (i.e.,  $V = \sigma/\mu$  where  $\mu$  stands for the mean of family earnings) and let  $V_j$  be the coefficient of variation in  $j$ 's earnings (i.e.,  $V_j = \sigma_j/\mu_j$ ) where  $j = H, W$ . Then the previous equation may be written

$$(1) \quad \ln V = \ln V_H + \ln \omega + K$$

where  $K = (0.5) \ln[1 + \theta^2 + 2 \cdot r \cdot \theta]$  and  $\omega = \mu_H/\mu$ , that is,  $\omega$  is the mean of husbands' earnings divided by the mean of family earnings.<sup>6</sup> Equation (1) provides the basic decomposition of the dispersion in family earnings used in this paper.<sup>7</sup> This equation decomposes the logarithm of the coefficient of variation in family earnings for any cohort at any age into three terms: one term is the logarithm of the coefficient of variation in the earnings of the husband,  $\ln V_H$ ; the second term is the

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<sup>6</sup> It is straightforward to show that  $V^2 = \omega^2 \cdot V_H^2 + \omega_W^2 \cdot V_W^2 + 2\omega \cdot \omega_W \cdot r \cdot V_H \cdot V_W$  where  $\omega = \mu_H/\mu$  and  $\omega_W = \mu_W/\mu$ . So, if the correlation between the spouses' earnings,  $r$ , is negligible, the square of the coefficient of variation of family earnings,  $V^2$ , is the weighted sum of the square of the coefficients of variation of the husbands' and wives' earnings with  $V_H^2$  and  $V_W^2$  weighted by  $(\mu_H/\mu)^2$  and  $(\mu_W/\mu)^2$  respectively. Because these weights are less than unity,  $V_H^2$  and  $V_W^2$  may each be greater than  $V^2$ .

<sup>7</sup> Cancian and Reed (1998) note that a decomposition of earnings inequality requires an interpretable counterfactual. To investigate the effects of the growing employment and pay of married women, in an arithmetical sense, these effects are embodied both in  $\ln \omega$  and  $K$ . However, as argued below, movements in  $\ln \omega$  are much more closely tied to movements in  $\ln V$  than are movements in  $K$  (that is, changes in the components of  $K$  are of relatively small importance in understanding movements in family earnings inequality) and, below, we shall provide some explicit counterfactuals involving  $\ln \omega$ .

logarithm of mean husbands' earnings as a ratio of mean family earnings,  $\ln \omega$ ; and the third term,  $K$ , involves a measure of the dispersion of the earnings of wives compared with the earnings of husbands,  $\theta$ , and the correlation between the earnings of husbands and wives,  $r$ .

To obtain a sense of the magnitude of these components, Table 2 lists descriptive statistics of  $\ln V$ ,  $\ln V_H$ ,  $\ln \omega$ ,  $K$ ,  $\theta$ , and  $r$ . The values of these variables correspond to all husbands and wives, not just those husbands and wives at work for pay. In absolute value, at mean values,  $K$  is the smallest component (and with the lowest standard deviation) of  $\ln V$  defined in equation (1).

The values of  $\ln V$  by age for five cohorts, each born fifteen years apart, are graphed in Figure 1.<sup>8</sup> For each cohort, the dispersion in family earnings rises with age and, at each age, dispersion increases across cohorts. At age 40, there is little difference in  $\ln V$  between the cohorts born in 1925-29 and in 1940-44, but then earnings dispersion for cohort 1955-59 is some 0.20 log points (about 22 percent) higher. These general patterns for  $\ln V$  also hold for other measures of dispersion. Thus the ratio of earnings at the 75<sup>th</sup> percentile to earnings at the 25<sup>th</sup> percentile tends to rise with age and with cohort.<sup>9</sup> Also the variance of the logarithm of family earnings increases with age and tends to be higher for each younger cohort. Finally, the general movements in  $\ln V$  are exhibited by the Gini coefficient: the correlation coefficient between  $\ln V$  and the Gini coefficient of family earnings inequality is 0.93.

Equation (1) classifies  $\ln V$  into three components, the first of which is  $\ln V_H$ , the logarithm of the coefficient of variation in the earnings of the husband. This is graphed in Figure 2 and has the

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<sup>8</sup> In this and subsequent figures, moving averages of the yearly observations are plotted.

<sup>9</sup> The 25<sup>th</sup> percentile corresponds to some very low earnings (and, for some cells, zero earnings) for couples in older ages. This makes the ratio of earnings of the 75<sup>th</sup> percentile to earnings of the 25<sup>th</sup> percentile an awkward series to track in the older age groups.

same general features as that of  $\ln V$ :  $\ln V_H$  grows with age for any given cohort and it is greater for recent cohorts at any age.

Figure 3 graphs  $\ln \omega$ , the logarithm of mean husbands' earnings divided by mean family earnings, the second component of  $\ln V$  in equation (1). Because mean husbands' earnings are less than mean family earnings,  $\ln \omega$  is always negative. For a given cohort,  $\ln \omega$  tends to fall with age. At any age,  $\ln \omega$  tends to be more negative for recent cohorts. As we shall see, both the age and the cohort patterns in  $\ln \omega$  reflect the changes in the relative employment probabilities of wives and husbands. The conjunction of the two principal empirical regularities of  $\ln \omega$  - that is,  $\ln \omega$  is inclined to fall with age for a given cohort while recent cohorts display substantially lower values of  $\ln \omega$  than older cohorts - implies that, in a cross-section,  $\ln \omega$  tends to rise with age. This is another example of the inappropriate inferences about the life cycle from cross-section patterns when important cohort effects are present.

The third component of  $\ln V$  in equation (1) is  $K = (0.5) \ln[1 + \theta^2 + 2.r.\theta]$ . The values of  $K$  are substantially less than unity. Consider each component.  $\theta$  measures the standard deviation of wives' earnings divided by the standard deviation of husbands' earnings and, as  $\sigma_w$  is typically less than  $\sigma_H$  with a mean of about one-half,  $\theta^2$  is about one quarter. Similarly, the correlation of husbands' and wives' earnings is usually around 0.05 and never larger (in absolute magnitude) than 0.28 so the product of  $\theta$  and  $r$  is also substantially less than unity.<sup>10</sup> Hence, the term in square brackets,  $1 + \theta^2 + 2.r.\theta$ , is approximately 1.3 whose logarithm is 0.26. When this is halved, the typical value is 0.13.

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<sup>10</sup>  $r$  measures the correlation between wives' and husbands' earnings including those couples where one spouse or the other does not work for pay, not the correlation in the earnings of husbands and wives among those couples where both work for pay. The low value of  $r$  has been noted before, e.g., Layard and Zabalza (1979).

The age and cohort patterns of  $K$  are graphed in Figure 4.  $K$  tends to be higher for more recent cohorts principally because  $r$  is greater in recent cohorts. A clear age pattern common across cohorts is not apparent in  $K$ . Not only are the values of  $K$  small relative to the values of  $\ln V$ , but also variations in  $K$  bear only a weak association with variations in  $\ln V$ .<sup>11</sup> For an understanding of movements in family earnings inequality as measured by  $\ln V$ ,  $K$  is clearly the least important component. Although the correlation between the earnings of husbands and wives has increased over time, its value is sufficiently small that the contribution of assortative mating in earnings to changes in overall family earnings inequality is of second-order of importance.<sup>12</sup>

These inferences from the graphs are reinforced from descriptive regressions in which  $\ln V$  and its components, in turn, are regressed on fixed cohort and fixed age effects. The estimated cohort effects are reported in Table 3.<sup>13</sup> For  $\ln V$  and  $\ln V_H$ , there are strong positive cohort effects indicating substantial increases in family and husbands' earnings inequality in recent cohorts. For family earnings inequality,  $\ln V$ , the dispersion for the 1970-74 birth cohort is about 1.75 times that of the 1910-14 cohort.<sup>14</sup> The cohort effects for  $\ln V_w$  move in the opposite direction indicating a decrease in earnings inequality over time among wives. This is closely associated with the growth in wives'

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<sup>11</sup> For the 281 age-cohort cells, the simple correlation coefficient between  $\ln V$  and  $K$  is -0.21.

<sup>12</sup> This was also Mincer's argument (1974, pp. 123-5).

<sup>13</sup> The estimated age effects in the equations for  $\ln V$  and  $\ln V_H$  increase almost monotonically with age. Those for  $\ln V$  suggest that the coefficient of variation in family earnings at age 60 years is 2.5 times that at age 20 years. The increase in  $\ln V_H$  with respect to age is even greater than that for  $\ln V$ . The coefficients for  $\ln \omega$  fall with age. No distinctive age pattern for the fixed effects is estimated for  $K$ .

<sup>14</sup> The estimates of 0.436 and -0.121 attached to the 1970-74 and 1910-14 cohort dummy variables respectively (so the difference is 0.557) imply that  $V_{70-74} = V_{10-14} (e^{0.557}) = V_{10-14} (1.745)$ . Similarly, the implied 1970-74 values as a proportion of 1910-14 values are 2.06 for the dispersion ( $V_H$ ) of husbands' earnings, 0.76 for the dispersion ( $V_w$ ) of wives' earnings, and 0.71 for  $\omega$ .

employment. Mild positive cohort effects for  $K$  are linked to the cohort effects in  $\theta$  and  $r$ .<sup>15</sup>

Hence the data presented to this point indicate an increase across cohorts in family earnings inequality with two components of  $\ln V - \ln V_H$  and  $K$  - contributing to this increase (especially  $\ln V_H$ ) and one component -  $\ln \omega$  - partially offsetting this.  $\omega$  measures the mean of husbands' earnings divided by the mean of family earnings and the decline in  $\ln \omega$  across cohorts is clearly associated with the rise in the employment of wives. In this sense, growing labor force participation of wives has counteracted the tendency for family earnings inequality to increase.

### Changes in Inequality

These inferences are more evident if changes across cohorts in these variables at given ages are examined. Thus, define  $D\ln V(a') = \ln V(a', c_R) - \ln V(a', c_E)$  where  $c_R$  denotes a recent cohort,  $c_E$  denotes an early cohort, and  $a'$  indicates a fixed age. Essentially, the changes we compute are changes from the late 1960s to the late 1990s and, necessarily, the cohorts will differ by age.<sup>16</sup> Then, by first differencing equation (1) across cohorts holding age constant,

$$(2) \quad D\ln V(a') = D\ln V_H(a') + D\ln \omega(a') + DK(a')$$

with  $D\ln V_H(a') = \ln V_H(a', c_R) - \ln V_H(a', c_E)$ ,  $D\ln \omega(a') = \ln \omega(a', c_R) - \ln \omega(a', c_E)$ , and  $DK(a') = \ln K(a', c_R) - \ln K(a', c_E)$ . Equation (2) decomposes changes in family earnings inequality at each age into changes in husbands' earnings inequality, changes in the importance of husbands' earnings in family earnings, and changes in the catchall term,  $K$ . The values of these terms are graphed in Figure

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<sup>15</sup> The estimated standard errors on the cohort effects are approximately 0.015 for  $\ln V$ , 0.018 for  $\ln V_H$ , 0.022 for  $\ln V_W$ , 0.006 for  $\ln \omega$ , 0.008 for  $K$ , 0.013 for  $\theta$ , and 0.010 for  $r$ .

<sup>16</sup> Thus, for people aged in their mid-20s (i.e., when  $a' = 24, 25, 26, 27,$  and  $28$ ), the early cohort is cohort 7 (born in 1920-24) and the recent cohort is cohort 13 (born in 1970-74). By contrast, for people aged in their mid-50s (i.e., when  $a' = 54, 55, 56,$  and  $57$ ), the early cohort is cohort 1 (born 1910-14) and the recent cohort is cohort 7 (born in 1940-44).

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The solid line in Figure 5 shows  $DlnV(a')$ , the increase in family earnings inequality across cohorts at each age. After rising for couples aged in their twenties, this series tends to fall with age with a minimum at ages in the early fifties before rising at older ages. So the change in family earnings inequality has tended to be greatest for young couples with increases in the logarithm of the coefficient of variation of over 40 percent and least for couples aged in their fifties with increases in the logarithm of the coefficient of variation of less than 20 percent.

The increase in earnings inequality among husbands,  $DlnV_H(a')$ , lies above the increase in family earnings inequality. If changes in family earnings inequality depended only on changes in husbands' inequality, there would have been a larger increase in family earnings inequality than observed. The age pattern of  $DlnV_H(a')$  mirrors that of  $DlnV(a')$ .

The change in the importance of husbands' earnings in family earnings,  $Dln\alpha(a')$ , is indicated by the dotted line at the bottom of Figure 5. This series is negative at every age indicating the decline in the ratio of husbands' earnings to family earnings. The largest negative change is for couples aged in their late twenties with decreases in  $ln\alpha(a')$  of almost 25 percent. From age 35 years to 55 years, the fall in  $ln\alpha(a')$  is between 20 and 15 percent. Because  $Dln\alpha(a')$  is always negative, it serves to offset the effect of the increase in husbands' earnings inequality on family earnings inequality.

The last component of  $DlnV(a')$  is  $DK(a')$  shown in Figure 5 by the line that, for most ages, hovers at a little more than zero. Though  $DK(a')$  assumes values as large as 17 percent at age 27, at most ages  $DK(a')$  is much less than this. In absolute value,  $DK(a')$  is clearly the smallest component of  $DlnV(a')$  and is least important in providing an explanation for  $DlnV(a')$ .

The major components of  $DlnV(a')$  are  $DlnV_H(a')$ , changes in earnings inequality among

husbands, and  $D \ln \omega(a')$ , changes in the importance in family earnings of husbands' earnings.

Consider each of these components in more detail and neglect the final term,  $K$ , in equation (1).

#### IV. Inequality in Husbands' Earnings

Family earnings inequality,  $\ln V$ , has been shown to be approximately equal to the inequality of the earnings of husbands,  $\ln V_H$ , less a factor,  $\ln \omega$ , that indicates the relative importance of wives earnings in family earnings. To understand better the patterns in these two important components of family earnings inequality, consider first  $\ln V_H$ , the logarithm of the coefficient of variation of husbands' earnings. By definition,  $\ln V_H = -\ln(\mu_H) + \ln(\sigma_H)$  where  $\mu_H$  is the mean of husbands' earnings and  $\sigma_H$  is the standard deviation of husbands' earnings. In turn,

$$(3) \quad \sigma_H^2 = E_H \cdot s_H^2 + E_H \cdot (1 - E_H) \cdot m_H^2$$

where  $E_H$  is the employment-population ratio of husbands,  $s_H^2$  is the variance of earnings among those husbands employed, and  $m_H^2$  is the square of mean earnings of those husbands employed.<sup>17</sup>

Inserting the definition of  $\sigma_H$  in equation (3) into the expression for  $\ln V_H = -\ln(\mu_H) + \ln(\sigma_H)$  and rearranging terms yields the following identity for  $\ln V_H$ :

$$(4) \quad \ln V_H = -\ln(\mu_H) + (0.5) \cdot \ln(E_H) + (0.5) \cdot \ln(s_H^2) + J,$$

where  $J = (0.5) \cdot \ln[1 + (1 - E_H)(m_H^2)/(s_H^2)]$ . This last term,  $J$ , assumes small values relative to those for the other components of  $\ln V_H$ . That is, as shown in Table 2, the typical value of  $(1 - E_H)$  is about 0.15 and the typical value of  $(m_H^2)/(s_H^2)$  is about 2.5 so the product of  $(m_H^2)/(s_H^2)$  and  $(1 - E_H)$  is about 0.38. One-half of the logarithm of 1.38 is about 0.15. By contrast, the means of  $-\ln(\mu_H)$  and

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<sup>17</sup> Let  $D = 1$  if  $y_H > 0$  and  $D = 0$  if  $y_H = 0$ . Then  $\sigma_H^2 = \mathcal{E}(y_H^2) - [\mathcal{E}(y_H)]^2 = \mathcal{E}[(D \cdot y_H)^2] - [\mathcal{E}(D \cdot y_H)]^2 = p \cdot \mathcal{E}(y_H^2 | D = 1) - p^2 \cdot [\mathcal{E}(y_H | D = 1)]^2$  where  $p = \text{prob}(D = 1)$ . Adding and subtracting  $p \cdot [\mathcal{E}(y_H | D = 1)]^2$  and recognizing that  $s_H^2 = \mathcal{E}(y_H | D = 1) - [\mathcal{E}(y_H | D = 1)]^2$  and that  $m_H^2 = [\mathcal{E}(y_H | D = 1)]^2$ , equation (3) in the text is derived.

$(0.5) \ln(E_H \cdot s_H^2)$  are -3.43 and 3.10, respectively. Given the mean value of  $\ln V_H$  is -0.19, the values of  $-\ln(\mu_H)$  and  $(0.5) \ln(E_H \cdot s_H^2)$  largely offset each other.

To assess how much of the variation in  $\ln V_H$  may be allocated among its components, form the variance of equation (4):

$$(5) \quad I = \sum_{i=1}^4 \frac{\sigma_i^2}{\sigma_0^2} + \frac{2}{\sigma_0^2} \sum_{i=1}^3 \sum_{j=i+1}^4 r_{ij} \sigma_i \sigma_j$$

where  $\sigma_0^2$  is the variance of  $\ln V_H$ ,  $\sigma_1^2$  is the variance of  $-\ln \mu_H$ ,  $\sigma_2^2$  is the variance of  $(0.5) \ln E_H$ ,  $\sigma_3^2$  is the variance of  $(0.5) \ln s_H^2$ , and  $\sigma_4^2$  is the variance in  $J$ .  $r_{12}$  is the correlation coefficient between  $-\ln \mu_H$  and  $(0.5) \ln E_H$ ,  $r_{13}$  is the correlation coefficient between  $-\ln \mu_H$  and  $(0.5) \ln s_H^2$ ,  $r_{14}$  is the correlation coefficient between  $-\ln \mu_H$  and  $J$ ,  $r_{23}$  is the correlation coefficient between  $(0.5) \ln E_H$  and  $(0.5) \ln s_H^2$ ,  $r_{24}$  is the correlation coefficient between  $(0.5) \ln E_H$  and  $J$ , and  $r_{34}$  is the correlation coefficient between  $(0.5) \ln s_H^2$  and  $J$ . Table 4 lists the components of equation (5) including the decomposition of variance after controlling for fixed age and cohort effects. Not surprisingly, the most important component is  $(0.5) \ln s_H^2$ , one-half of the variance in husbands' earnings among those husbands who work. For understanding the variation in  $\ln V_H$ , movements in the dispersion of earnings among working husbands are of primary importance and movements in the employment-population ratio of husbands and in the component  $J$  are of small importance.<sup>18</sup>

#### V. The Growing Importance of Wives for Family Earnings

As Figure 5 makes clear, changes in  $\ln \omega$  have partially offset the effect of increases in husbands' earnings inequality on family earnings inequality. Consider how the increases in the

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<sup>18</sup> There is a large negative correlation between  $-\ln \mu_H$  and  $(0.5) \ln s_H^2$  ( $r_{13}$ ) which reflects the growth in mean earnings of husbands over these cohorts and the corresponding growth in earnings inequality.



relative employment and the relative earnings of wives have contributed to these changes in  $\ln \omega$ .

### An Accounting Decomposition

Define  $m_H$  and  $m_W$  as, respectively, the mean earnings of husbands employed for pay and wives employed for pay. Given  $\omega = \mu_H/\mu$ , and given  $\mu_H = E_H \cdot m_H$  and  $\mu = E_H \cdot m_H + E_W \cdot m_W$ , then

$$(6) \quad \ln \omega = - \ln[ 1 + (E_W/E_H) \cdot (m_W/m_H) ] .^{19}$$

Unit changes in  $\ln \omega$  map one-for-one into unit changes in  $\ln V$  so, other things equal, an increase in married women's employment ( $E_W$ ) reduces inequality in family earnings (as measured by  $\ln V$ ).

Suppose  $E_W/E_H$  and  $m_W/m_H$  may be expressed as functions of age and cohort: defining  $RE = E_W/E_H$  and  $Rm = m_W/m_H$ , let relative employment and relative earnings each be estimable functions of age,  $a$ , and cohort,  $c$ , namely,  $RE = f(a, c)$  and  $Rm = g(a, c)$ . Then  $\ln \omega$  may be written as an indirect function of age and cohort:  $\ln \omega = - \ln[ 1 + f(a, c) \cdot g(a, c) ]$ . With numerical expressions for  $f(a, c)$  and  $g(a, c)$ ,  $\ln \omega$  may be simulated for different values of age and cohort.

Consider the effect of changes in relative employment on  $\ln \omega$  given observed changes in relative earnings. As in Section III, let  $c_R$  denote a recent cohort,  $c_E$  an early cohort, and  $a'$  a given age. With knowledge of  $f(a, c)$  and  $g(a, c)$ , we may ask what  $\ln \omega$  would look like for recent cohorts if  $Rm$  had changed as observed but  $RE$  had remained at its values associated with early cohorts:

$$(7) \quad \ln \omega(a'; RE(c_E), Rm(c_R)) = - \ln[ 1 + f(a', c_E) \cdot g(a', c_R) ] .$$

In this expression,  $Rm$  assumes the values associated with a recent cohort while  $RE$  assumes the values associated with an earlier cohort. Therefore,  $\ln \omega(a'; RE(c_E), Rm(c_R))$  quantifies the impact on family earnings inequality of the change in the earnings structure holding constant relative

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<sup>19</sup> Because  $E_W < E_H$  and because  $m_W < m_H$ ,  $(E_W/E_H) \cdot (m_W/m_H)$  is always substantially less than unity. The mean value of  $(E_W/E_H) \cdot (m_W/m_H)$  is 0.326. Its minimum value is 0.149 and its maximum value is 0.505.

employment. By contrast, consider computing the impact on family earnings inequality of changes in relative employment holding constant relative earnings:

$$(8) \quad \ln \omega(a'; RE(c_R), Rm(c_E)) = - \ln[1 + f(a', c_R) \cdot g(a', c_E)].$$

Hence, at each age,  $RE$  assumes values associated with a recent cohort while  $Rm$  assumes values associated with an earlier cohort.  $\ln \omega(a'; RE(c_R), Rm(c_E))$  indicates the impact on family earnings inequality of the change in the structure of relative employment holding constant relative earnings.

The first step in these counterfactuals is to provide an accurate description of the age and cohort patterns in relative employment and relative earnings,  $f(a, c)$  and  $g(a, c)$ . After fitting a number of different functional forms, the relative employment and relative earnings of these age-cohort cells are expressed as a fully interacted quintic function of age and linear function of cohort:

$$(9) \quad RE(a, c) = \sum_{j=0}^5 \sum_{k=0}^1 \beta_{jk} (a^j)(c^k) + u(a, c)$$

$$(10) \quad Rm(a, c) = \sum_{j=0}^5 \sum_{k=0}^1 \gamma_{jk} (a^j)(c^k) + \varepsilon(a, c)$$

where  $u$  and  $\varepsilon$  denote stochastic

elements. Weighted least-squares estimates of these two equations remove 91 percent of the variation in both relative employment and relative earnings.<sup>20</sup> With empirical estimates of  $f(a, c)$  and  $g(a, c)$ , the age profiles for  $\ln \omega$  may now be simulated corresponding to different assumptions about the paths of relative employment and relative earnings.

Figure 6 graphs the profiles of  $\ln \omega$  for cohorts 4 and 10, that is, those born in 1925-29 and

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<sup>20</sup> Adding a fully interacted quadratic term in cohort increases the  $R^2$  to 0.96 for  $RE$  and 0.92 for  $Rm$ , but the out-of-sample implications tended to be implausible with recent cohorts at some ages having values of  $RE$  sometimes substantially greater than unity.

1955-59, forty years apart. The lines with crosses plot the actual observations on  $\ln \omega$  for the 1925-29 and 1955-59 cohorts. The dotted line plots the implied values of  $\ln \omega$  for the 1925-29 cohort and the continuous line plots the implied values of  $\ln \omega$  for the 1955-59 cohort from the estimates of equations (9) and (10). Within the sample period, the implied series for  $\ln \omega$  smooths the raw data. The values of  $\ln \omega$  for the 1955-59 cohort are uniformly below those for the 1925-29 cohort both because the earnings of wives of the 1955-59 cohort have risen relative to the earnings of husbands and because the employment of wives in the 1955-59 cohort has grown relative to the employment of husbands.<sup>21</sup> From age 25 to about 50 years,  $\ln \omega$  is more than twenty log points lower for the 1955-59 cohort than for the 1925-29 cohort. This growth in the relative earnings and employment of wives has reduced the importance of husbands' earnings in family earnings and offset the impact on family earnings inequality of the growth in husbands' earnings inequality.

The implied values of  $\ln \omega$  for cohorts 1925-29 (the fourth cohort) and 1955-59 (the tenth cohort) in Figure 6 are reproduced in Figure 7. These are the dotted and continuous lines, respectively, in Figure 6. Figure 7 also presents some simulations of  $\ln \omega$  corresponding to different assumptions about relative employment and relative earnings. Thus, the series denoted  $RE(4), Rm(10)$  plots the values of  $\ln \omega$  when relative employment assumes its implied values for the fourth cohort and relative earnings assumes its implied values for the tenth cohort.<sup>22</sup> The series denoted  $RE(10), Rm(4)$  plots the values of  $\ln \omega$  when relative employment assumes its implied values for the tenth cohort and

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<sup>21</sup> The "bulge" in  $\ln \omega$  for families at ages in their late twenties and early thirties implied for the 1925-29 cohort is present in the data for the early cohorts. Inspect the 1940-44 cohort in Figure 3.

<sup>22</sup> Thus the series  $RE(4), Rm(10)$  is the particular representation at different ages for  $c_E = 4$  and  $c_R = 10$  of what was identified in equation (7) as  $\ln \omega(a'; RE(c_E), Rm(c_R))$ .

relative earnings assumes its implied values for the fourth cohort.<sup>23</sup> Evidently, both the changes in relative employment and in relative earnings account for the shift in  $\ln \omega$  over the forty years. At younger ages, the change in relative earnings is somewhat more important whereas beyond age 42 years relative employment is more important.<sup>24</sup>

### Allowing Relative Earnings to Affect Relative Employment

The accounting decomposition in the previous sub-section embodies no economic behavior. Suppose now some labor supply responses are specified. That is, suppose the changes in the relative employment of wives to husbands,  $RE = E_W/E_H$ , are induced by changes in relative earnings,  $Rm = m_W/m_H$ . That is, audaciously, write  $E_W/E_H = \delta_0 + \delta (m_W/m_H) + u$  where  $u$  is a stochastic disturbance.<sup>25</sup> Approximately  $\ln \omega = - (E_W/E_H)(m_W/m_H)$ , so that predicted values of  $\ln \omega$  can be obtained as follows:

$$\ln(\hat{\omega}) = -\hat{\delta}_0 \left( \frac{m_W}{m_H} \right) - \hat{\delta} \left( \frac{m_W}{m_H} \right)^2$$

Knowledge of the parameters  $\delta_0$  and  $\delta$  allow inferences to be drawn about the effect of relative wage

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<sup>23</sup>  $RE(10), Rm(4)$  constitutes  $\ln \omega(a; RE(c_R), Rm(c_E))$  in equation (8) for  $c_E = 4$  and  $c_R = 10$ .

<sup>24</sup> The comparisons of  $\ln \omega$  over the forty years between the 1925-29 and 1955-59 cohorts involve a number of ages outside the observed sample period. Thus, the 1925-29 cohort is not observed before age 39 while the 1955-59 cohort is not observed beyond age 44 years. With so many observations outside the observed ages, the results in the preceding paragraphs may be regarded skeptically. Therefore, the same analysis was undertaken comparing cohorts closer together. When this was effected, a similar conclusion was drawn: both the changes in relative employment and in relative earnings accounts for the shift in  $\ln \omega$  across cohorts. As in Figure 7, at older ages, the change in relative employment appears more important in describing the change in  $\ln \omega$  while, at younger ages, the change in relative earnings appears more important.

<sup>25</sup> Some conjecture that real wage reductions of low skill husbands have induced greater employment of their wives. This would imply that  $\delta > 0$  incorporates this cross-wage effect. Juhn and Murphy (1997) argue that own-wage effects on labor supply substantially dominate cross-wage effects.

changes on the decline in the relative importance of husbands earnings. Table 5 contains weighted least-squares estimates of  $\delta_0$  and  $\delta$ . In column (1), an increase in  $m_w/m_H$  of 0.10 is associated with an increase in  $E_w/E_H$  of 0.12 so the relative employment of wives to husbands is highly sensitive to their relative market earnings. At sample mean values, the elasticity of  $E_w/E_H$  with respect to  $m_w/m_H$  is 0.75 or, with fixed age and cohort effects (in column (2)), the elasticity is 0.44.

The implications of these estimates for  $\ln \omega$  are shown in Figure 8 for two cohorts, the 1940-44 and 1955-59 birth cohorts. For the 1940-44 cohort, the age pattern in the imputed values of  $\ln \omega$  follows the actual values of  $\ln \omega$  though the correspondence is much higher at ages from 35 to 46 than earlier or later years. For both cohorts, imputed values of  $\ln \omega$  lie below actual values suggesting that while movements in relative earnings contribute substantially to the changes in the importance of husbands' earnings in total family earnings - the correlation coefficient between the actual and predicted values of  $\ln \omega$  is 0.92 - they are not adequate to explain all the observed changes.

### Wives' Employment and Earnings Inequality

The previous sub-sections examined the impact of the growing employment of wives on the importance of wives' earnings in family earnings. Now we quantify the impact of rising employment-population ratios of wives on the inequality of earnings among all wives. The variance in earnings among all wives (workers and nonworkers),  $\sigma_w^2$ , is given by  $\sigma_w^2 = E_w \cdot s_w^2 + E_w \cdot (1 - E_w) \cdot m_w^2$  where  $E_w$  is the employment-population ratio of wives,  $s_w^2$  is the variance of earnings among employed wives, and  $m_w^2$  is the square of mean earnings of employed wives. (See footnote 17.) In other words, the variance in wives' earnings is a weighted average of the variance among the employed and the variance between the employed and the nonemployed. Dividing this expression through by  $\mu_w^2$  (the square of the mean of wives' earnings) yields

$$(11) \quad V_w^2 = E_w \cdot (s_w / \mu_w)^2 + E_w \cdot (1 - E_w) \cdot \eta$$

where  $V_w^2 = (\sigma_w / \mu_w)^2$  and  $\eta = (m_w / \mu_w)^2$ . The left-hand side of equation (11), the square of the coefficient of variation in wives' earnings, is now a unit-free measure of dispersion. The effect of an increase in wives' employment-population ratio on  $V_w^2$  is

$$(12) \quad \frac{\partial V_w^2}{\partial E_w} = \eta [(V_w^*)^2 + (1 - 2E_w)] + E_w [\lambda + (1 - E_w)\kappa]$$

where  $V_w^*$  is the coefficient of variation in wives' earnings among those wives employed for pay,  $\lambda = \partial [(s_w / \mu_w)^2] / \partial E_w$ , and  $\kappa = \partial \eta / \partial E_w$ .

The components of equation (12) not directly observed are the terms  $\lambda$  and  $\kappa$ , but these may be computed by using our 281 husband-wife cells data to estimate  $(s_w / \mu_w)^2 = \lambda_0 + \lambda E_w + u_1$  and  $\eta = \kappa_0 + \kappa E_w + u_2$  where  $u_1$  and  $u_2$  are stochastic error terms. The weighted least-squares estimates of  $\lambda$  and  $\kappa$  are presented in columns (3) through (6) of Table 5. Clearly, increases in wives' employment are associated with large decreases in  $(s_w / \mu_w)^2$  and in  $\eta$ . An increase in  $E_w$  of 0.10 reduces the value of  $(s_w / \mu_w)^2$  by 0.62 (the estimate of  $\lambda$  in column (3) of Table 5), almost one-third of its mean value. Or, with fixed age and cohort effects, a rise in wives' employment rate of 0.10 decreases  $(s_w / \mu_w)^2$  by 0.145 (the estimate of  $\lambda$  in column (4) of Table 5) which is 72 percent of its mean. Thus the rising employment of wives substantially reduces wives' earnings inequality. Also, an increase in  $E_w$  of 0.10 reduces the value of  $\eta$ , the square of the ratio of the mean earnings of employed wives to the mean earnings of all wives, by 1.07 (the estimate of  $\kappa$  in column (5) of Table 5) and this constitutes over one-third of the mean value of  $\eta$ . With fixed age and cohort effects, an increase in the employment rate of wives of 0.10 decreases  $\eta$  by 1.29.

Using these estimates of  $\lambda$  and  $\kappa$  in equation (12), the values for  $\partial (V_w)^2 / \partial E_w$  may be

computed for each cell. Using the values of  $\lambda$  and  $\kappa$  in columns (3) and (5) of Table 5, the resulting mean value of  $\partial(V_w)^2/\partial E_w$  is -4.547; using the values of  $\lambda$  and  $\kappa$  in columns (4) and (6) of Table 5, the mean value of  $\partial(V_w)^2/\partial E_w$  is -10.150. The mean value of  $(V_w)^2$  is 1.850 so the estimate of  $\partial(V_w)^2/\partial E_w$  of -4.547 implies that an increase in  $E_w$  of 0.10 reduces  $(V_w)^2$  by 0.455 which constitutes one-quarter of the mean value of  $(V_w)^2$ . Or, if  $\partial(V_w)^2/\partial E_w$  is -10.150, a 0.10 increase in  $E_w$  reduces  $(V_w)^2$  by 1.015, over half its mean value.<sup>26</sup> The increasing employment of wives has had a strong effect on decreasing the variance in earnings among all wives.

## VI. Conclusions

Family earnings inequality increases with age - roughly, the coefficient of variation of family earnings at age 60 years is about 2.5 times that at 20 years of age - and it has grown across cohorts - the coefficient of variation of family earnings of the 1970-74 birth cohort is about 1.75 times that of the 1910-14 birth cohort. Using a felicitous decomposition of the logarithm of the coefficient of variation in family earnings,  $\ln V$ , this age and cohort growth is attributable principally to the growth in the inequality in husbands' earnings. The cohort growth in family earnings inequality would have been greater if married women had not entered the labor market in increasing numbers. From Figure 5, at middle age,  $\ln V$ , increased by about 0.26 points since the late 1960s while the logarithm of the coefficient of variation of husbands' earnings,  $\ln V_H$ , increased even more by 0.35 points. The fall in the logarithm of husbands' earnings as a fraction of family earnings - associated with the rise in married women's employment and pay - of about 0.18 points offsets the effect of increases in  $\ln V_H$ . Estimates allowing for the increase in wives' relative earnings to affect the relative employment of

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<sup>26</sup> Or, equivalently, the elasticity of  $(V_w)^2$  with respect to  $E_w$  is -1.445 using estimates of  $\lambda$  and  $\kappa$  that do not control for fixed age and cohort effects and the elasticity is -3.226 using estimates of  $\lambda$  and  $\kappa$  that do control for fixed age and cohort effects.

wives suggest that a large fraction of the decrease in the importance of the husbands' earnings is attributable to the growth in wives' relative pay. The growth in the employment of wives had a substantial effect on decreasing the variance in earnings among wives.

In conclusion, we return to the four questions posed on the first page of this paper. First, increases in the dispersion of husbands' earnings has had a profound effect on increasing family earnings inequality. Second, wives' growing employment-population ratios have had a smaller yet notable impact on decreasing family earnings inequality. Third, according to the estimates here, the growth in the employment of wives relative to husbands has been induced in part by the growth in the relative pay of wives and, by reducing the importance of husbands' earnings in family earnings, this has contributed to a reduction in the dispersion in earnings among families. Fourth, although the correlation of the earnings of husbands and wives has been increasing across cohorts, it tends to be small in absolute value and plays a negligible role in accounting for the growth in family earnings inequality over time.

This paper has neglected a number of issues that merit further investigation. While wives' increasing market employment has received much attention here, their growing work hours has been disregarded. Further, the role of measurement error in affecting the results has been put aside. Finally, the factors identified here (and other factors) may well be of varying importance at different points in the income distribution and this calls for some disaggregation. Each of these points will be addressed in subsequent research.



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## Appendix

To address the issue of the top-coding of earnings, consider the set of husbands with positive earnings and with earnings below the top-coded level. From this set, select those husbands whose earnings are in the eightieth percentile and above. Denote the earnings of the  $i$  th husband by  $y_{Hi}$ . To these husbands in this set, fit the following least-squares regression equation:

$$\ln\left(\frac{y_{Hi}}{0.8y^c}\right) = \alpha_0 + \sum_{j=1}^4 \alpha_j A_i^j + \sum_{j=1}^2 \beta_j (S_i^H)^j + \sum_{j=1}^2 \gamma_j (S_i^W)^j + u_i$$

where  $y^c$  denotes the censoring value of earnings (i.e., the top-coded value),  $A$  denotes the husband's years of age,  $S^H$  his years of schooling, and  $S^W$  the years of schooling of his wife. The equation's stochastic term is  $u$ . After estimating this equation, use it to predict the earnings of those husbands with earnings above the top-coded level as follows:

$$\hat{\ln} y_i = \ln y^c + \hat{\alpha}_0 + \sum_{j=1}^4 \hat{\alpha}_j A_i^j + \sum_{j=1}^2 \hat{\beta}_j (S_i^H)^j + \sum_{j=1}^2 \hat{\gamma}_j (S_i^W)^j$$

This imputation procedure was used in an analogous way for wives. This was applied in each year. For a very small number of observations, the predicted value of earnings was below  $y^c$ . In these few instances, imputed earnings was set to the top-coded level.

Table1

Definitions and Ages of Cohorts  
 (omitting cells with fewer than one thousand husband-wife pairs)

cohort	years born	youngest observations aged.....	oldest observations aged....	number of years observed
1	1910-14	54 in 1967-68	60 in 1970-74	7
2	1915-19	49 in 1967-68	60 in 1975-79	12
3	1920-24	44 in 1967-68	60 in 1980-84	17
4	1925-29	39 in 1967-68	60 in 1985-89	22
5	1930-34	34 in 1967-68	60 in 1990-94	27
6	1935-39	29 in 1967-68	60 in 1995-99	32
7	1940-44	24 in 1967-68	57 in 1997-2000	34
8	1945-49	20 in 1967-69	53 in 1998-2000	34
9	1950-54	20 in 1970-74	49 in 1999-2000	30
10	1955-59	20 in 1975-79	44 in 1999-2000	25
11	1960-64	20 in 1980-84	39 in 1999-2000	20
12	1965-69	21 in 1986-90	34 in 1999-2000	14
13	1970-74	23 in 1993-97	29 in 1999-2000	7
all	1910-74	20 in 1967-84	60 in 1970-2000	281

Table 2

Descriptive Statistics on Variables for 281 Age-Cohort Cells

	variable	mean	stan. dev.	minimum	maximum
1	$\ln V$	-0.330	0.193	-0.797	0.291
2	$\ln V_H$	-0.189	0.230	-0.766	0.521
3	$\ln V_W$	0.284	0.153	-0.024	0.669
4	$\ln \omega$	-0.280	0.071	-0.409	-0.139
5	$K = (0.5) \ln[1 + \theta^2 + 2.r.\theta]$	0.139	0.054	0.048	0.378
6	$\theta$	0.509	0.093	0.343	0.900
7	$r$	0.055	0.055	-0.063	0.279
8	$\ln \mu_H$	3.431	0.184	2.925	3.856
9	$E_H$	0.846	0.080	0.588	0.974
10	$s_H^2$	753.2	628.4	101.2	3,103.9
11	$m_H^2$	1,447.9	511.0	392.0	3,084.4
12	$m_H^2/s_H^2$	2.504	0.905	0.700	5.964
13	$(0.5).\ln(E_H .s_H^2)$	3.095	0.336	2.291	3.901
14	$J=(0.5).\ln[1 + (1 - E_H)(m_H^2)/(s_H^2)]$	0.147	0.058	0.033	0.285

Table 3

The Results from Fixed Effects Weighted Least-Squares Regressions: Birth Cohort Effects

cohorts:	dependent variable						
	$\ln V$	$\ln V_H$	$\ln V_W$	$\ln \omega$	$K$	$\theta$	$r$
1910-14	-.121	-.197	.146	.123	-.047	-.081	-.040
1915-19	-.090	-.162	.148	.099	-.027	-.047	-.022
1920-24	-.072	-.126	.135	.086	-.032	-.042	-.042
1925-29	-.028	-.069	.108	.066	-.026	-.041	-.025
1930-34	-.018	-.040	.059	.033	-.011	-.015	-.015
1935-39	ref.	ref.	ref.	ref.	ref.	ref.	ref.
1940-44	.028	.041	-.026	-.031	.018	.032	.016
1945-49	.060	.096	-.119	-.083	.047	.084	.036
1950-54	.111	.174	-.183	-.128	.066	.112	.052
1955-59	.190	.260	-.187	-.159	.089	.132	.086
1960-64	.264	.354	-.225	-.195	.105	.136	.120
1965-69	.321	.431	-.273	-.217	.107	.110	.156
1970-74	.436	.524	-.132	-.223	.135	.163	.156

Table4

Decomposition of the Variance in  $\ln V_H$ 

	(1)	(2)	(3)	(4)
	nothing held constant	age held constant	cohort held constant	age and cohort held constant
$(\sigma_1^2 / \sigma_0^2)$	0.644	0.444	0.588	1.180
$(\sigma_2^2 / \sigma_0^2)$	0.047	0.009	0.032	0.200
$(\sigma_3^2 / \sigma_0^2)$	2.388	3.063	2.600	4.514
$(\sigma_4^2 / \sigma_0^2)$	0.064	0.090	0.022	0.259
$r_{12}$	-0.127	-0.231	-0.030	-0.820
$r_{13}$	-0.713	-0.827	-0.762	-0.816
$r_{14}$	0.214	0.719	0.243	0.651
$r_{23}$	-0.447	0.049	-0.567	0.661
$r_{24}$	-0.727	-0.404	-0.470	-0.692
$r_{34}$	-0.044	-0.882	-0.121	-0.908

In this table,  $\sigma_0^2$  is the variance of  $\ln V_H$ ,  $\sigma_1^2$  is the variance of  $-\ln \mu_H$ ,  $\sigma_2^2$  is the variance of  $(0.5)\ln E_H$ ,  $\sigma_3^2$  is the variance of  $(0.5)\ln s_H^2$ , and  $\sigma_4^2$  is the variance in  $J$ .  $r_{12}$  is the correlation coefficient between  $-\ln \mu_H$  and  $(0.5)\ln E_H$ ,  $r_{13}$  is the correlation coefficient between  $-\ln \mu_H$  and  $(0.5)\ln s_H^2$ ,  $r_{14}$  is the correlation coefficient between  $-\ln \mu_H$  and  $J$ ,  $r_{23}$  is the correlation coefficient between  $(0.5)\ln E_H$  and  $(0.5)\ln s_H^2$ ,  $r_{24}$  is the correlation coefficient between  $(0.5)\ln E_H$  and  $J$ , and  $r_{34}$  is the correlation coefficient between  $(0.5)\ln s_H^2$  and  $J$ .

Table 5  
 Weighted Least-Squares Estimates of  $E_W/E_H = \delta_0 + \delta(m_W/m_H) + u$ ,  
 $(s_W/\mu_W)^2 = \lambda_0 + \lambda E_W + u_1$ , and  $\eta = \kappa_0 + \kappa E_W + u_2$

	(1)	(2)	(3)	(4)	(5)	(6)
	dependent variable					
	$E_W/E_H$	$E_W/E_H$	$(s_W/\mu_W)^2$	$(s_W/\mu_W)^2$	$\eta$	$\eta$
estimated parameters:						
$\delta_0$	0.191 (0.028)	0.345 (0.029)				
$\delta$	1.204 (0.063)	0.707 (0.085)				
$\lambda$			-6.168 (0.248)	-14.526 (0.972)		
$\kappa$					-10.683 (0.170)	-12.900 (0.547)
fixed age & cohort effects?	no	yes	no	yes	no	yes
$R^2$	0.54	0.95	0.69	0.84	0.93	0.98
<i>see</i>	0.079	0.027	0.473	0.378	0.348	0.216

Estimated standard errors are in parentheses. The mean of  $E_W/E_H$  is 0.722 and its standard deviation is 0.115. The mean of  $E_W$  is 0.588 with a standard deviation of 0.134. The mean of  $(s_W/\mu_W)^2$  is 2.012 with a standard deviation of 0.850. The mean of  $\eta = (m_W/\mu_W)^2$  is 3.015 with a standard deviation of 1.281. The equation's standard error of estimate is *see*.

Figure 1

$\ln V$  by Age and Cohort

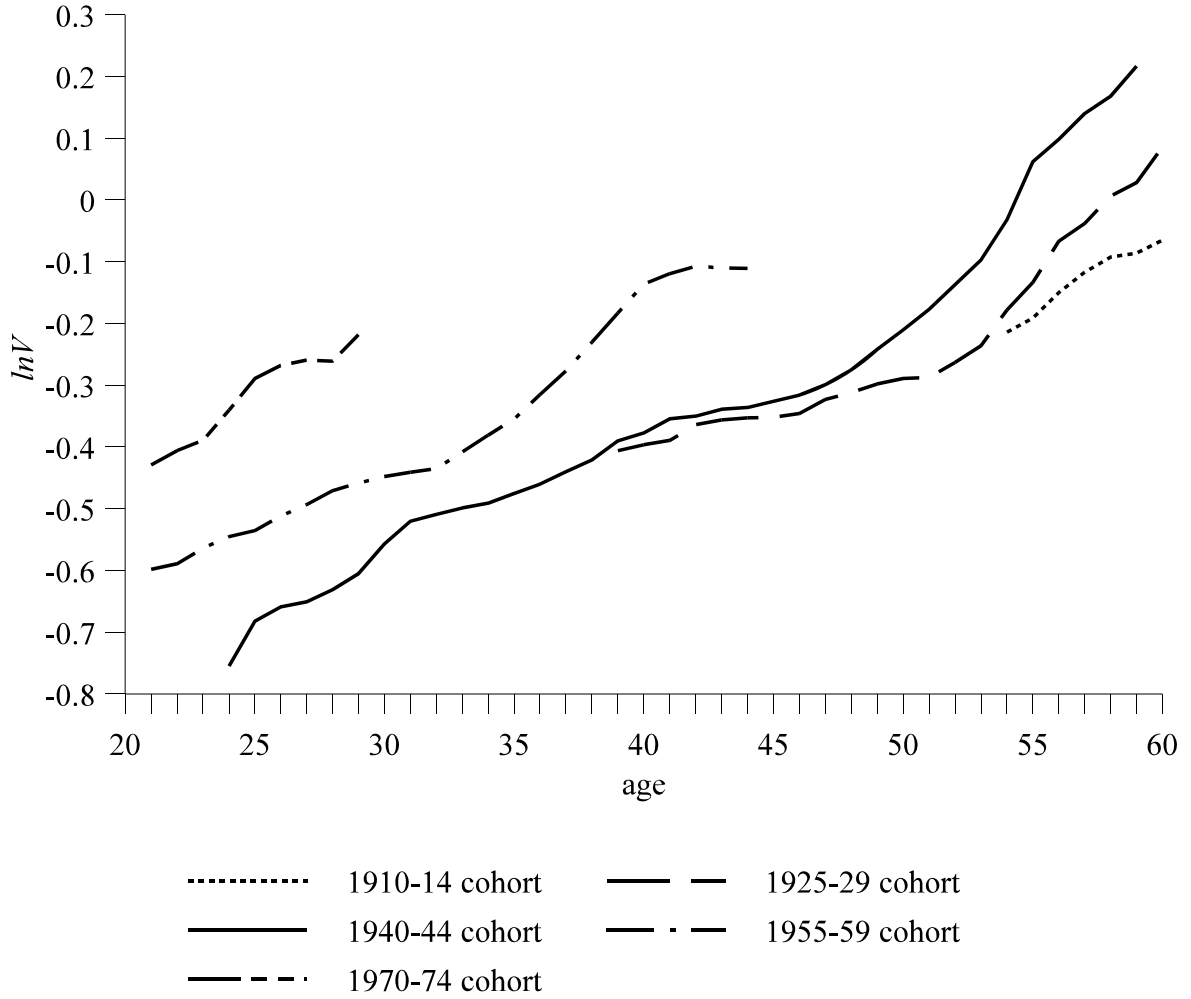




Figure 2

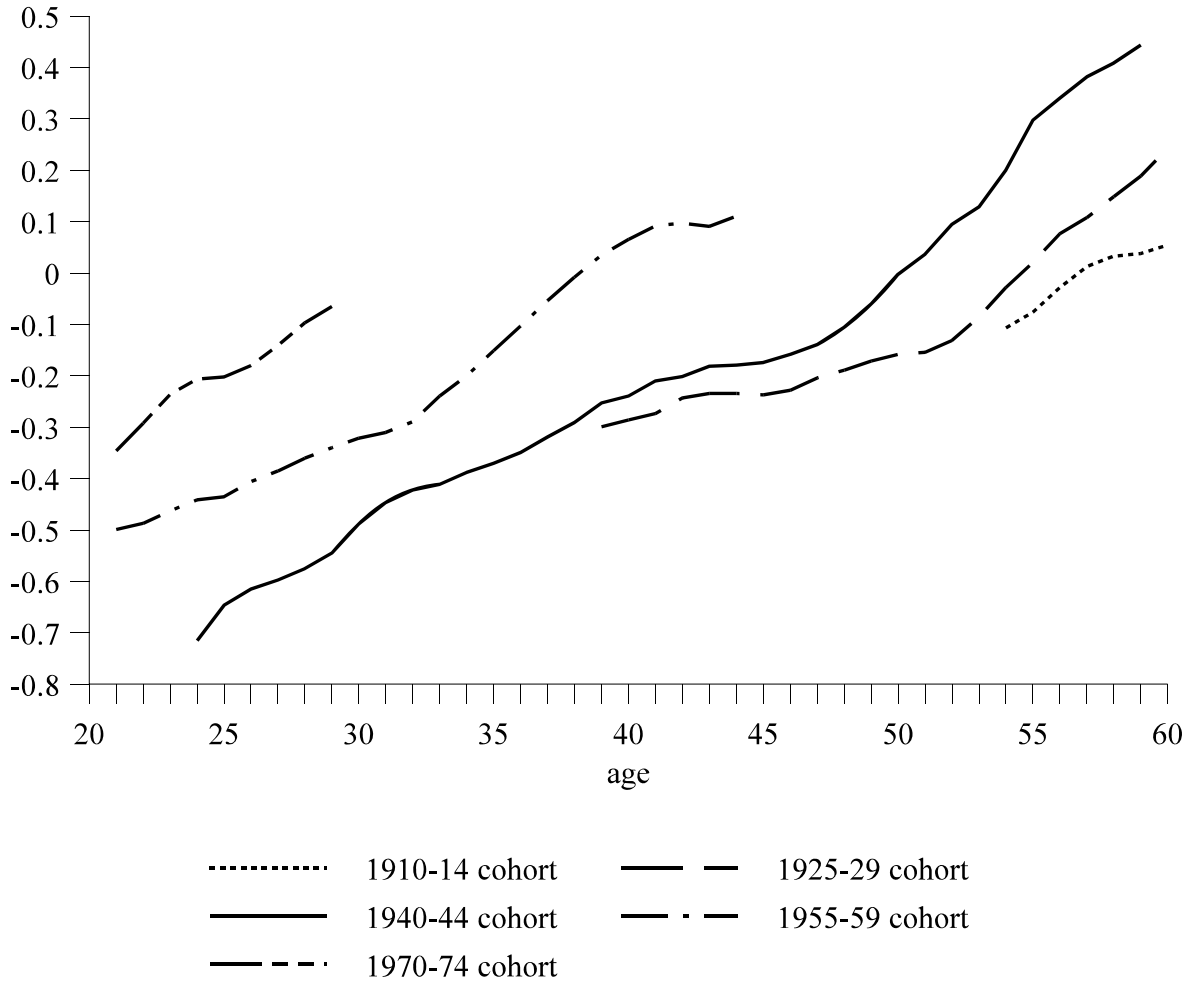
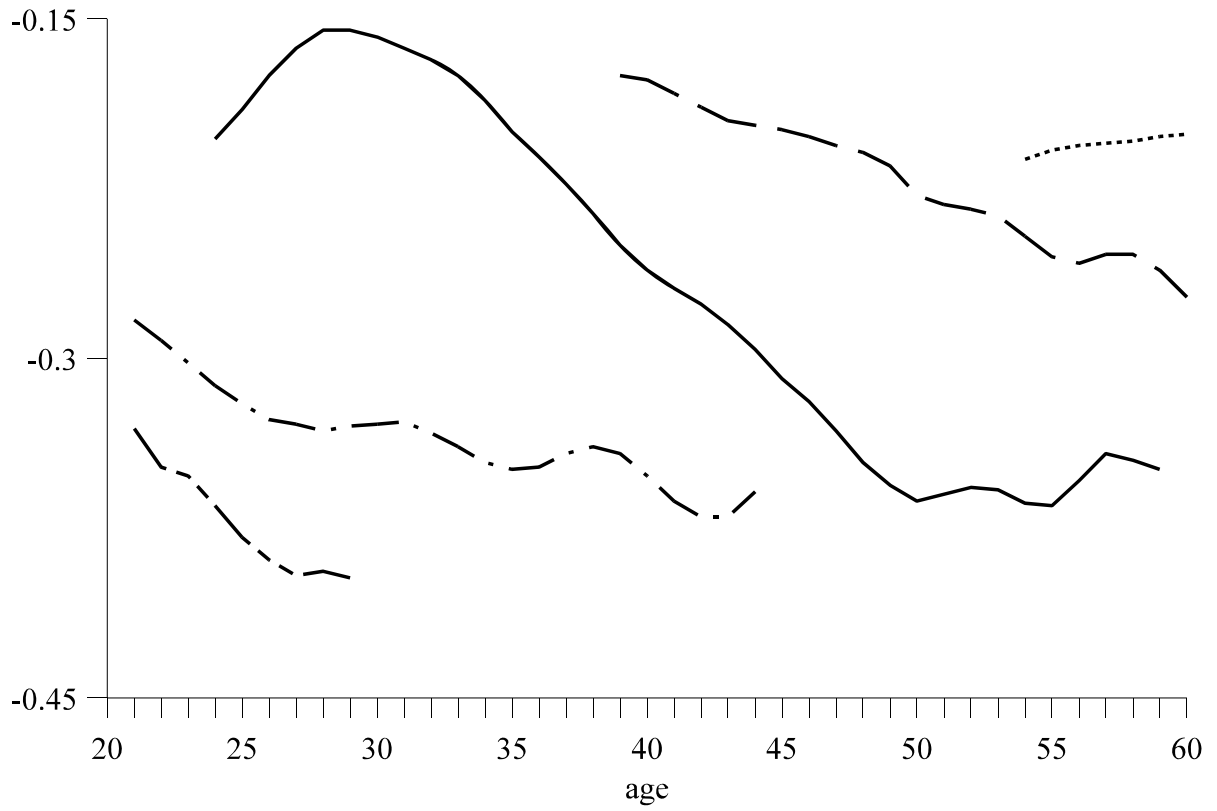
 $\ln V_H$  by Age and Cohort

Figure 3

 $\ln \omega$  by Age and Cohort

.....	1910-14 cohort	— — —	1925-29 cohort
————	1940-44 cohort	— · —	1955-59 cohort
— · — ·	1970-74 cohort		

Figure 4

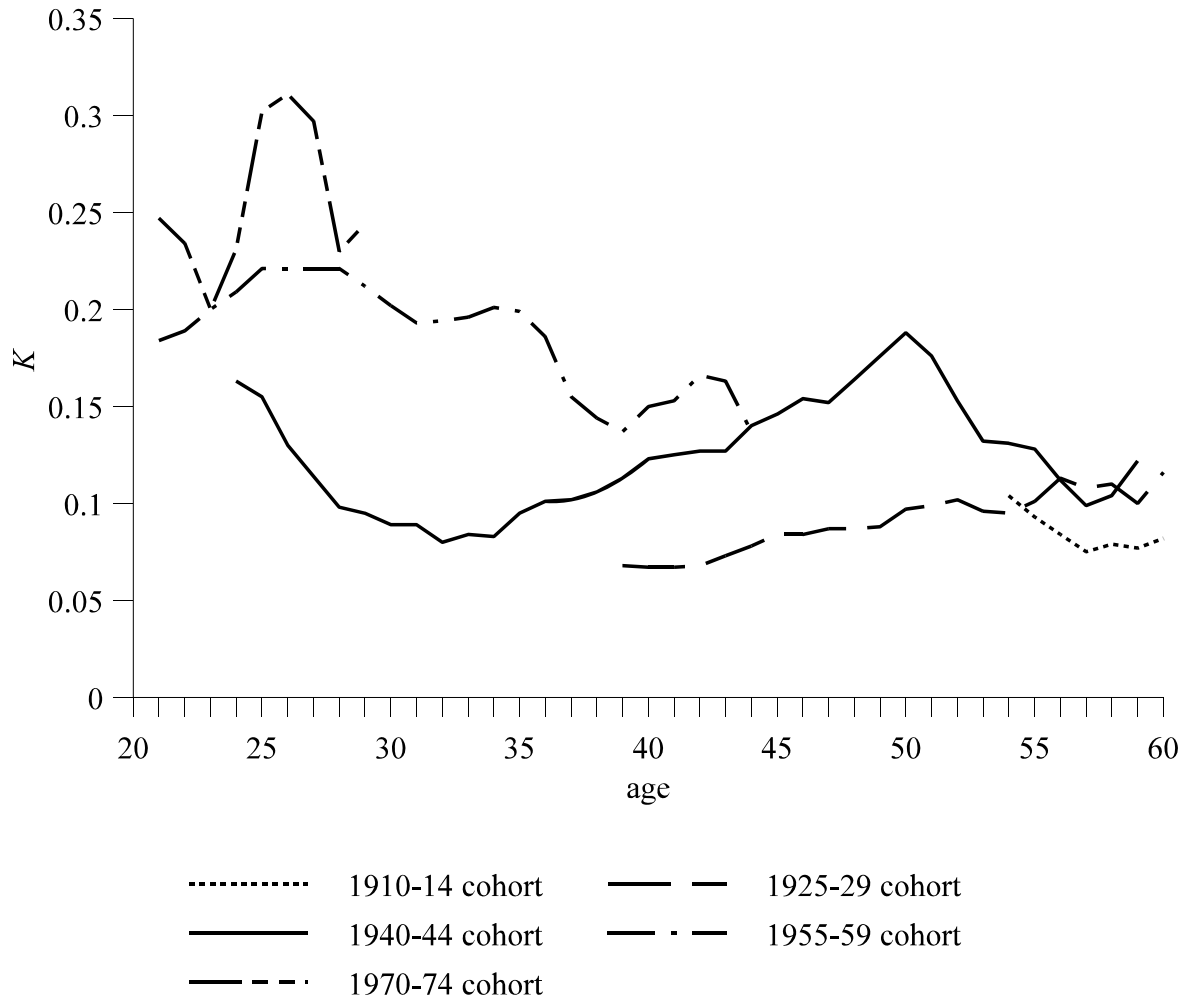
 $K$  by Age and Cohort

Figure 5

Changes in Family Earnings Inequality and its Components across Cohorts

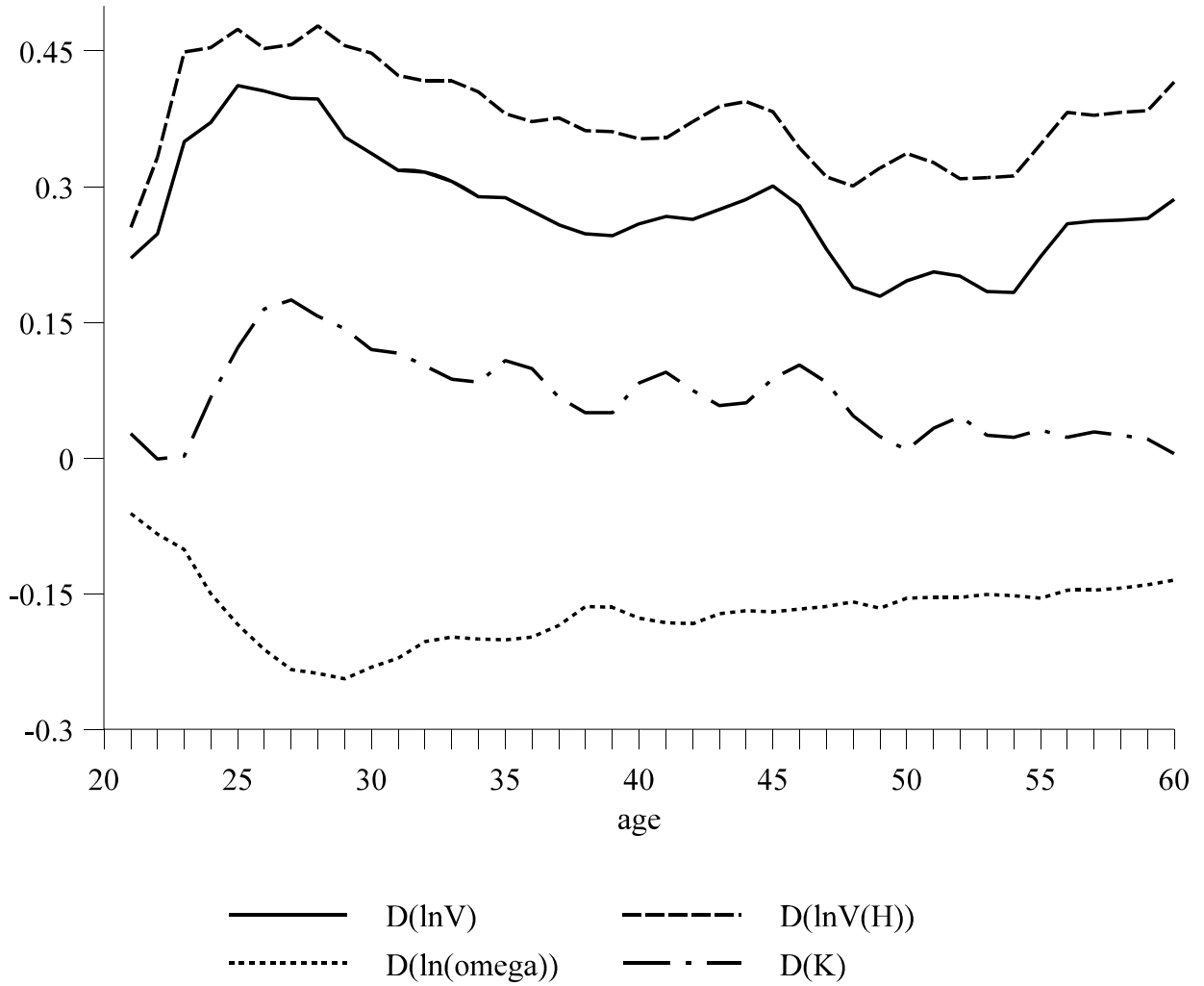
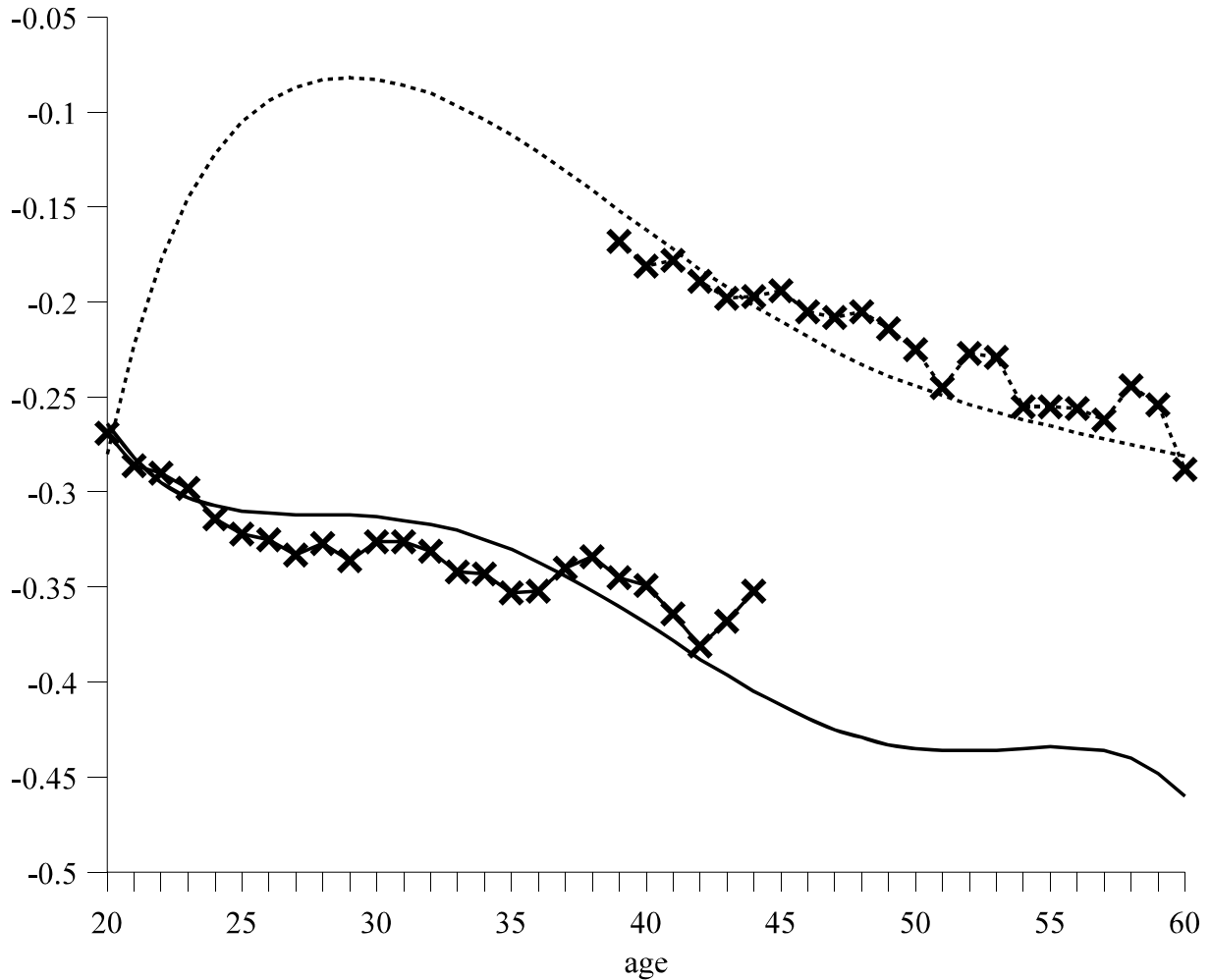


Figure 6

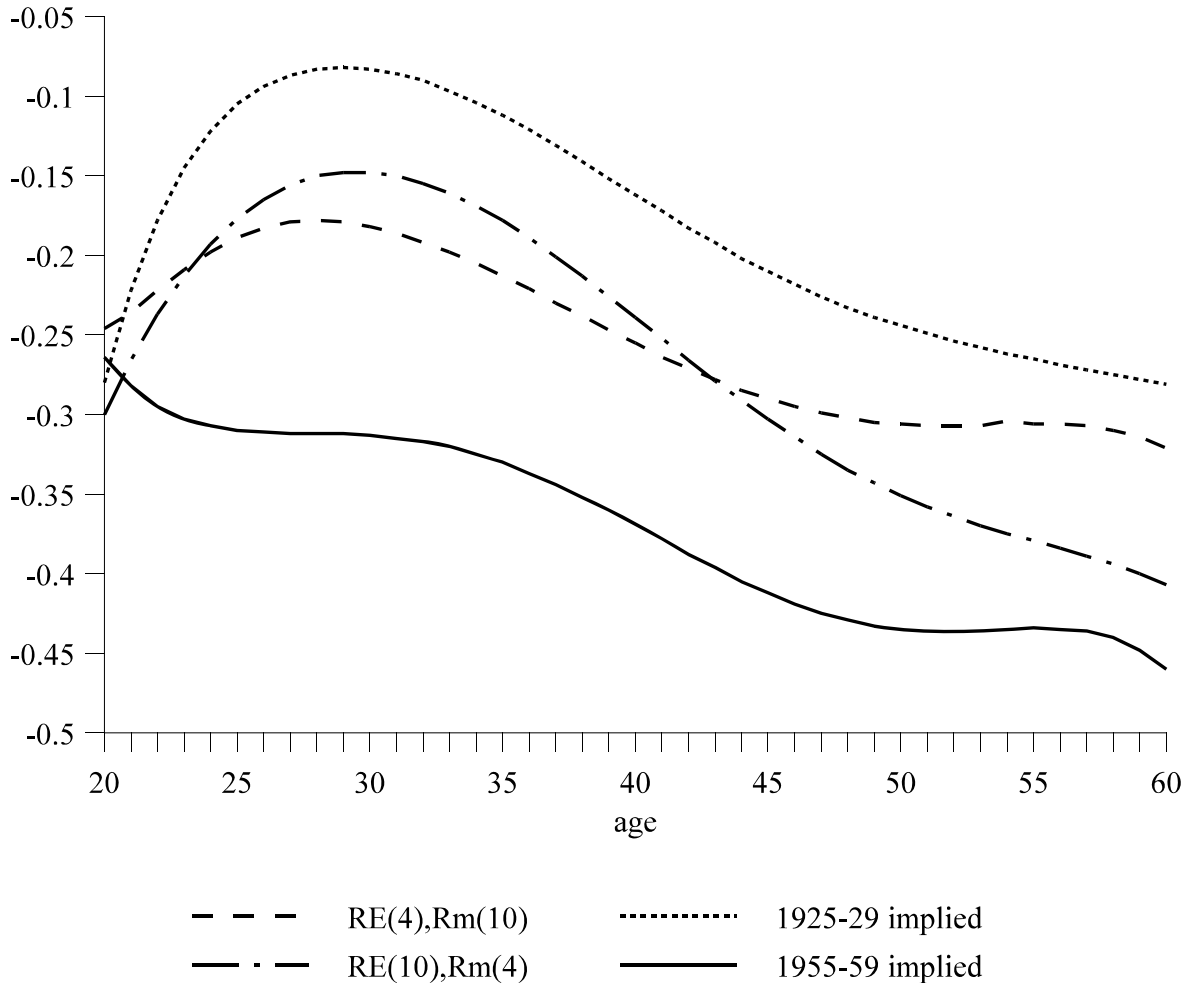
$\ln \omega$  by Age: Actual and Implied for the 1925-29 and 1955-59 Cohorts



The lines with crosses plot the actual observations on  $\ln \omega$  for the 1925-29 and 1955-59 cohorts. The dotted line plots the values implied for  $\ln \omega$  for the 1925-29 cohort from the estimates of equations (9) and (10) and the continuous line plots the values implied for  $\ln \omega$  for the 1955-59 cohort from the estimates of equations (9) and (10).

Figure 7

$\ln \omega$  by Age: Implied and Extrapolated for the 1925-29 and 1955-59 Cohorts



T

he dotted line plots the values implied for  $\ln \omega$  for the 1925-29 cohort from the estimates of equations (9) and (10) and the continuous line plots the values implied for  $\ln \omega$  for the 1955-59 cohort from the estimates of equations (9) and (10). The other two lines graph simulations of  $\ln \omega$  corresponding to different assumptions about relative employment and relative earnings. The series denoted  $RE(4),Rm(10)$  plots the values of  $\ln \omega$  when relative employment assumes its implied values for the fourth cohort and relative earnings assumes its implied values for the tenth cohort. The series denoted  $RE(10),Rm(4)$  plots the values of  $\ln \omega$  when relative employment assumes its implied values for the tenth cohort and relative earnings assumes its implied values for the fourth cohort.

Figure 8

Actual and Imputed Values of  $\ln \omega$  by Age and Cohort