Recent Trends in Wage Inequality and the Wage Structure in Canada[*]

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1. Introduction

After a lengthy period of relative stability, the decades of the 1980s and 1990s brought pressures toward growing inequality in Canada and several other countries. Such pressures raised concerns that Canadian society may increasingly become characterized by "haves" and "have-nots." These developments raised a number of important issues. Some related to the nature of the phenomenon. Are the earnings of individuals indeed becoming more unequally distributed? If so, is this a general phenomenon or one concentrated on particular groups? Do changes in the earnings of individuals imply similar changes in family income? How does the tax and transfer system affect the distribution of after-tax-and-transfer family income? Other questions related to the causes and consequences of these developments.

The chapters in this volume deal with these (and other) dimensions of inequality in Canada. The purpose of this chapter is to address the first two questions listed above –whether individual earnings are becoming more unequally distributed, and what groups in society are affected. More specifically, this chapter examines recent Canadian trends in wage inequality and in the wage structure --the way in which wages vary systematically with characteristics such as education, age, and gender. While a number of studies have documented the evolution of wage inequality and the wage structure during the 1980s and early 1990s, little is known about more

recent trends during the strong economic recovery of the late 1990s and the (mild) recession of 2001.

The principal contribution of the paper is to update these trends using newly available data from the 2001 Census. One salient finding is that the wage differential between more and less-educated workers increased sharply during the second half of the 1990s. We also find a similar result using two other data sets, the Survey of Labour and Income Dynamics (SLID) and the Labour Force Survey (LFS). Another interesting development is that after fifteen years of sustained expansion, the wage differential between younger and older workers declined substantially between 1995 and 2000.

Our analysis complements that in several other chapters. Because the chapter by Fortin and Schirle examines gender earnings differences we focus mainly on wage differences by age and education. However, we report results separately for males and females because the trends for the two groups are so different. We also focus on the wages of individual workers, leaving the analysis of family income to the chapter by Frenette, Green and Picot.

The plan of the paper is as follows. In Section 2, we survey the existing literature on the evolution of wage inequality and the wage structure in Canada and highlight what we perceive to be the key knowledge gaps in the area. We describe the various data sets available in Section 3 and argue that the Census is best suited for documenting recent trends in wage inequality and the wage structure. The main Census results are presented in Section 4. We then look in detail at the evolution of the university-high school wage gap among subgroups of the population in Section 5. Section 6 shows that our main findings from the Census are robust to the choice of alternative wage measures and alternative data sets. We conclude in Section 7.

2. Literature Survey

A number of studies have looked at the evolution of wage inequality and the wage structure in Canada since the early 1980s. Unlike the United States where there is an unambiguous increase in wage inequality during this period, existing studies for Canada provide an ambiguous picture on the evolution of wage inequality. On the one hand, studies that look at inequality in hourly wage rates using special supplements to the LFS generally find little change in overall measures of wage inequality like the variance of log wages.[1] On the other hand, studies that look at inequality in weekly or annual earnings using the Survey of Consumer Finance (SCF), the Canadian Census, or administrative tax data tend to find steady growth in earnings inequality.[2]

Why these different data sources yield different trends in wage inequality remains an open issue. One possible answer is that the growth in earnings inequality is being driven by growing inequality in hours of work instead of growing inequality in hourly wages (Morissette et al., 1993; Doiron and Barrett, 1996). Another possible answer is that some of the growth in observed wage dispersion is due to increasing measurement error in wage and earnings measures (Lemieux 2003).

Despite these differences, however, a number of key trends in the wage structure appear to be robust to choice of data source. In particular, a number of studies on the wage structure in Canada have documented a steep growth in the wage gap between older and younger workers, especially during the first half of the 1980s (e.g. Beaudry and Green 1998, 2000; Picot, 1998a, 1998b). It is also widely accepted that in Canada, unlike the United States, the wage gap between more- and less-educated workers remained stable throughout the 1980s and early 1990s (Freeman and Needels, 1993; Murphy, Riddell and Romer, 1998).

Overall inequality can be decomposed into two components. The "within-group" portion refers to the amount of inequality within a particular age-education-gender group, while the "between-group" component refers to the amount of inequality that arises from earnings differences across age-education-gender groups. Since the trends in wage differentials between age and education groups appear to be robust to the choice of data, within-group inequality must be the source of discrepancy across data sources in trends in overall wage inequality. Indeed, studies that use direct measures of hourly wages, such as Card, Kramarz and Lemieux (1999) find no growth in within-group inequality. By contrast, studies like Morissette et al. (1993) document substantial growth in within-group inequality in the SCF. This is consistent with Lemieux (2003) who finds that, in the United States, within-group wage inequality grows much more in the March Current Population Survey (CPS), where earnings are collected on an annual retrospective basis (as in the Canadian SCF), than in the May and outgoing rotation group supplements of the CPS, where earnings for most workers are collected on an hourly and contemporaneous basis. In light of these measurement problems, we will focus our analysis on the evolution of the wage structure and only briefly mention trends in overall and within-group wage inequality.

The fact that returns to education appear to be relatively stable in Canada is surprising in light of the dramatic growth in returns to education south of the border. The standard explanation for this apparent paradox is that the relative supply of highly educated workers increased faster in Canada than the United States since the early 1980s (Freeman and Needels, 1993; Murphy, Riddell and Romer, 1998). In the United States, the consensus is that returns to education increased because the relative demand for more-educated workers grew faster than

relative supply (Katz and Murphy, 1992). The faster growth in relative supply in Canada may have been just enough to keep returns to education stable.

In both Canada and the United States, however, the fact that returns to education appear to have remained stable in the 1990s is puzzling. The 1990s are viewed by many as a period of unprecedented technological change that should have resulted in a large increase in the demand for highly skilled workers. In fact, Card and DiNardo (2003) view the stability in U.S. returns to education in the 1990s as a major challenge to the view that recent changes in the wage structure are primarily driven by skill-biased technical change.

Unfortunately, the trends in the wage structure since the mid-1990s have not been as well documented in Canada as in the United States. The major challenge in documenting these trends is the lack of consistent data sources throughout the 1990s. Until recently, most studies used the Survey of Consumer Finances (SCF) that was, unfortunately, discontinued in 1997.[3]

One exception is Burbidge et al. (2002) who document recent changes in returns to schooling by combining data from the SCF up to 1997 with data for more recent years from the SLID and the LFS. They conclude that the return to schooling –the wage gap between university-educated and other workers-- remained stable throughout the period 1981-2000. More surprisingly, they also find that the return to schooling remained stable for young men over the last two decades. This appears to contradict studies by Bar-Or et al. (1995), Beaudry and Green (1998) and Card and Lemieux (2001) that all find that the return to schooling grew substantially for young men during the 1980s and early 1990s.

The main contribution of this paper is to update trends in wage inequality using data from the 1981 to 2001 Census. In the next section, we describe in detail the data used in the study and

explain why we think that the Census is the best data source for documenting trends in the wage structure and wage inequality in Canada.

3. Data

a. Canadian Census

Since 1981, the Canadian Census has been collecting consistent information on educational attainment, earnings and work experience during the previous year (annual earnings from different sources, weeks worked, and full-time employment status), and other socio-economic characteristics of individuals. The information on educational attainment is unusually rich. The Census provides detailed information on years of schooling and degrees and diplomas obtained. We combine these variables to classify workers into seven education groups: 0-8 years of elementary schooling, some high school, high school diploma, some post-secondary education, post-secondary degree or diploma below a university bachelor's degree (including trade certificates), university bachelor's degree, and post-graduate degree (Masters, PhD, and professional degrees).

Another advantage of the Census for studying the evolution of the wage structure is the large sample size. In the Census, basic questions about demographics and educational attainment are asked of all individuals in the population. Twenty percent of individuals are also asked an additional set of questions (the "long form") about earnings and labour market activities. Over the years, Statistics Canada has made available public use samples that are random samples of 10 to 15 percent (depending on the years) of individuals who completed the "long form". These represent large samples of 2 to 3 percent of all individuals in the country. Following the existing literature, we focus our analysis on "adults" age 16 to 65 at the time of the

Census (June).[4] The sizes of the available samples of workers range from 235,606 in 1981 to 418,209 in 1991.[5]

One difficulty in studying recent trends in the wage structure is that public use samples of the 2001 Census are not yet available. Fortunately, as part of this project Garnett Picot, Andrew Heisz and Logan MacLeod of Statistics Canada kindly provided us with special tabulations from the "master files" of the 2001 Census. These tabulations are based on the full 20 percent sample of individuals who answered the "long form" in the 2001 Census (3,041,619 workers).

One drawback of the Census for studying the evolution of the wage structure is that it only provides limited information on annual hours of work. As a result, it is not possible to construct a direct measure of average hourly wages by dividing annual earnings by annual hours of work.[6] Following Card and Lemieux (2001) and many U.S. studies such as Katz and Murphy (1992), we use weekly earnings of full-time workers as our main measure of wages. As mentioned in Section 2, the existing evidence suggests that trends in the wage structure (wage dispersion between age or education groups) are relatively robust to the choice of wage measure. By contrast, trends in within-group, or residual, wage inequality should be interpreted with caution, as they appear to be sensitive to the choice of wage measure.   In light of this, we focus most of our empirical analysis on measures of wage dispersion between age and education groups, for both men and women.

Following most of the literature, we only use wage and salary earnings for computing weekly earnings of full-time workers. Another common practice in the literature that we do not follow here is to limit the sample to "full-year" workers who worked at least 49 or 50 weeks during the previous year.[7] For the sake of completeness, however, we report some results using

6

all earnings (both wage and salary and self-employment earnings), and some results when the sample is limited to full-year workers (see Section 6).

In the public use files of the Census, earnings are top-coded for a small fraction (less than one percent) of individuals with very high earnings. Statistics Canada adjusts the top-code over time to keep it more or less constant in real terms.[8] For the sake of consistency, we also top-code earnings in the 2001 Census at the same value in real terms as the $200,000 top-code in the 1996 Census ($217,850). Finally, we trim all wage observations with weekly earnings below $75 (in $2000) since they yield implausibly low values for hourly wages.[9]

b. Other data sets

We think that the Census is the best data source for studying the evolution of wage inequality and the wage structure because it provides a consistent measure of educational attainment over the 1980-2000 period. As mentioned in the Introduction, the evolution of wage differences across educational groups is a central issue in the literature on wage inequality in Canada, the United States, and other countries. It is thus essential to have a data source like the Census that provides information on the evolution of the returns to education in a consistent fashion over a sufficiently long period of time, including recent years.

Several other micro data sets also contain information on education and earnings in Canada. In particular, most previous studies on wage inequality have relied on the Survey of Consumer Finances (SCF) which was conducted annually (or bi-annually) until 1998 (earnings year 1997). The earnings and work experience variables in the SCF are very similar to those in the Census. In principle, it is thus possible to construct the same wage measure --weekly wage and salary earnings of full-time workers-- in the SCF as in the Census. The major disadvantage

of the SCF is that education is not measured in a consistent fashion over time. In particular, there was an important change in the way educational achievement is measured in the SCF between 1989 and 1990.[10] For instance, prior to 1990 the LFS questions limited post-secondary education to the type of education that normally requires high school completion. After 1990, any education that could be counted towards a community college diploma, a trades certificate, or a university degree is treated as post-secondary. As a result, the number of individuals classified as having some or completed post-secondary education increased very substantially in 1990, while the fraction of individuals with some secondary school decreased substantially. Furthermore, prior to 1990 it is not possible to separate individuals with a university bachelor's degree from those with a post-graduate degree. Prior to 1990, it is thus not possible to compute the standard wage difference between individuals with exactly a bachelor's degree and individuals with exactly a high school diploma.

The other obvious disadvantage of the SCF for measuring recent trends in the wage structure is that it was discontinued in 1998 (earnings year 1997). Since then, Statistics Canada has been releasing cross-sectional files from the SLID that are intended as a replacement for the SCF. Unfortunately, several key variables are collected very differently in the SLID than in the SCF. In particular, earnings of respondents are self-reported in the SCF while administrative tax records are used for most respondents in the SLID. Furthermore, as in all panel surveys some of the respondents in the SLID cannot be followed over time. Relative to a pure cross-section like the SCF or the Census, this attrition bias may affect sample composition in ways that are difficult to take into account.

Because of these various measurement problems, we strongly believe that the Census is superior to the SCF/SLID for measuring the evolution of the wage structure in Canada since the

early 1980s. We nonetheless report some results for the SCF and the SLID for the sake of completeness and comparability with previous studies.

The last data source we use is the LFS that has collected information about hourly wages on a monthly basis since January 1997. Compared to the SCF and the Census, the key advantage of the LFS is that it collects information about the hourly wage rate of workers on their main job. The LFS can thus be used to examine how using weekly earnings of full-time workers – a measure that can also be computed in the LFS – instead of hourly wages affects the results. It also provides an additional source of information on recent trends in the Canadian wage structure.

Note finally that in the SLID, unlike the SCF or the Census, it is possible to construct a measure of hourly wage rates from the detailed information available on all jobs held by individuals in the previous year. We thus report results using both this wage measure and the more traditional measure –weekly earnings of full-time workers—that can be constructed from the information about total earnings and weeks of work in the previous year. We also process the SLID, SCF, and LFS data to make the samples and wage measures as comparable as possible to those used in the Census. In particular, we trim low wage values, only use wage and salary earnings, and only retain individuals age 16-65.

4. Main Results from the Census

Figure 1 presents both unadjusted and regression-adjusted wage differentials between the different education groups. The wage differentials reported in the Figure 1 are all defined relative to workers with a high school diploma (but without any post-secondary education, including trade certificates). Unadjusted wage differentials are simply the difference between

9

the mean log wage of workers in a given education group, and the mean log wage of high school graduates.[11] The regression-adjusted estimates are obtained by estimating a standard regression of log wages on a set of six education dummies (high school is the base case) and a quartic in potential experience. We use the standard procedure to compute years of potential experience, defined as age minus years of schooling minus six. The Census asks detailed questions about years of schooling completed, and we use this information to compute potential experience.

Since we do not have access to the micro-data from the 2001 Census, we cannot directly estimate a wage regression on individual-level data. We instead use a two-step approach. In the first step, we compute average log wages for each age-education group (or cell). We have 50 age groups (age 16 to 65) and 7 education groups for a total of 350 age-education cells. The number of cells is reduced to 332 after eliminating 18 cells of individuals who are too young for having completed a given level of education (negative potential experience).[12] In the second step, we estimate a weighted earnings regression for mean cell wages. The weights used in the regression are the number of people in the cell. When all the variables in the regression can be written as function of age and education, the two-step estimates are numerically equivalent to the estimates obtained by running directly the same regression on the micro data.

The two approaches do not yield identical results in our case because potential experience is constructed using the years of schooling variable that is not simply a function of the seven education categories. The problem is that this variable takes on different values for individuals in the same education group. For instance, some people with exactly a bachelor's degree report 16 years of schooling completed, while others report 17 years of schooling. In the cell-level regressions, we use mean years of schooling within each cell to compute years of potential experience in that cell. In other words, we impute the same level of potential experience to all

10

workers in the same age-education cell. This is different from estimating a regression model at the individual level where individual-specific potential experience is used instead. Fortunately, using average potential experience (in the cell) instead of the individual specific potential experience has little impact on the estimated wage differentials.[13]

a. Returns to education

Figure 1a presents the raw education wage differential for men. To simply the discussion of the results, we will refer to workers with exactly a bachelor's degree as "BA" graduates although this group also includes individuals with other types of bachelor's degrees like a B.Sc. We also interpret differences in log wages as percentage point differences for presentation purposes.[14]

---Figure 1a inserted here---

The main result in Figure 1a is that the BA-high school wage differential increased sharply between 1995 and 2000.[15] Between 1980 and 1995, the BA-high school differential was relatively stable at around 30 to 35 percentage points. It then jumped to 40 percent in 2000. Similarly, the wage differential between university post-graduates and high school graduates expanded sharply after 1995. By contrast, the wage differentials between other education groups and high school graduates are smaller and relatively stable over time. In fact, wage differentials are close to zero for all the remaining education groups except workers with a post-secondary degree below a BA (includes university certificates below a BA, community college or CEGEP diploma, and trade certificates). Taken at face value, Figure 1a suggests that for men returns to high school completion relative to those individuals who only have elementary or some secondary schooling are very small.

Figure 1b shows, however, that adjusting for differences in years of potential experience has important consequences for the pattern of education differentials. The regression-adjusted wage differentials are systematically larger (in absolute value) than the unadjusted wage differentials. For example, the adjusted wage gap between high school graduates and workers with only elementary schooling (0 to 8 years) is 20 percent in Figure 1b, compared to almost zero in Figure 1a. High school dropouts make about 10 percent less than high school graduates in Figure 1b, while workers with some post-secondary education earn 5 to 10 percent more.

---Figure 1b inserted here---

The discrepancy between the adjusted and unadjusted differentials is due to the fact that the workforce has become increasingly educated over time. For instance, most of the workers with only elementary schooling are older and more experienced. This explains why relative earnings of this group decline substantially when experience is held constant. In other words, secular growth in educational attainment generates a negative correlation between schooling and experience. As a result, returns to education are biased down when experience is not controlled for.

Unlike the unadjusted wage gap that is stable over time, the adjusted wage gap between workers with a post-secondary diploma and a high school diploma grows steadily over time from 9 percent in 1980 to 16 percent in 2000. Interestingly, the adjusted wage gap between university and high school graduates increases more steadily over time than the unadjusted gap in Figure 1a. For example, the adjusted BA-high school gap increases from 34 percent in 1980 to 40 percent in 1995, while the unadjusted gap remains relatively unchanged (around 32 percent) over the same period. Most of the rise in the adjusted wage gaps took place in the early 1980s and

late 1990s. For all university graduates (bachelor's degree or more), both the adjusted and unadjusted wage gap relative to high school graduates increase sharply after 1995.

Figures 1a and 1b show clear evidence that returns to education have been increasing for Canadian men between 1980 and 2000. But while the growth in unadjusted wage differentials is limited to university graduates between 1995 and 2000, the growth in adjusted wage gaps is more evenly spread out among time periods and education groups.

The results for women reported in Figures 1c and 1d are quite different from those for men. First, returns to education are systematically larger than for men.[16] For instance, the adjusted BA-high school gap for women in 1980 (48 percent) is much larger than the corresponding wage gap for men (34 percent). Second, most education wage differentials among women have increased only modestly over time. The only exception is the return to high school completion which has remained stable – as was the case for men. Overall, there has been some convergence between the returns to education of men and women between 1980 and 2000. However, returns to education remain larger for women than men in 2000.

---Figure 1c inserted here---

---Figure 1d inserted here---

The differences between unadjusted and adjusted differentials highlight the importance of controlling for other factors (in this case, experience) when making wage comparisons among education groups. Accordingly, in the remainder of the paper we focus on the adjusted differentials.[17]

b. Returns to age/experience

Figure 2a reports the adjusted wage differentials between men age 46-55 and men of other age groups.[18] These wage gaps are computed from a regression of log wages on a set of age dummies that also control for education (using dummies for the seven education categories). Men age 46-55 are used as the base group since they tend to have the highest earnings of all age groups. Figure 2a shows a large and steady expansion in the wage gap between younger (age 16-25 or 26-35) and older workers between 1980 and 1995. This finding is consistent with other studies such as Morissette (2001), Beaudry and Green (2002), and Picot (1998a, 1998b). Our Census results for the period 1980-95 thus confirm the well-known fact that returns to experience grew significantly while returns to education remained relatively stable over this period.

---Figure 2a inserted here---

Figure 2a also shows, however, that relative wages of younger workers started improving after 1995. This reversal in earlier trends is sufficiently marked in Figure 2b that in 2000 the wage gap between younger and older workers is back to its mid-1980s level. Clearly, young workers did relatively well in terms of earnings during the economic expansion of the late 1990s.

Although not shown, it is worth noting that there is substantially less growth in age wage gaps between 1980 and 1995 when adjusted wage gaps are used instead of unadjusted wage gaps. Consider for instance the wage gap between workers age 26-35 and 46-55. In 1995, both the adjusted and unadjusted wage gaps were about 28 percent. The fact that controlling for education has no impact on the wage gap means that workers age 26-35 and 46-55 have similar levels of education. By contrast, in 1980 the unadjusted gap (12 percent) was substantially smaller than the adjusted gap (19 percent), suggesting that younger workers were more educated than older workers. This pattern of results is consistent with Card and Lemieux (2001) who show that, in both Canada and the United States, there has been stagnation in educational

14

attainment of men born after 1950 (age 30 in 1980). This explains why the unadjusted wage gap grew almost twice as fast as the adjusted gap between 1980 and 1995, a conclusion that was also reached by Morissette, Picot, and Kapsalis (1999).

Figure 2b shows that adjusted age wage differentials increase substantially more for women than men over the period 1980-95. The decline in age wage differentials after 1995 is also smaller for women than for men; indeed, for some age groups the differentials simply remain stable after 1995. Unlike educational wage differentials, age wage differentials are also substantially lower for women than men. This is consistent with the well-known fact that returns to age, or potential experience, are lower for women because they tend to accumulate less actual experience than do men over the life-cycle (Mincer and Polachek, 1974). The growth in age wage differentials for women may thus simply reflect the fact that younger cohorts of women are increasingly attached to the labour market.

---Figure 2b inserted here---

c. Overall Wage Inequality

Figure 3 decomposes the growth in the overall variance of log wages into a between- and within-group component. The within-group component is the variance of the residuals from the regression of log wages on a set of six education dummies and a quartic in potential experience. It therefore measures the variance of wages within education-experience groups. The between-group component is the variance of the explained part of the regression. It measures the variance in wages between education and experience groups.

Figures 3a and 3b show that, for both men and women, the variance of wages grows steadily between 1980 and 2000. Most of the growth in the variance is due to the within-group

15

component. The between group component mostly grows between 1980 and 1985 because of the large expansion in age wage differentials during this period. The between-group variance remains relatively stable after 1985 as the growth in education wage differentials is offset by the decline in age wage differentials. To illustrate this point better, consider the case of men. Between 1980 and 1985, 0.016 of the 0.020 growth in the between group variance is due to the growth in age differentials. The remaining change (0.004) is due to changes in education wage differentials. By contrast, age wage differentials account for a 0.003 decline in the between group variance between 1995 and 2005, which is offset by a 0.006 growth in the between group variance due to growing education wage differentials.

---Figure 3a inserted here---

---Figure 3b inserted here---

For reasons mentioned in Section 2, however, the finding that within-group inequality grows steadily over the 1980-2000 period should be interpreted with some caution. In particular, existing studies for both Canada and the United States suggest that this aspect of wage inequality is sensitive to the choice of data.

In the remainder of the paper, we present a more detailed examination of changes in the wage gap between university and high school educated workers. Our objective is to more fully explore the finding that these differentials have expanded significantly since 1995.

5. The university-high school wage gap by age and experience

A key finding of Section 4 is that the wage gap between university and high school educated men increased steeply between 1995 and 2000. As illustrated in Figure 1b, this stands in sharp contrast with the situation prior to 1995 where the university-high school gap remained relatively

16

constant. Card and Lemieux (2001) show, however, that the stability in the university-high school wage gap for all men prior to 1995 hides important differences across age groups. They show that the wage gap increased for younger men but decreased for older men. Using data from the SCF, Beaudry and Green (1998) and Bar-Or et al. (1995) also find that the return to a university degree among younger men increased during the 1980s.[19]

Figure 4a shows the evolution in the wage gap between workers with exactly a bachelor's degree and workers with exactly a high school diploma for different age groups.[20] Consistent with the aforementioned studies, Figure 4a shows that the BA-high school wage gap increased by 5 to 10 percentage points for workers age 25-29 and 30-34 between 1980 and 1995. During the same period, the wage gap remained stable for workers age 35-49 and declined by 5-10 percentage points for older workers. A consequence of these offsetting trends is that the BA-high school wage gap remained relatively stable between 1980 and 1995.

---Figure 4a inserted here---

As in 1980-95, the growth in the BA-high school wage gap is more pronounced for younger workers between 1995 and 2000. The magnitude of the 1995-2000 change is much more dramatic, however, than between 1980 and 1995. For example, the wage gap for men age 26-30 almost *doubles* from 15 percent in 1995 to 28 percent in 2000. The wage gap also starts growing for middle-age men (age 36 to 50) by 2 to 8 percentage points. Relative to 1995, the wage gap also increases for older men though it remains lower in 2000 than in the 1980s.

Figure 4b shows that, compared to men, the wage gaps for women are clearly not growing over time. One exception is the wage gap for the youngest age group (25-29) that is significantly higher in 2000 than in other years. For all other age groups, the BA-high school wage gap declines between 1980 and 2000, though not significantly so in most cases.

---Figure 4b inserted here---

Figure 5 reports the BA-high school gaps by (potential) experience groups instead of age groups. For young workers, the BA-high school gap between individuals of the same age tends to be relatively small. The wage gain from attending university is offset by the fact that, given age, high school-educated workers have more labour market experience than university-educated workers. Comparing BA and high school graduates with the same level of potential experience controls for this source of discrepancy. Thus the education wage differentials among experience groups are larger than the corresponding differentials among age groups, especially at younger ages. In particular, Figure 5a shows that the BA-high school wage gap for inexperienced workers is much larger than the corresponding gap for the young age groups in Figure 4a.

---Figure 5a inserted here---

The results reported in Figure 5b for women are qualitatively similar to those for men. The wage gap for less-experienced women increases substantially over time. By 2000, the BA-high school wage gap is substantially larger for less-experienced than that for more-experienced female workers. On average, the BA-high school wage gap is higher in 2000 than it was in 1980 since the decline in the wage gap for more experienced women is more than offset by the growth in the wage gap for less experienced women.[21]

---Figure 5b inserted here---

The BA-high school wage gaps shown in Figures 4 and 5 are reproduced in Tables 1 and 2 along with their standard errors. The wage gaps are precisely estimated for most groups, and very precisely estimated in 2000 where we use the full 20 percent sample of the 2001 Census. Panel a of Table 1 shows that increase in the wage gap for young men (34 and younger) and the decrease in the wage gap for older men (age 50 and older) are large relative to the standard

18

errors. Formal tests indicate that these changes are statistically significant at the usual 95 percent confidence level. The last column of Table 1 also shows that the average wage gap for all age groups did not change significantly between 1980 and 1995.

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6. The university BA-high school wage gap: robustness checks

All the results presented up to this point are based on weekly wage and salary earnings of full-time workers from the 1981 to 2001 Census. One important finding is that the wage differential between university and high-school educated workers increased significantly for men between 1995 and 2000. We now show that this key finding is robust to the choice of wage measure in the Census. We also document recent trends in the university-high wage gap in other data sets.

a. Alternative wage measures from the Census

Figure 6 shows the evolution of the BA-high school wage gap using four different wage measures from the Census. In addition to the benchmark wage gap used up to this point (based on weekly earnings of all wage and salary workers), we first show the wage gap obtained using all earnings (including self-employment earnings). The two other wage gaps are obtained using the same two wage measures on the sub-sample of individuals working more than 49 weeks a year (full-year workers).

The four alternative measures of the adjusted BA-high school wage gap for men are reported in Figure 6a. The figure shows that both using all earnings and limiting the sample to full-year workers tend to increase the wage gap. For example, the wage gap obtained using all

<div align="center">19</div>

earnings for full-year workers is 3 to 6 percentage points higher than the benchmark wage gap (wage and salary earnings for all workers). The trends in all four wage gaps are broadly similar, however. They all show significant growth in the BA-high school wage gap between 1980 and 1985, modest or no growth between 1985 and 1995, followed by a steep increase in the wage gap between 1995 and 2000. All four alternative measures of the BA-high school wage gap grow by about 10 percentage points over the period 1980-2000.

---Figure 6a inserted here---

The same basic pattern of results holds for women. Figure 6b shows that both the average levels of the wage gap and the trends in the wage gap are robust to the choice of wage measure. The figure also confirms the earlier result that the BA-high school wage gap does not increase as much for women as for men. Nonetheless, the adjusted wage gap grows by about six percentage points between 1980 and 2000.

---Figure 6b inserted here---

b. Alternative data sources.

Figure 7 compares the Census BA-high school wage gap for 1990 to 2000 to the wage gaps obtained using other data sets. In all cases, the wage measure used is weekly wage and salary earnings of full-time workers. The first comparison data set is the SCF that provides measures of the BA-high school wage gap for the period 1989-97. The second comparison data set is the SLID for 1996-2000. The third comparison data set is the LFS for 1997-2001.

Figure 7a shows that the adjusted BA-high school wage gap for men follows relatively similar trends in all data sets. As in the Census, the BA-high school wage gap in the SCF is relatively stable until 1995. The Census data suggest a small increase in the wage differential

between 1990 and 1995, while the SCF data suggest a modest decrease. The SCF wage gap then

increases between 1995 and 1997, the last year for which the SCF data were collected. Both the

SLID and the LFS also exhibit upward trends during the 1996-2000 and 1997-2001 periods,

respectively, although compared to the Census the growth in the differential appears to be more

modest in the LFS and SLID. Similarly, the adjusted wage gaps reported in Figure 7b increase

for all data sets over the period 1995-2001. Note, however, that the wage gaps from the LFS, the

SLID, or the SCF are systematically lower than the corresponding gaps in the Census in 1995

and 2000. This mirrors the finding of Frenette, Green and Picot (this volume) that the SCF and

SLID tend to understate earnings dispersion relative to Census or tax data.

---Figure 7a inserted here---

Figure 7b reports the same estimates for women. As for men, the three alternative data

sources indicate growth in the BA-high school wage gap after 1995. In the LFS, the growth in

the wage gap is smaller than in the Census, while the SCF indicates similar growth to that in the

Census. In the SLID, the growth in the wage gap is larger than in the Census. On balance, the

results reported in Figure 7 confirm the basic finding from the Census that the wage differential

between university and high school educated workers increased after the mid-1990s.

---Figure 7b inserted here---

As mentioned in Section 3, the main weakness of the Census is that it does not provide

detailed information on average weekly hours of work. As a result, it is not possible to compute

a direct measure of average hourly earnings. In both the SLID and the LFS, however, it is

possible to compare the wage gap obtained using average hourly earnings to the "Census-type"

wage gap based on weekly earnings of full-time workers. Figure 8 compares these two

alternative measures of the adjusted BA-high school wage gap for both the LFS and the SCF.

21

For both men (Figure 8a) and women (Figure 8b), the 1997-2001 growth in the BA-high school wage differential is very similar for the two wage measures in the LFS. In the SLID, the wage gap based on hourly wage rates grows more than the wage gap based on weekly earnings for men, while the opposite is true for women. Overall, Figures 8a and 8b suggest that using weekly earnings of full-time workers does not systematically bias the wage gap estimates in one direction or another.

7. Summary and Conclusions

This paper examines trends in the wage structure and wage inequality in Canada over the last two decades. Particular attention is devoted to wage differentials by age (or experience) and education, two major sources of earnings differences among workers. Most of our analysis is based on the Canadian Census because, unlike other data sets, it provides consistent information on earnings and educational attainment for large samples of workers between 1980 and 2000. The use of Census data allows us to make two main contributions to the existing literature on the evolution of the wage structure and wage inequality in Canada. First, we examine behaviour during the latter half of the 1990s, a period of strong economic growth that has received little attention in previous studies of earnings inequality. Second, we believe that the Census is more suited to studying the evolution of the Canadian wage structure over the past two decades than the alternative data sources that most previous research has employed.

Our investigation with Census data yields several conclusions. For men and women, education wage differentials (adjusted for experience) have increased substantially over the

period 1980-2000. For men, the university BA – high school wage gap increased from approximately 35% in 1980 to about 45% in 2000, with the most dramatic rises occurring in the early 1980s and the late 1990s. There was a similar increase from about 45% to 55% in the gap between high school graduates and university post-graduates. Increased returns to education were also evident, but more modest in size, for other (non-university) post-secondary programs. Only in the case of high school completion was there no evidence of rising returns to education. The gap between high school dropouts and high school graduates remained relatively stable, as did that between those with elementary school and high school graduates.

Returns to education also rose during this period for Canadian women, but the magnitudes of the increases were more modest. For example, the university BA – high school gap increased from 48% to 54% over these two decades, and the university post-graduate – high school gap rose from 63% to 68%. As other studies have documented, the levels of the returns to education are much larger for females than for males, but the greater growth in male education differentials implies that some convergence in the male and female returns to education occurred over the sample period. Among women there were also modest increases in the returns to non-university post-secondary education and no clear changes in the differentials between high school graduates and those with less than high school education.

Our main finding is thus that the wage differential between more-educated and less-educated workers increased substantially over the past two decades, with particularly steep growth for men between 1995 and 2000. For example, the raw wage gap between men with exactly a bachelors' degree and men with only a high school diploma increased from 32 percent to 40 percent during this period. The equivalent increase for the adjusted wage gap was from 40

percent to 45 percent. For both men and women, the increase in the BA-high school wage gap is particularly large for young workers.

Another interesting development is that after fifteen years of sustained expansion, the wage differential between younger and older men declined substantially between 1995 and 2000. Indeed, by 2000 the wage gap between younger and older men had returned to its mid-1980s level. Wage differentials between younger and older women also declined, although not as dramatically as was the case for men.

Despite the recent decline in wage differentials among age groups, overall wage inequality increased steadily over the 1980-2000 period. One explanation for the increase is that the growth in education wage differential increased substantially between 1980 and 2000, while the recent decline in wage differentials among age groups remained smaller than the large increase in these differentials between 1980 and 1995. Another explanation is that residual, or within-group, wage inequality grew very substantially over the 1980 to 2000 period. Why residual inequality grew so much remains a unresolved issue that needs to be clarified in future research.

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Table 1: BA-High School Wage Gap by age groups, all full-time workers

	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Average
A. MEN									
1980	0.097	0.213	0.299	0.331	0.326	0.424	0.422	0.268	0.297
	(0.012)	(0.014)	(0.017)	(0.024)	(0.028)	(0.029)	(0.036)	(0.061)	(0.011)
1985	0.102	0.230	0.300	0.308	0.334	0.400	0.439	0.401	0.314
	(0.014)	(0.014)	(0.016)	(0.020)	(0.026)	(0.029)	(0.034)	(0.052)	(0.010)
1990	0.146	0.260	0.283	0.303	0.316	0.370	0.357	0.453	0.311
	(0.011)	(0.011)	(0.012)	(0.013)	(0.018)	(0.022)	(0.031)	(0.048)	(0.008)
1995	0.151	0.313	0.316	0.301	0.332	0.328	0.339	0.345	0.303
	(0.013)	(0.012)	(0.013)	(0.013)	(0.015)	(0.020)	(0.033)	(0.056)	(0.009)
2000	0.279	0.349	0.387	0.383	0.358	0.353	0.359	0.395	0.358
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.011)	(0.018)	(0.003)
B. WOMEN									
1980	0.329	0.487	0.516	0.526	0.491	0.607	0.495	0.665	0.514
	(0.014)	(0.019)	(0.029)	(0.034)	(0.039)	(0.040)	(0.055)	(0.112)	(0.018)
1985	0.317	0.420	0.523	0.510	0.487	0.479	0.642	0.383	0.470
	(0.014)	(0.017)	(0.020)	(0.025)	(0.036)	(0.042)	(0.051)	(0.072)	(0.014)
1990	0.350	0.427	0.464	0.493	0.493	0.514	0.451	0.477	0.459
	(0.011)	(0.012)	(0.013)	(0.014)	(0.018)	(0.026)	(0.036)	(0.058)	(0.010)
1995	0.353	0.445	0.449	0.454	0.495	0.505	0.462	0.361	0.440
	(0.014)	(0.013)	(0.014)	(0.014)	(0.015)	(0.020)	(0.035)	(0.072)	(0.011)
2000	0.433	0.480	0.494	0.469	0.467	0.495	0.460	0.353	0.456
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.011)	(0.025)	(0.004)

Table 2: BA-High School Wage Gap by experience groups, all full-time workers

	2-6	7-11	12-16	17-21	22-26	27-31	32-36	37-41	Average
A. MEN									
1980	0.288	0.308	0.370	0.358	0.367	0.402	0.315	0.292	0.338
	(0.012)	(0.013)	(0.016)	(0.022)	(0.027)	(0.028)	(0.034)	(0.057)	(0.010)
1985	0.404	0.346	0.368	0.361	0.375	0.396	0.407	0.337	0.374
	(0.014)	(0.014)	(0.015)	(0.019)	(0.024)	(0.028)	(0.032)	(0.048)	(0.009)
1990	0.377	0.376	0.375	0.362	0.347	0.354	0.345	0.384	0.365
	(0.012)	(0.011)	(0.012)	(0.012)	(0.016)	(0.020)	(0.029)	(0.043)	(0.008)
1995	0.420	0.418	0.438	0.350	0.374	0.349	0.313	0.236	0.362
	(0.014)	(0.013)	(0.013)	(0.013)	(0.014)	(0.018)	(0.030)	(0.050)	(0.008)
2000	0.525	0.469	0.475	0.447	0.390	0.367	0.329	0.298	0.413
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.009)	(0.016)	(0.003)
B. WOMEN									
1980	0.453	0.509	0.532	0.523	0.509	0.585	0.487	0.677	0.534
	(0.013)	(0.018)	(0.027)	(0.033)	(0.038)	(0.039)	(0.055)	(0.107)	(0.018)
1985	0.545	0.464	0.528	0.532	0.466	0.531	0.627	0.364	0.507
	(0.014)	(0.016)	(0.019)	(0.023)	(0.034)	(0.042)	(0.048)	(0.070)	(0.013)
1990	0.549	0.493	0.494	0.509	0.506	0.500	0.430	0.475	0.495
	(0.012)	(0.013)	(0.013)	(0.014)	(0.017)	(0.024)	(0.035)	(0.053)	(0.009)
1995	0.578	0.526	0.530	0.487	0.512	0.504	0.453	0.359	0.494
	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.018)	(0.032)	(0.068)	(0.010)
2000	0.621	0.583	0.561	0.518	0.491	0.495	0.445	0.332	0.506
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.010)	(0.023)	(0.004)

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[1] See Morissette et al. (1994), Card, Kramarz, Lemieux (1999), DiNardo and Lemieux (1997), Doiron and Barrett (1996), and Card, Lemieux and Riddell (2004). The data sets that include direct information on hourly wage rates are the 1981 Survey of Work History, the 1984 Survey of Union Membership, the 1986-90 Labour Market Activity Survey, the 1991 and 1995 Surveys of Work Arrangements, and the monthly LFS from January 1997 on.

[2] For studies based on the SCF, see Morisette et. al. (1993); for studies based on the Census see Statistics Canada (2003); for studies based on tax data see Baker and Solon (2003) and Saez and Veall (2003).

[3] The SCF was collected as a supplement to the April LFS. The last SCF was conducted in April 1998. It contains detailed information on earnings in 1997 (previous year).

[4] The information on weeks worked and annual wage and salary earnings refer to the previous year. Thus the individuals in our samples were age 15 to 64 during the period to which our wage measures apply.

[5] Samples sizes in 1986 and 1996 are 247,611 and 390,055, respectively

[6] The census asks about weeks of work and part-time/full-time status during the previous year, as well as actual weekly hours of work during the census week (in June). Since weekly hours of work vary considerably over time for many individuals, hours of work in the survey week is a poor proxy for average weekly hours of work during the previous year. In particular, many individuals who did not work during the Census week did work during the previous year.

[7] Prior to 1981, it was not possible to compute average weekly earnings since the Census only reported annual weeks of work in a few intervals. The U.S. Census and Annual Demographic Supplement of the March Current Population Survey also used to follow that practice. Given these data limitations, focusing on "full-time/full-year" workers used to be the most sensible way of obtaining a reasonable proxy for hourly wages of workers. Since the Census has been providing information on weeks of work since 1981, there is no longer a compelling reason for looking at full-year workers only.

[8] The top codes in nominal dollars are $100,000 in 1980, $140,000 in 1985, and $200,000 in both 1990 and 1995. When expressed in constant dollars of 1995, these top-codes translate to $202,099 in 1980, $197,680 in 1985, and $227,010 in 1990.

[9] Since full-time workers work at least 30 hours a week, a full-time worker earning $75 a week makes at most $2.50 an hour. This represents less than half of the minimum wage in any province in 2000.

[10] The SCF is a supplement to the (April) Labour Force Survey (LFS). The information about educational achievement in the SCF is collected as part of the LFS. See Lavoie (1992) and Burbidge et al. (2002) and for more discussion of the comparability problems in the SCF/LFS educational categories following the introduction of the new education question in the 1990 LFS.

[11] The difference in log wages provides a close approximation to the percentage difference in wages.

[12] We eliminate the following cells: age 16 with a high school diploma or more, age 17 with more than high school, age 18 to 21 with a bachelors' degree or more, and age 22 with a post-graduate university degree.

[13] We can directly compare the results from individual-level regression with either measure of potential experience for the years where we have access to the micro data (1980 to 1995). When we do so we find that the resulting education wage differentials are almost identical using the two approaches.

[14] For example, we call a 0.10 difference in log wages a "10 percent difference."

[15] A similar increase occurred in the early 1980s, but was reversed during the period 1985 to 1995.

[16] Other Canadian studies, such as Ferrer and Riddell (2002), also find that returns to education are much higher for women.

[17] Our working paper (Boudarbat, Lemieux and Riddell, 2003) reports both unadjusted and adjusted differentials.

[18] We employ age categories such as 46-55 years of age as of the survey date so that the age of the respondents during the time period when wages are measured correspond to the standard age groupings used by Statistics Canada (in this case ages 45-54).

[19] As noted previously, an exception is the study by Burbidge et. al. (2002) that concludes that the university – high school wage premium for young men was relatively stable over this period. The reasons for this contradictory finding are unclear.

[20] Because the education wage differentials are shown separately for each age group, they control for age and thus are conceptually equivalent to the adjusted series reported previously.

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[21] Figure 5b shows that, controlling for experience, the BA-high school wage gap is increasing (for women). By contrast, Figure 4b shows that this wage gap is decreasing when age is controlled for instead of experience. This apparent puzzle is due to the fact that returns to experience have been increasing for women over this period. This reduces the BA-high school wage gap at a given age since the extra experience of high school graduates is now more valuable than it used to be.

Figure 1a: Unadjusted Wage Gap in Log Weekly Earnings of Full-time Men (Relative to High School Graduates)
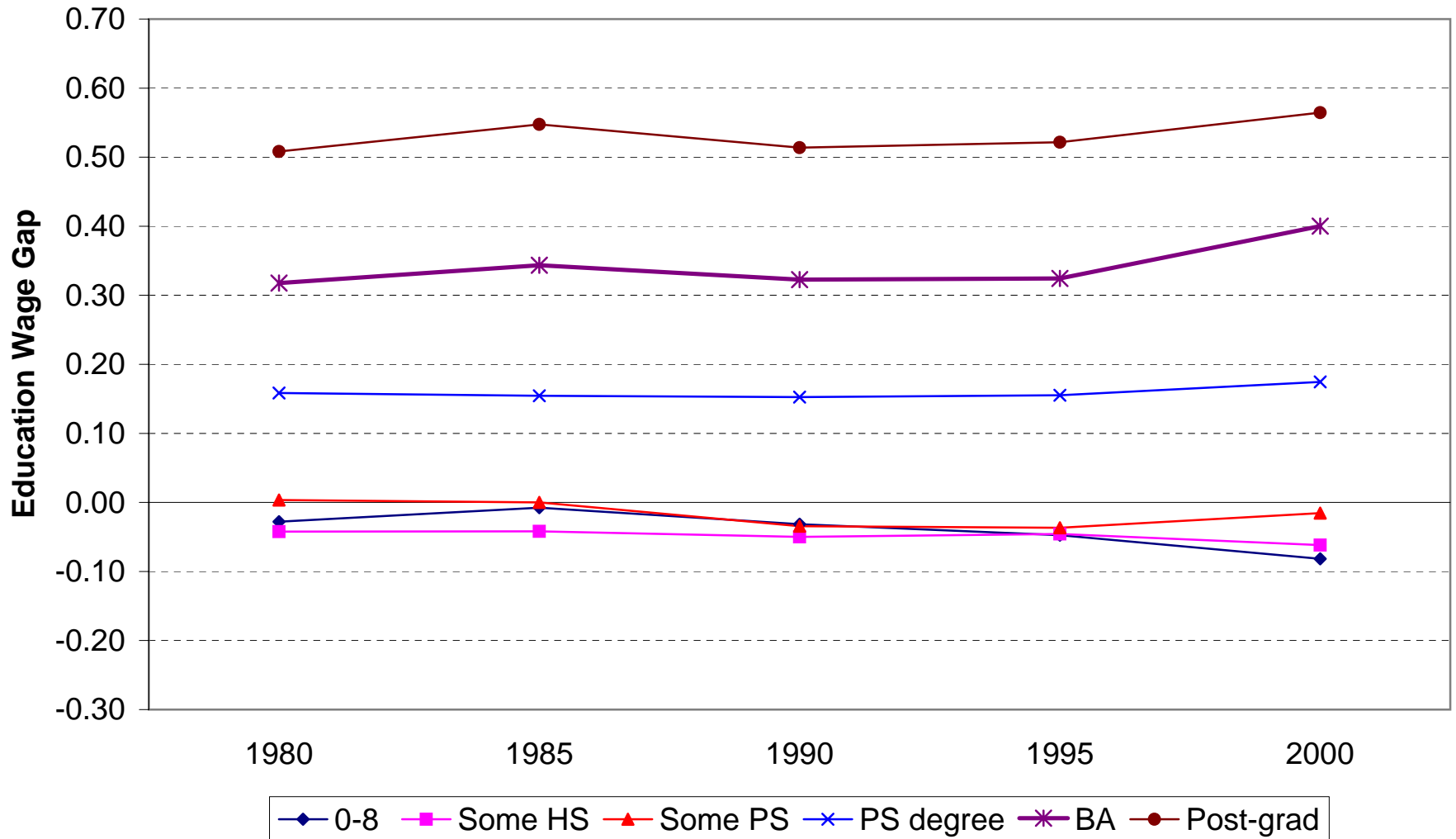
Figure 1b: Regression-Adjusted Wage Gap in Log Weekly Earnings of Full-time Men (Relative to High School Graduates)
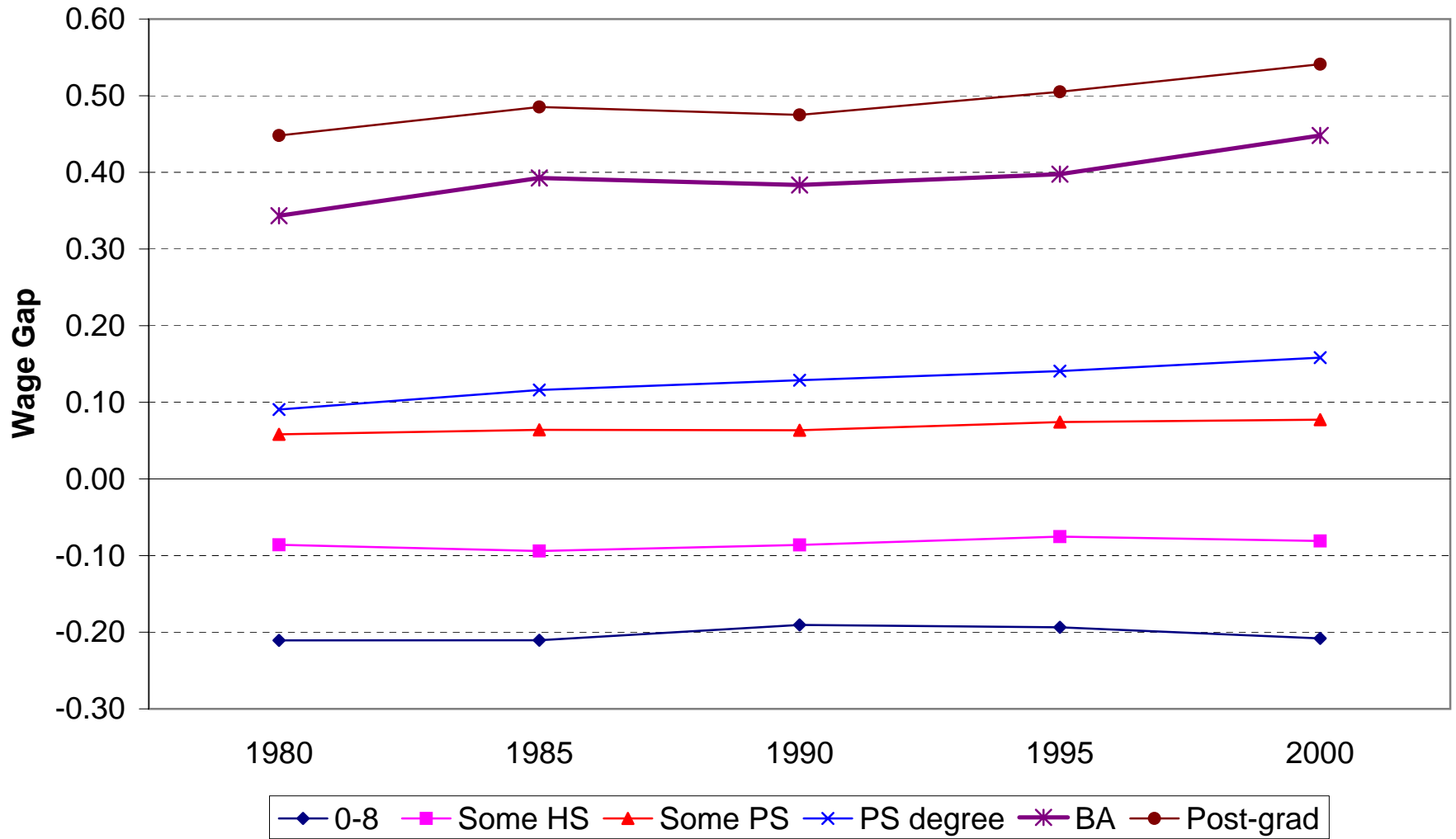
Figure 1c: Unadjusted Wage Gap in Log Weekly Earnings of Full-time Women (Relative to High School Graduates)
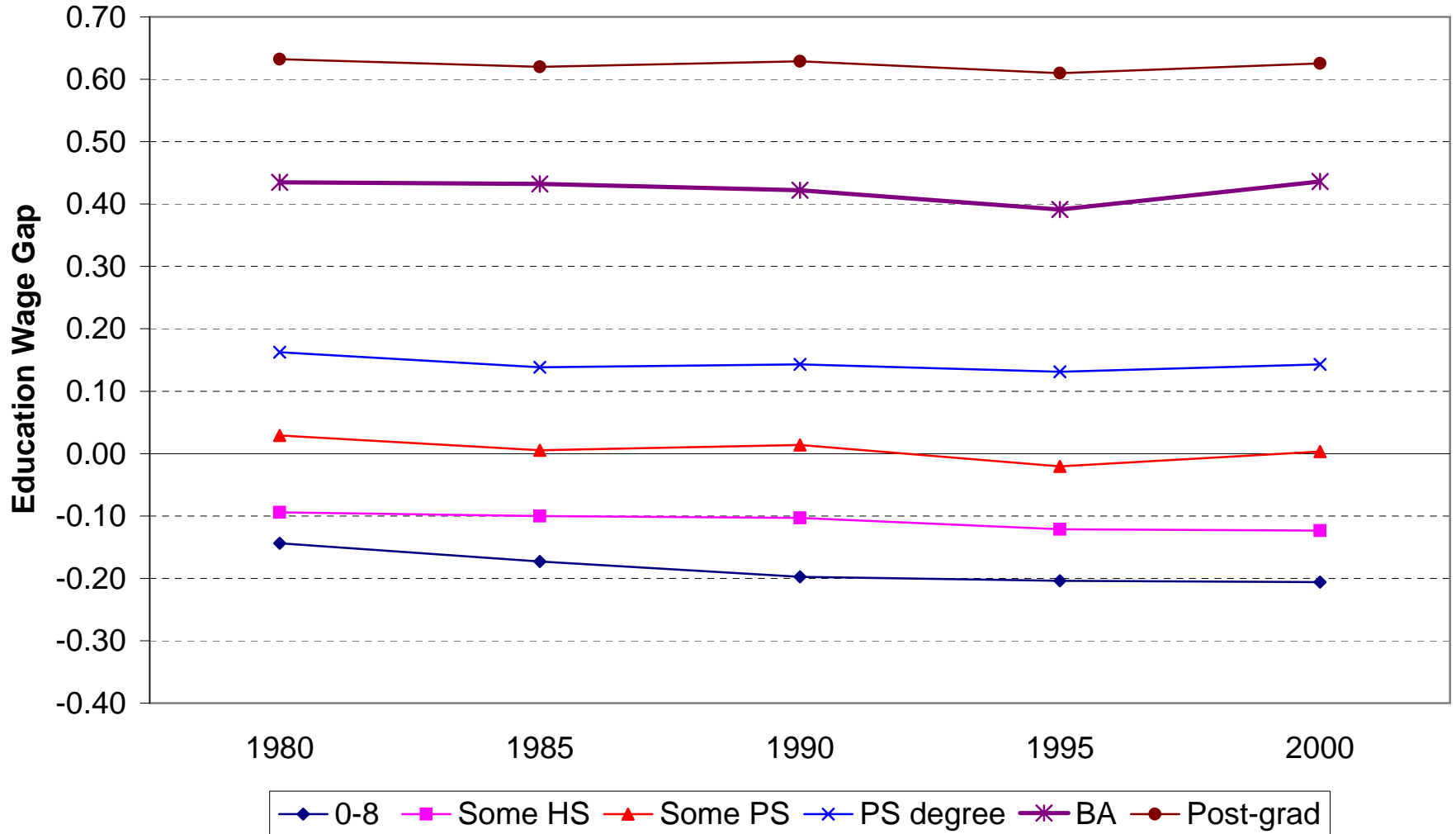
Figure 1d: Regression-adjusted Wage Gap in Log Weekly Earnings of Full-time Women (Relative to High School Graduates)
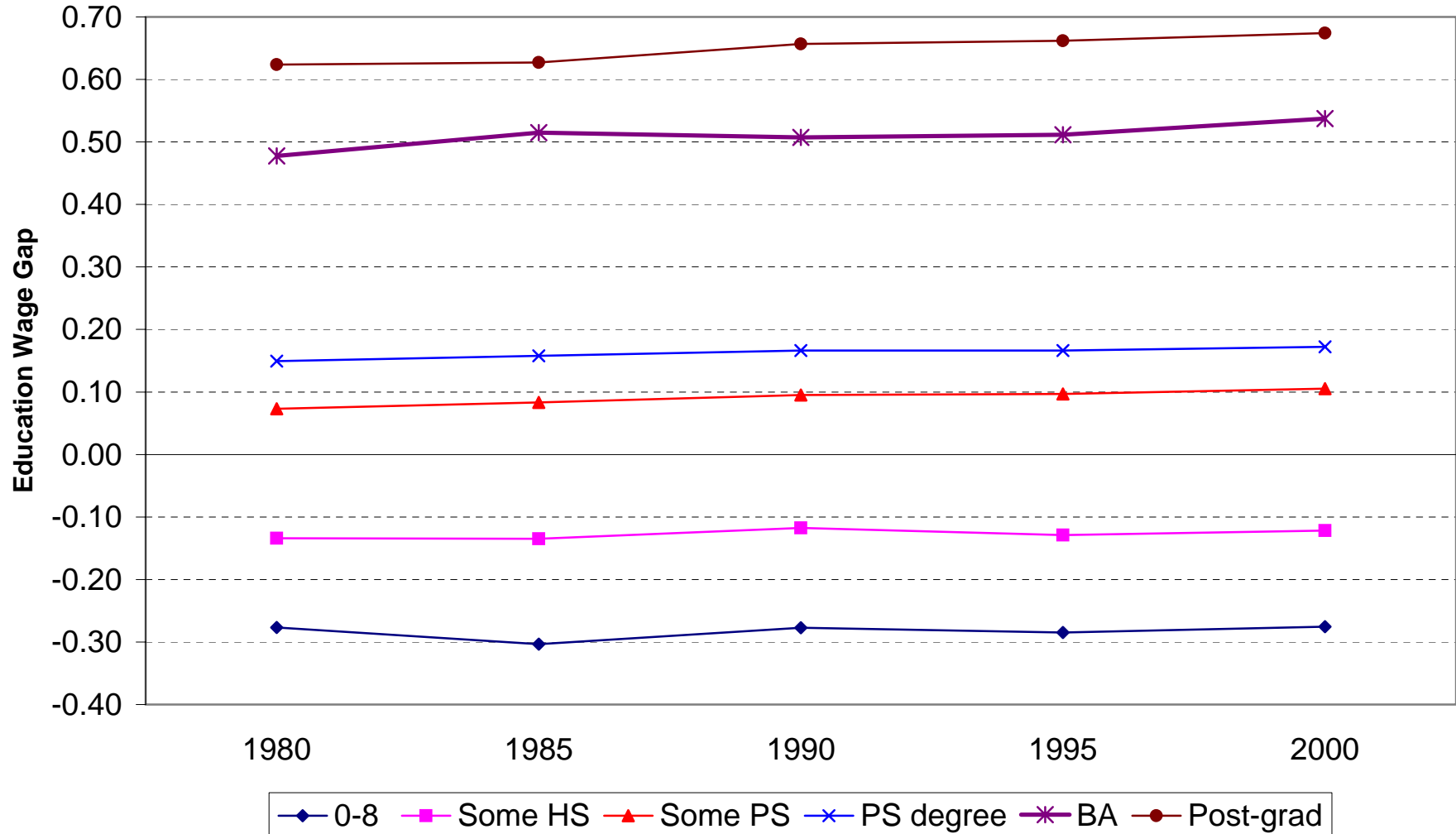
Figure 2a: Regression-adjusted Age Wage Gaps: Men Age 46-55 Relative to other Age Groups
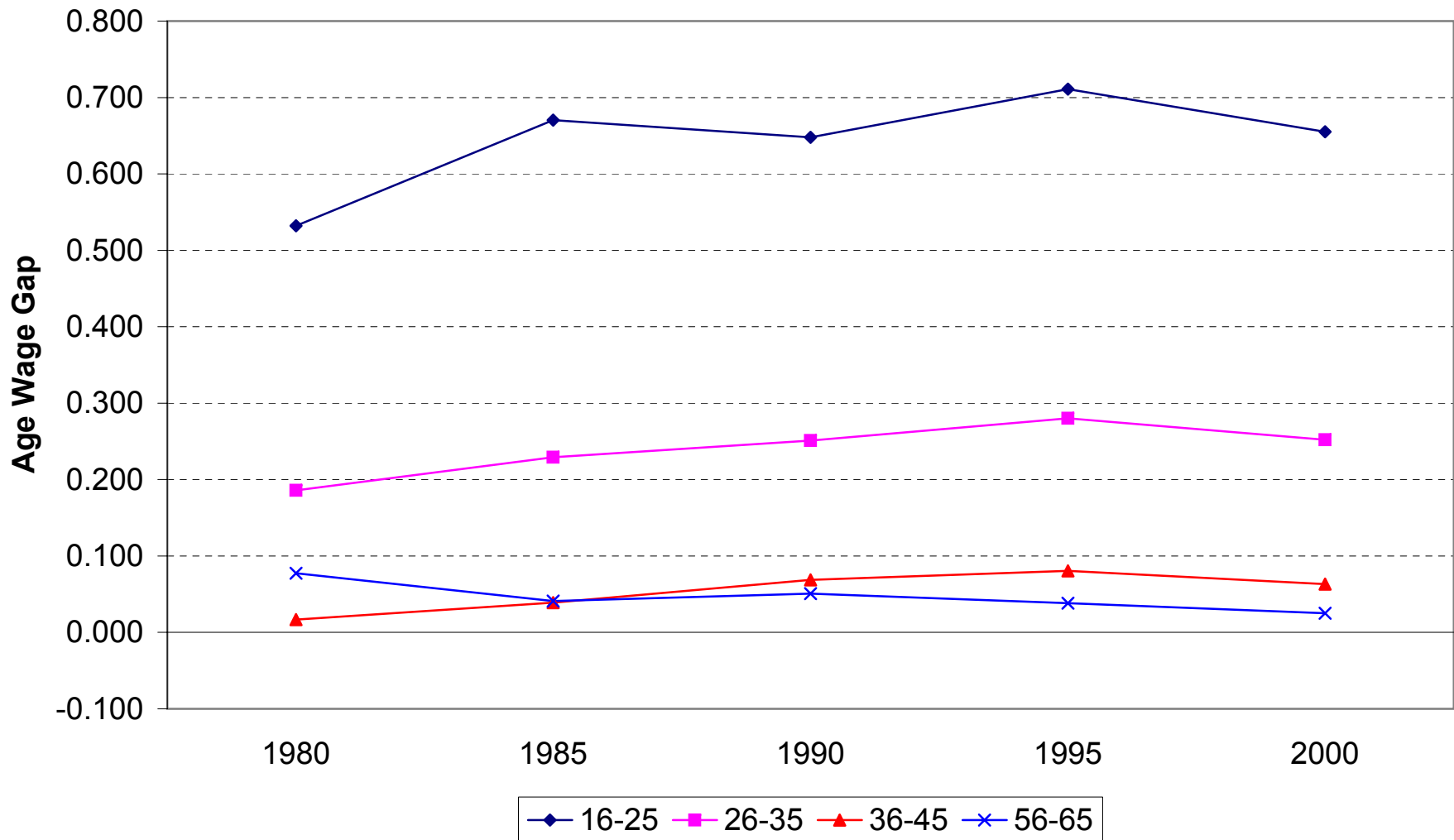
Figure 2b: Regression-adjusted Age Wage Gaps: Women Age 46-55 Relative to other Age Groups
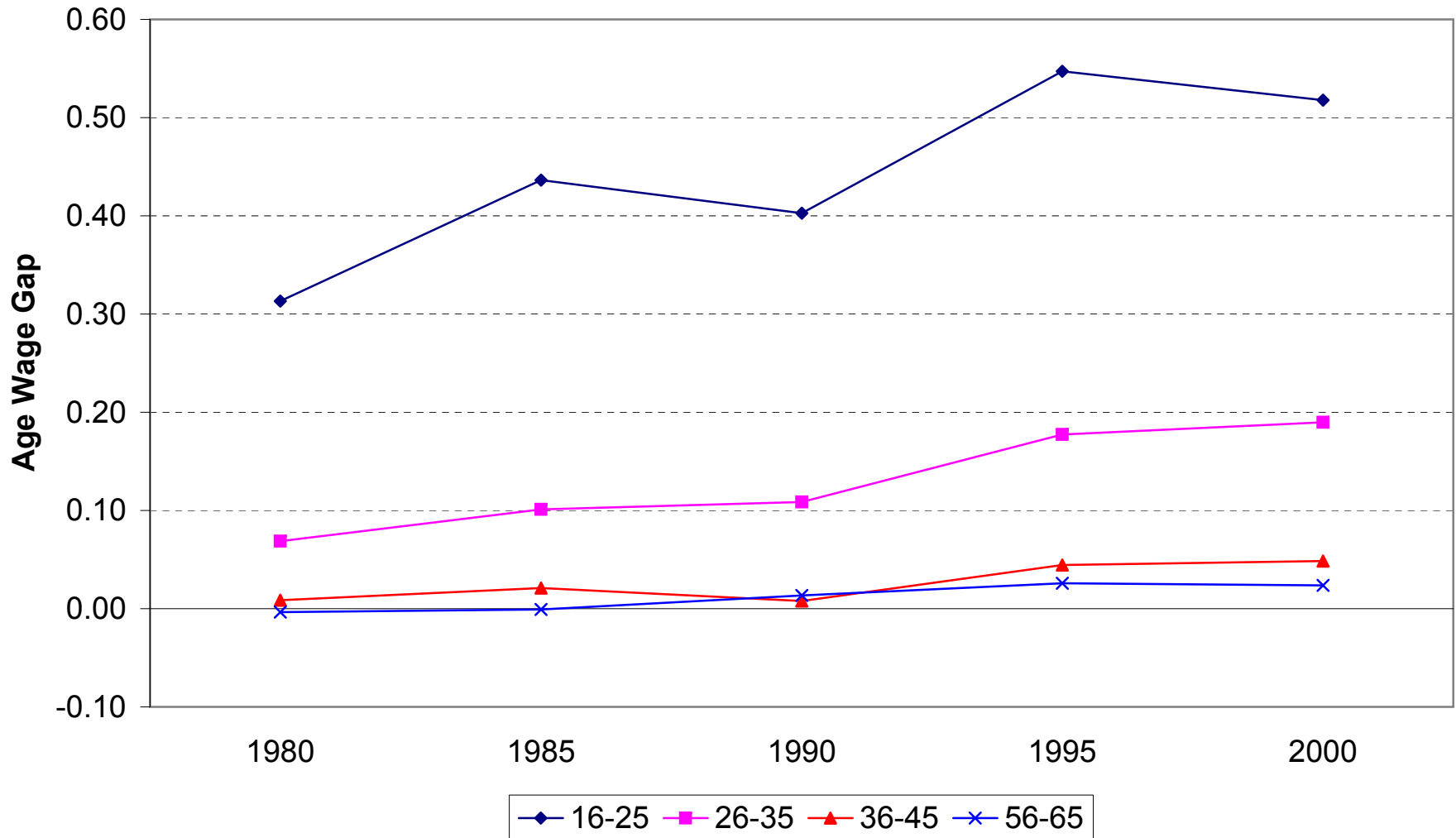
Figure 3a: Between- and Within-Group Variance of Log Weekly Earnings of Full-time Men
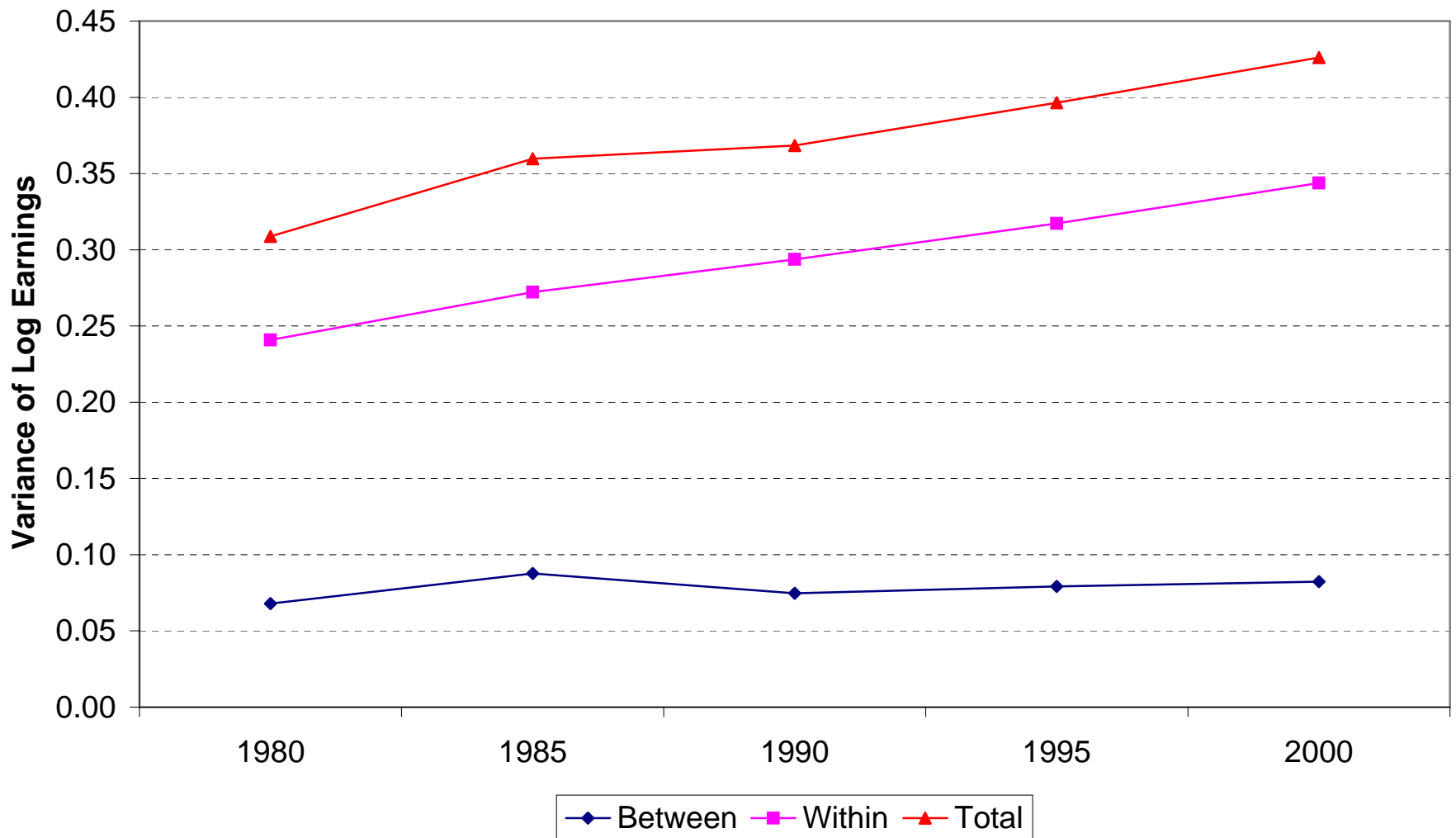
Figure 3b: Between- and Within-Group Variance of Log Weekly Earnings of Full-time Women
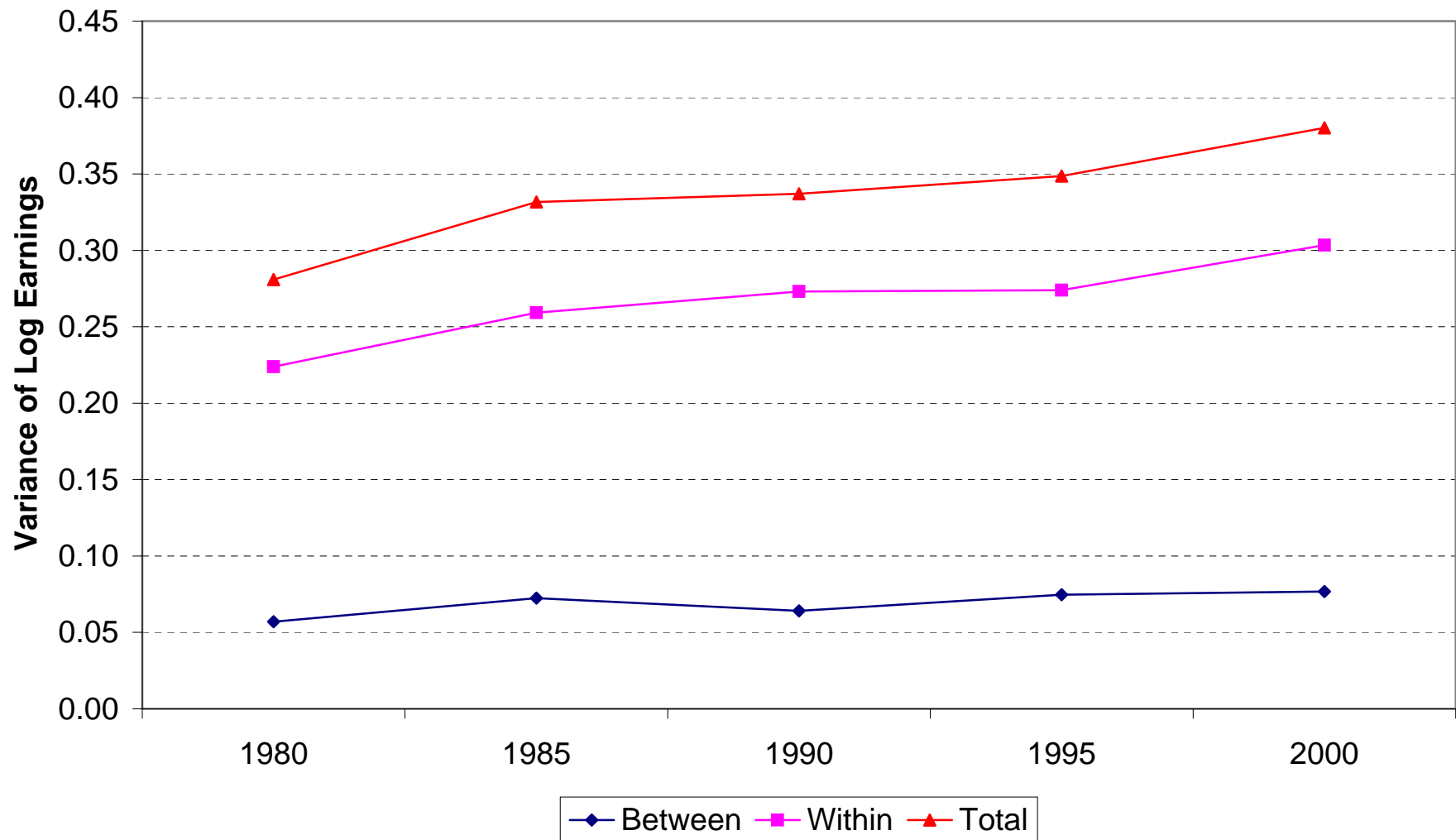
Figure 4a: BA-High School Wage Gap by Age Group, Men
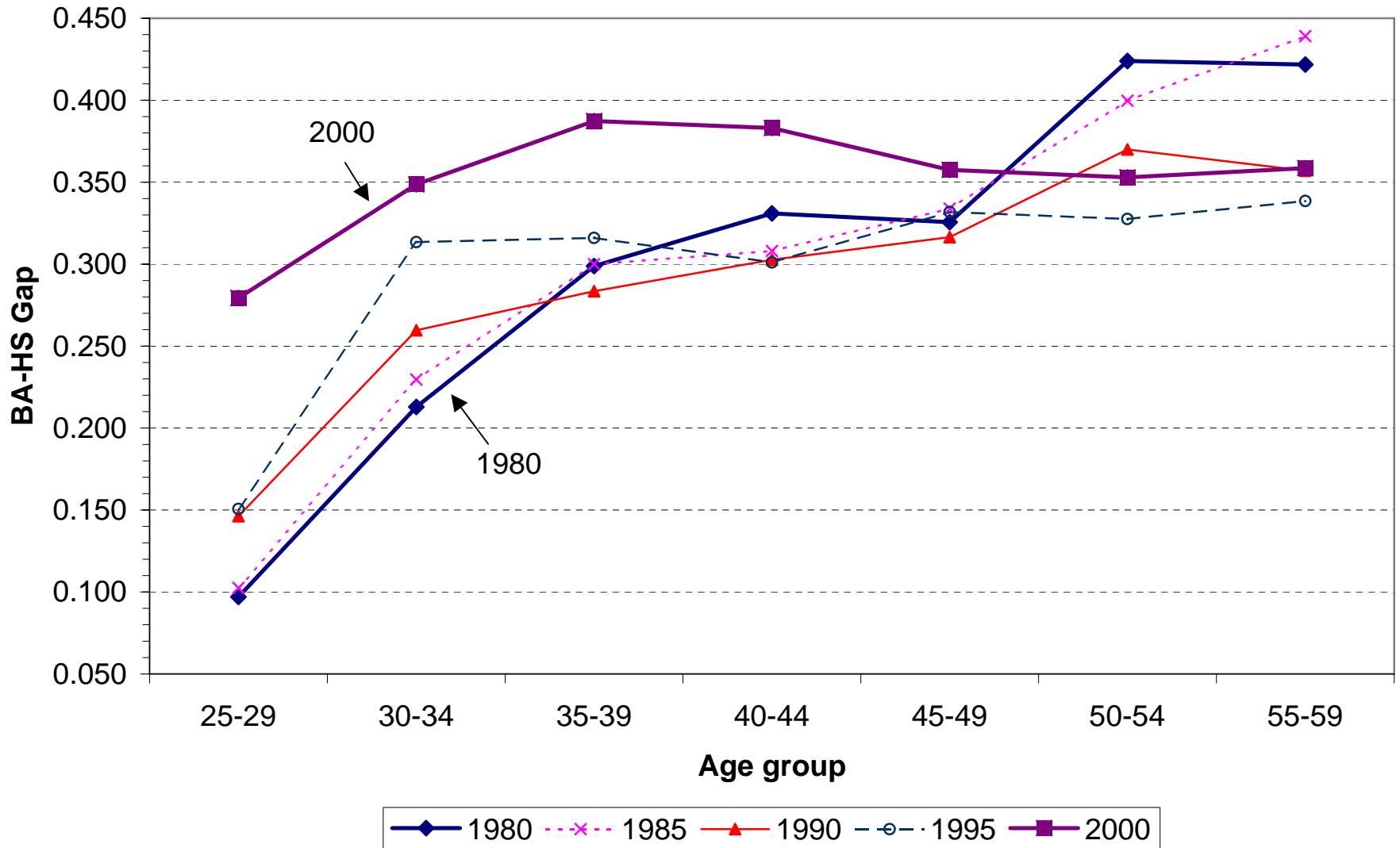
Figure 4b: BA-High School Wage Gap by Age Group, Women
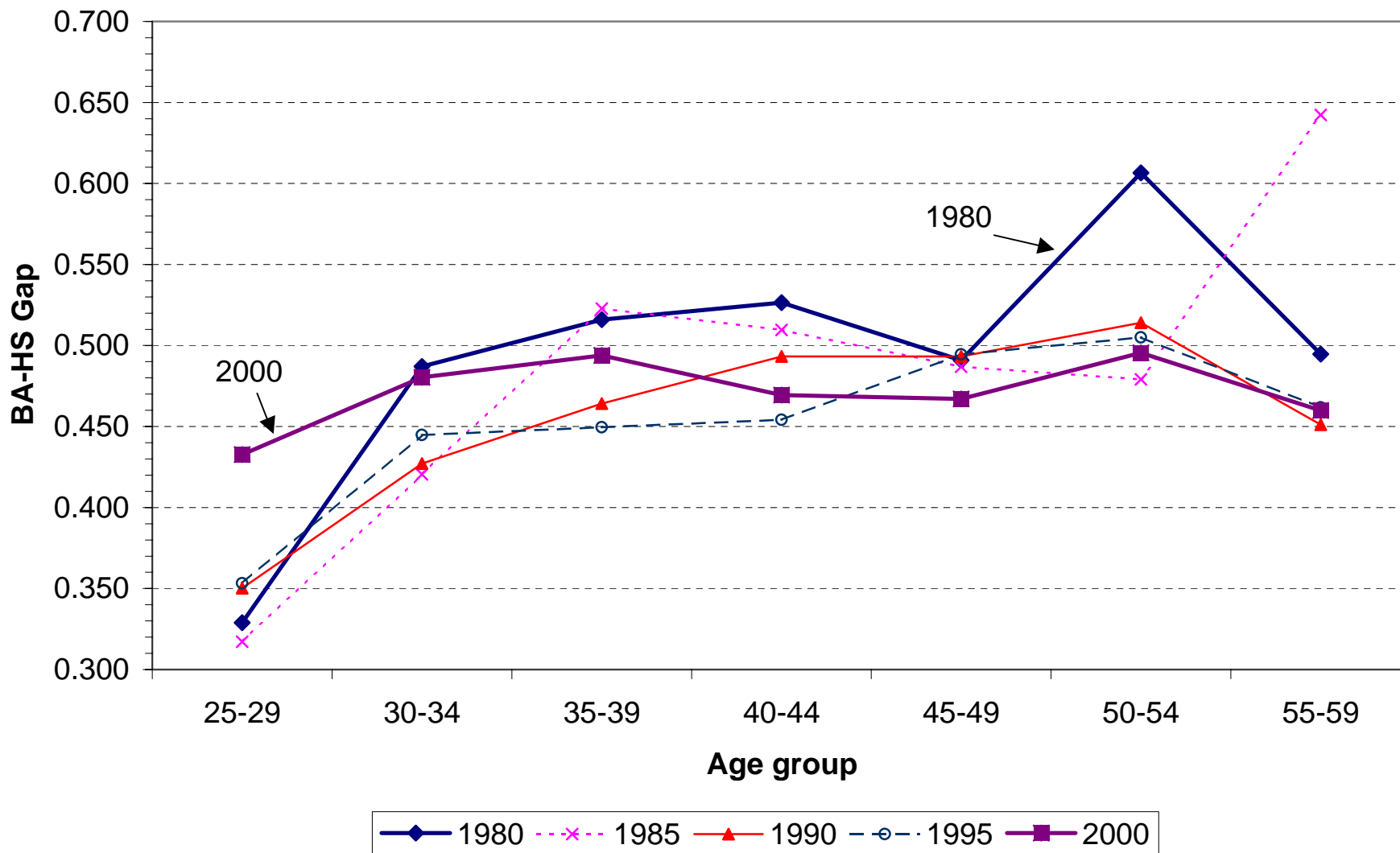
Figure 5a: BA-High School Wage Gap by Experience Group, Men
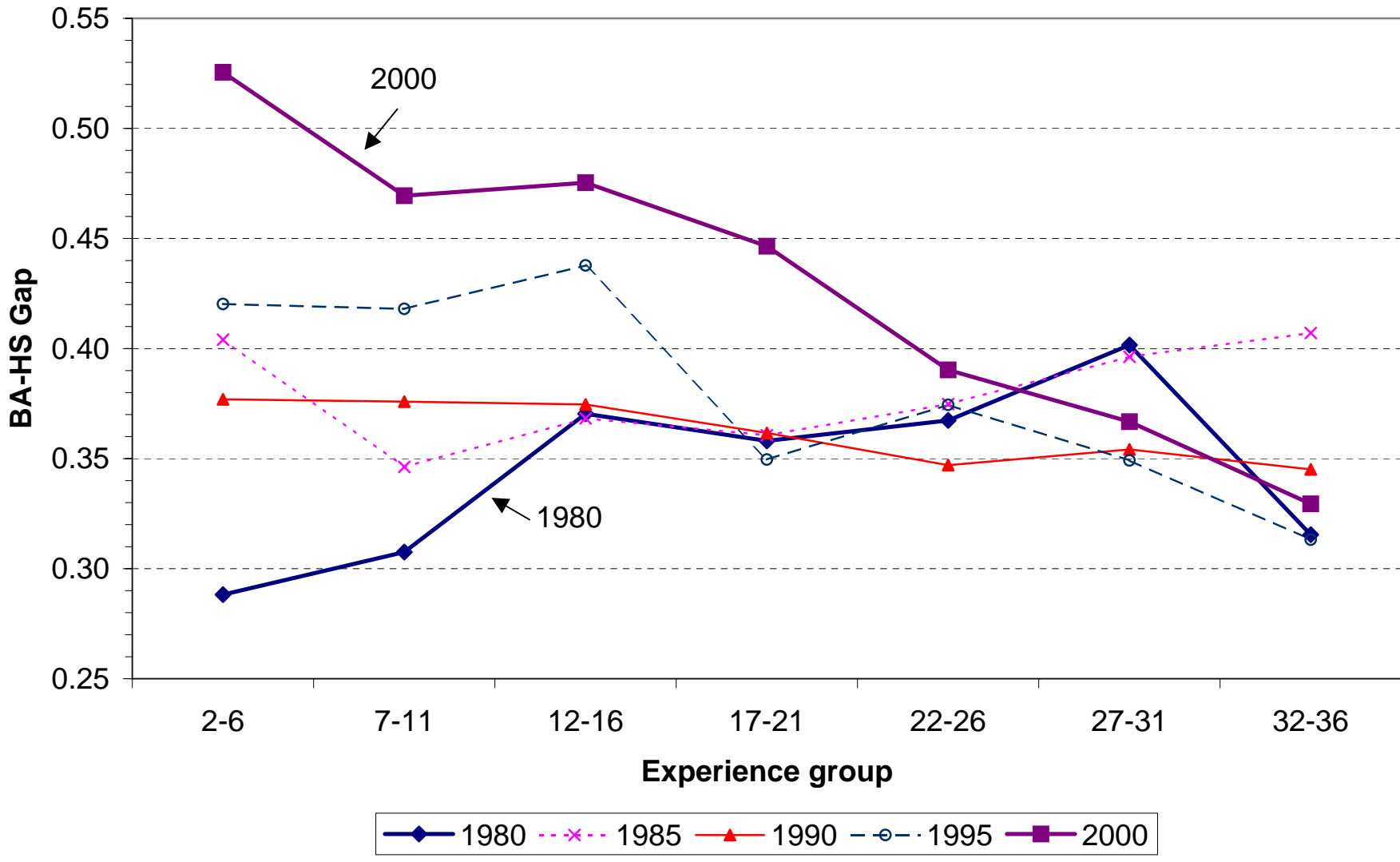
Figure 5b: BA-High School Wage Gap by Experience Group, Women
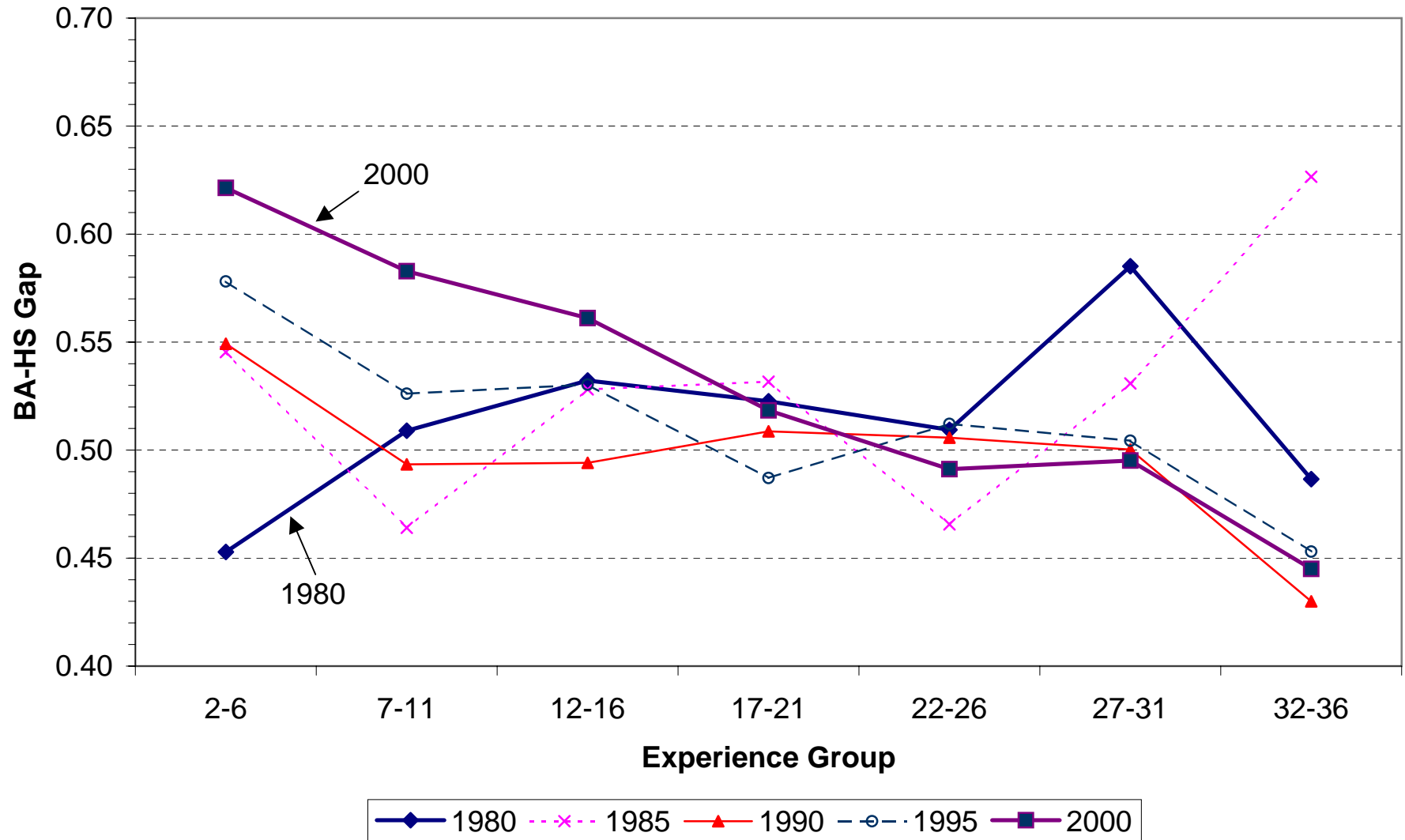
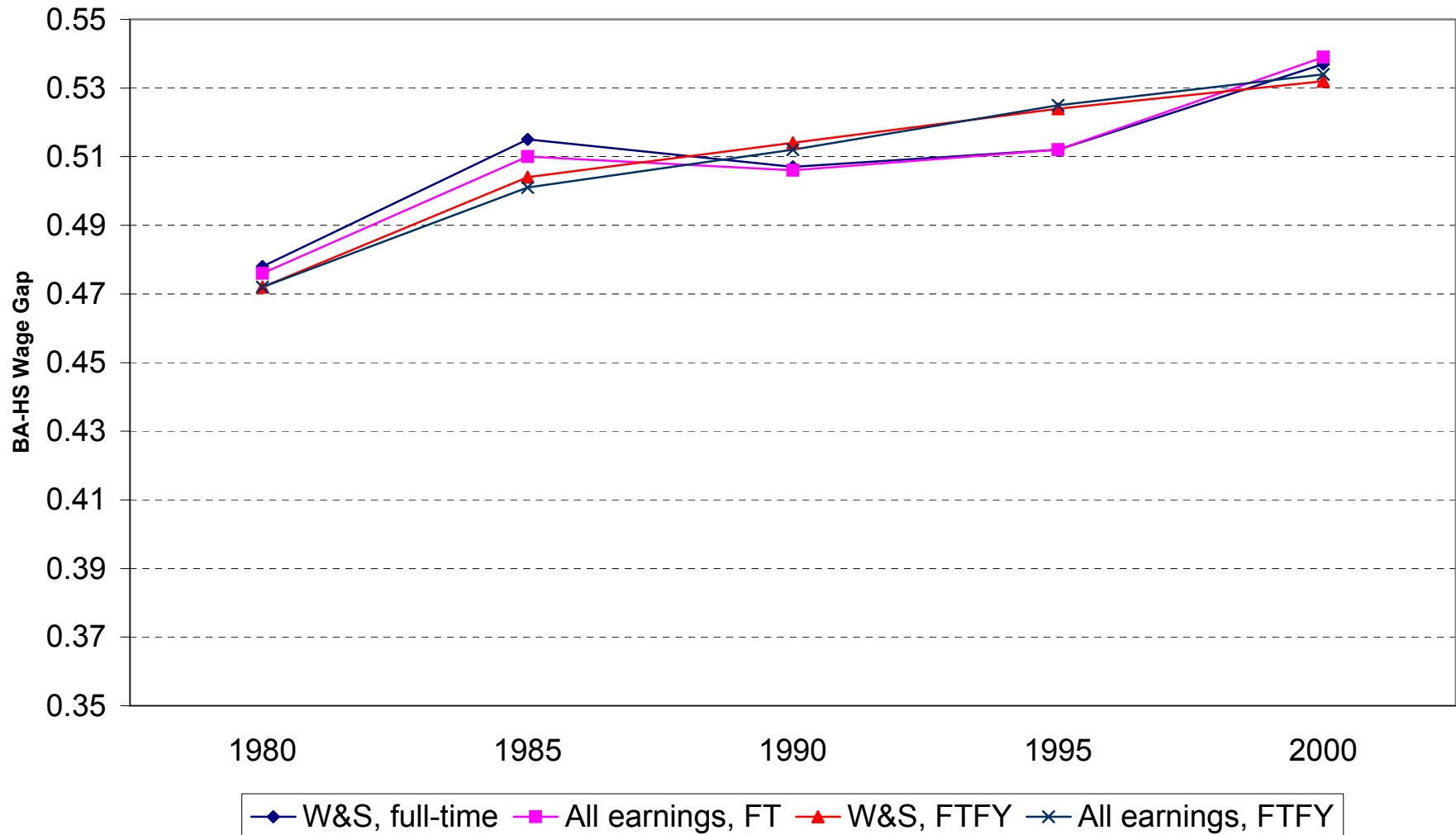**Figure 6a: Alternatives measures of the BA-HS Wage Gap from the Census: Adjusted Gap for Men**
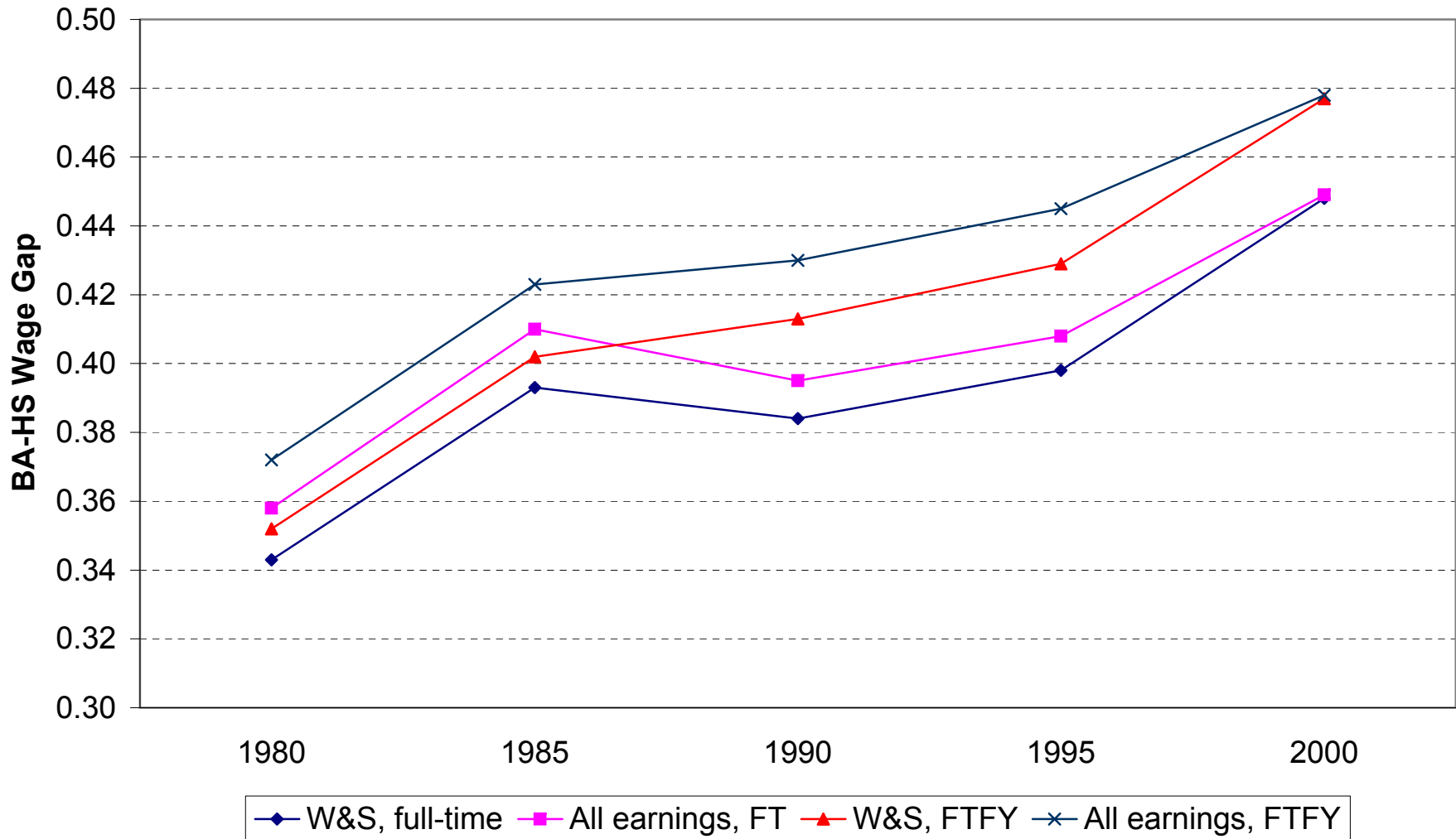
Figure 6b: Alternative Measures of the BA-HS Wage Gap from the Census: Adjusted Wage Gap for Women

Y-axis: BA-HS Wage Gap (0.35 to 0.55)

X-axis: 1980, 1985, 1990, 1995, 2000

Legend: W&S, full-time — All earnings, FT — W&S, FTFY — All earnings, FTFY

**Figure 7a: Adjusted BA-HS Wage Gap for Men, Alternative Data Sets
(weekly earnings of FT workers)**
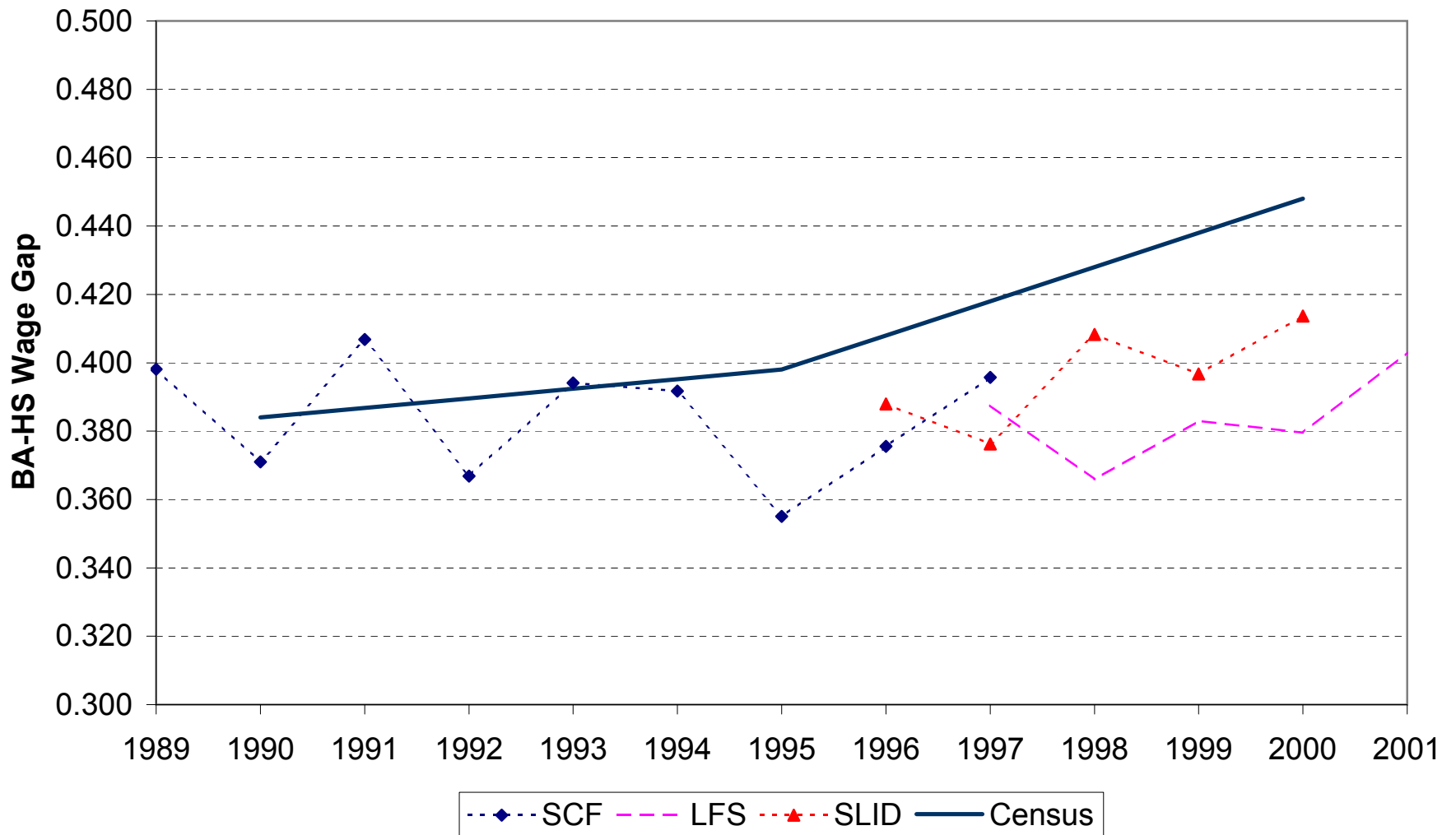
Figure 7b: Adjusted BA-HS Wage Gap for Women, Alternative Data Sets (weekly earnings of FT workers)
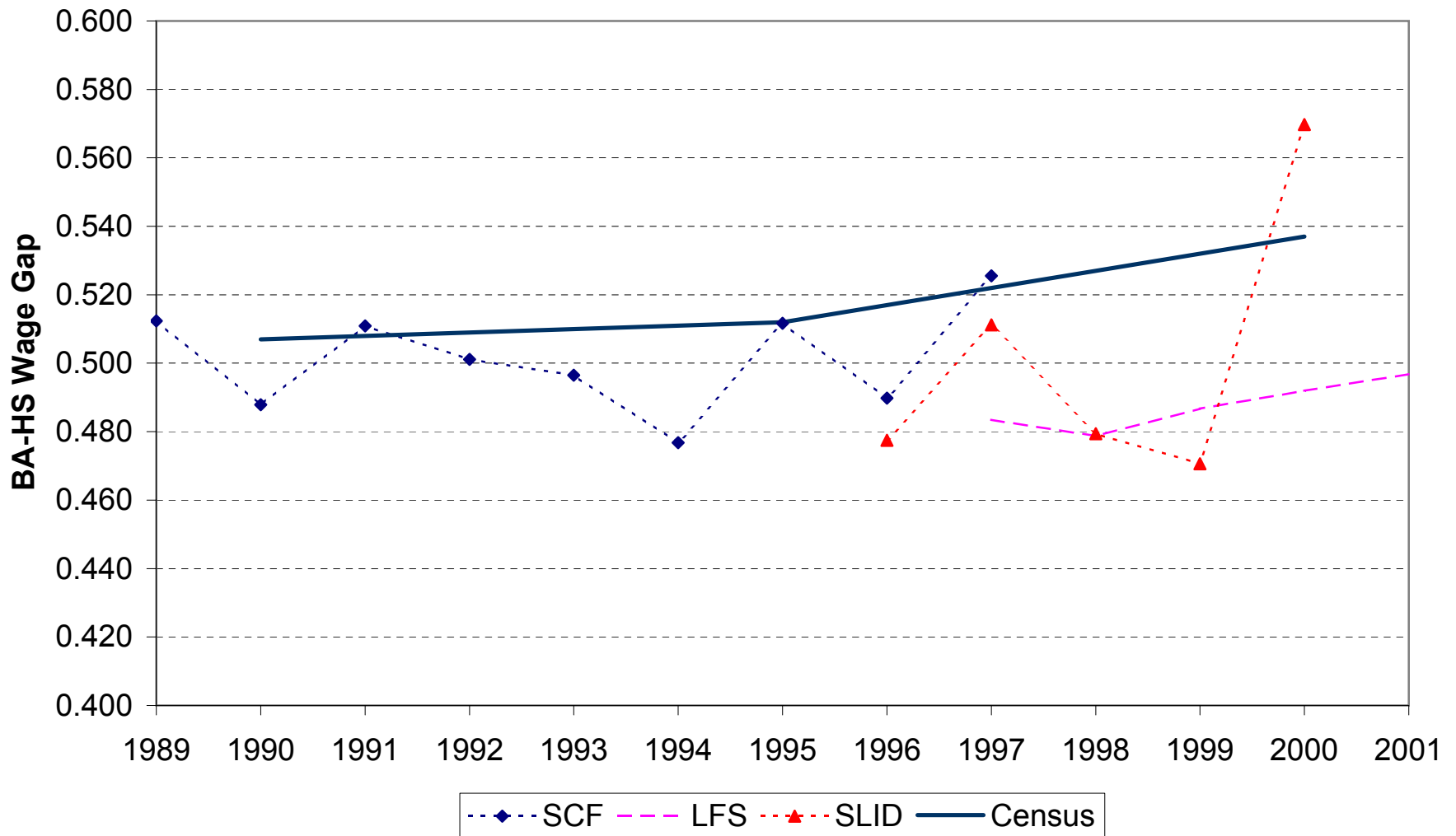
Figure 8a: Adjusted BA-HS Wage Gap Based on Hourly Wage Rates and Weekly Earnings of FT Workers, Men
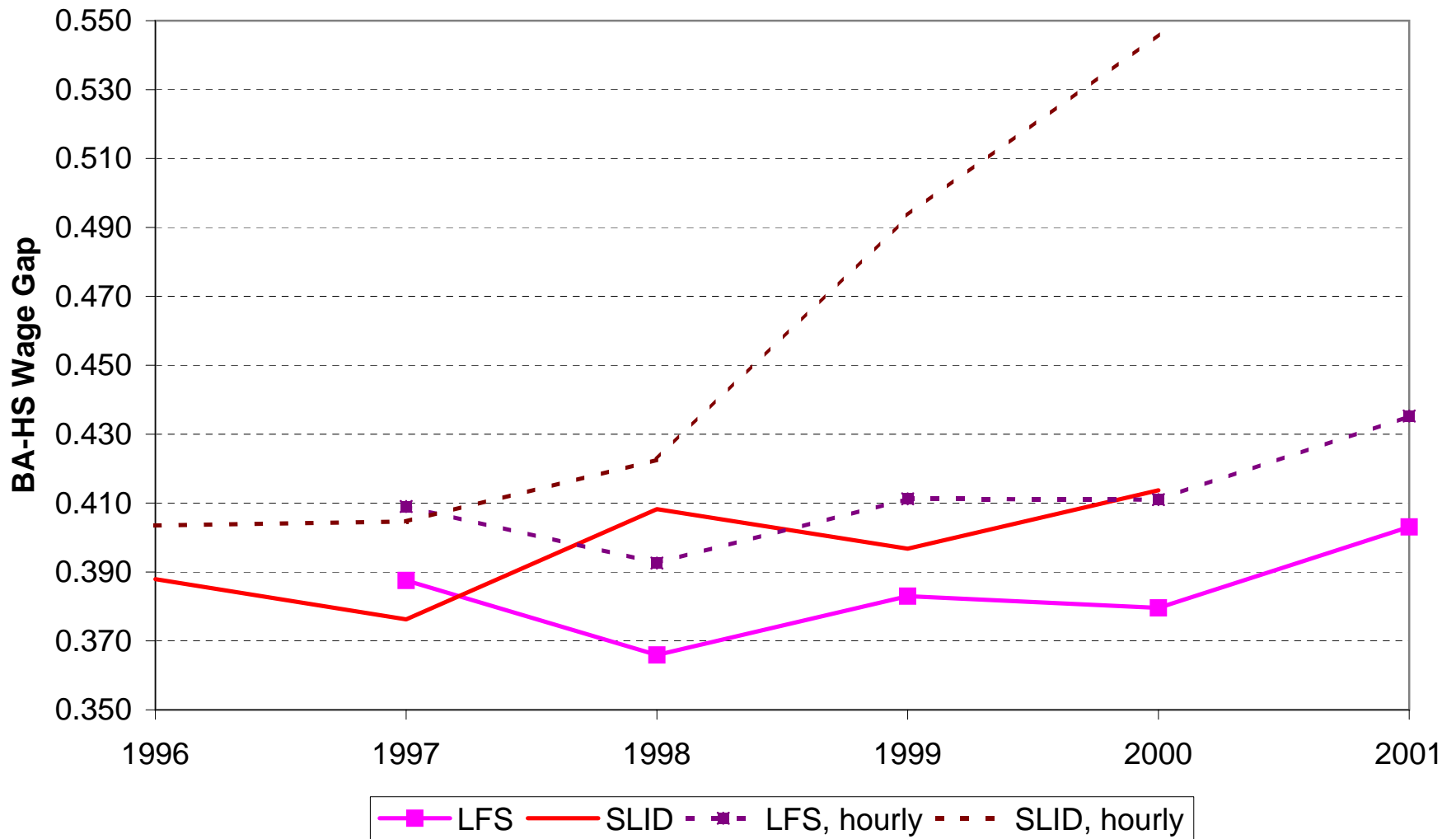
Figure 8b: Adjusted BA-HS Wage Gap Based on Hourly Wage Rates and Weekly Earnings of FT Workers, Women