

# **The Effect of Labor Market Trends on the Incentives and Incidence for Claiming Social Security Benefits Early**

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## **Abstract**

This study examines the effect of incentives to claim Social Security benefits early originating in the labor market. Using synthetic matched survey and administrative data it first documents large increases in the fraction of earnings of less educated workers replaced by Social Security benefits in the 1990s. Exploiting variation in replacement rates at the level of year and education groups, we then show that these increases have significantly contributed to the contemporaneous decline in claiming ages of less educated workers. We argue that the rise in replacement rates can be explained by an increase in earnings inequality, and that trends in earnings inequality are likely to lead to increases in replacement rates in the future. We also examine a second channel through which labor market trends affect early claiming, the rise and decline in educational attainment across cohorts. We conclude that changes in replacement rates are likely to play a bigger role than changes in the education distribution.

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## 1. Introduction

Although a large literature analyzes the determinants of retirement decisions, relatively few papers explicitly analyzed the decision of when to claim social security benefits (Coile, Diamond, Gruber, Jousten 2002). Moreover, typical analyses of the decision to claim tend to focus on financial incentive deriving from the lifetime value of benefits. The current literature on claiming places little focus on incentives to claim benefits coming from the labor market.

Incentives to claim originating from the labor market could potentially be strong. On the one hand, a long literature on other labor market programs documents that high benefits relative to current earnings (i.e., high replacement rates) tend to increase program participation and lower employment. On the other hand, a large literature has documented profound recent changes in earnings inequality potentially raising replacement rates of Old-Age and Survivors Insurance (OASI) Benefits. At the same time, there has been a well-documented decline in the typical age of claiming. Yet, little attention has been paid to the effect of these changes in earnings inequality on the incidence of early claiming.<sup>2</sup>

Because changes in earnings inequality interact with the structure of OASI benefits, they can lead to multiple short and long run effects on the replacement rate. Initially, a decline in labor market opportunities for lower skilled workers lead to an immediate rise in the effective replacement rate, since benefits are based on a long-run average of earnings unlikely to be significantly affected by short-term fluctuations in earnings. Over time, as successive cohorts of lower skilled workers are exposed to a regime of reduced labor market opportunities for longer periods of time, average lifetime earnings and benefits start to decline, and the initial rise in the replacement rate declines. Neither effect has been evaluated in the current literature.<sup>3</sup>

Similarly, little attention has been paid to another significant change in the United States labor market. Based on current education levels of workers currently in middle age, the level of educational attainment for eligible workers is likely to decline. Since there are good reasons to believe – and we document below – that more educated workers claim benefits later, this may

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<sup>2</sup> Von Wachter (2007) has analyzed these effects on the labor force participation decision of less-educated older workers.

<sup>3</sup> These adjustment dynamics add to effects on replacement due to indexing and the concavity of the benefit schedules. The role of labor market conditions through an immediate rise in replacement rates and the effect of indexing have been first discussed in the context of Social Security Disability Insurance (SSDI) by Autor and Duggan (2002).

lead to an increase in early claiming of benefits. Yet, the potential impact of this change on the incidence of early claiming has not been fully assessed.

A difficulty in studying the effect of labor market trends on claiming is very few data sources have both information on OASI benefits and claiming and information on education and labor market outcomes. Even fewer data sources have information covering a broad number of years. In this paper, we circumvent this problem by using several data sources, including published statistics, administrative data, and survey data. Our two main sources of data are a merge between the Survey of Income and Program Participation (SIPP) and administrative data from the Social Security Administration – made available to external researcher through a synthetic version that guarantees confidentiality – and multiple years of the Current Population Survey (CPS).<sup>4</sup>

Using this data, we first document changes in earnings inequality and educational attainment among present and future cohorts of workers eligible for OASI benefits. Our main contribution then is to analyze the potential impact of these changes on claiming incentives embodied in the replacement rate and the incidence of claiming benefits early. We use our findings to assess what the changes in labor market outcomes could imply for the evolution of claiming ages in the future.

Our findings suggest that despite significant differences in claiming behavior between higher and lower educated workers, a slowdown in the educational attainment among workers eligible to claim OASI benefits is unlikely to have a strong effect on future claiming ages. We also show that there has been a substantial reduction in claiming ages among less educated workers in the mid 1980s and 1990s. This reduction was concurrent to significant increases in various measures of the replacement rate of OASI benefits that were likely driven by changes in labor market opportunities for less educated workers. We use this variation in claiming incentives to present cell-level regression estimates of the effect of replacement rates on early claiming of benefits. We conclude that retirement incentives originating in the labor market play a potentially important role in determining claiming behavior.

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<sup>4</sup> Two alternative sources of data are a match between the Health and Retirement Survey (HRS) and the New Beneficiary Data System. The former data source is confidential and starts in 1992 (yet retrospective information on claiming is available for survivors). The second data source does not allow researchers to follow claiming behavior of multiple cohorts.

The next section gives an overview of the literature and our approach, the third section summarizes the data we use. The main section discusses our empirical findings, beginning with a descriptive analysis of trends in claiming and the burden on Social Security, as well as trends in earnings inequality and educational attainment by cohort. We then assess the effect of changing education shares on claiming. In an intermediate step, we document large changes in the incentives and incidence of early claiming for lower educated workers. In the final section, we present the results from our regression analysis and discuss implications from our findings.

## **2. Previous Literature and Conceptual Approach**

A large literature has analyzed the determinants of workers' retirement decisions. Typically, these papers also consider incentive to retire from the labor force related to Social Security (especially from Old-Age and Survivors Insurance, OASI).<sup>5</sup> More recently, particular care has been taken to model various incentives embodied in different Social Security rules (e.g., Liebman Luttmer, and Seif 2008). However, few papers have directly analyzed the effect of these incentives on the decision when to claim OASI benefits. Those paper that do analyze claiming of benefits typically focus on the value of the future benefit stream as the major financial determinant of the claiming decision (e.g., Coile, Diamond, Gruber, and Jousten 2002). Incentives related to the labor market outcomes of covered workers (other than the summary of their earnings history summarized by their averaged monthly indexed earnings, AIME) have not received a lot of attention.

Historically, the decisions to quit working and to claim benefits were closely linked. However, although certainly the two decisions are still closely related, changes in the regulations governing social security benefits, the incidence of private pension plans, and the labor market for older workers have led to an increasing distinction. Analyzing the two decisions separately should help to better understand the whole retirement process. This is particularly true since the literature has had difficulties in fully understanding determinants of retirement decisions. The decision to claim is a much better defined event and should be more directly linked to the rules of the pension system. Moreover, given the concern with the solvency of the Social Security system, a direct analysis of the claiming decision is warranted.

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<sup>5</sup> For an overview of that literature, see Lumsdaine and Mitchell (1999)

The incentives for a worker deciding to claim OASI benefits may be affected in important ways by his labor market outcomes. In particular, in addition to considering his income from the total lifetime value of benefits, a worker will also consider the relative value of his current earnings with the benefits he would receive if he were to work for another year. We will call this ratio the ‘effective’ replacement rate, to distinguish it from the ratio of the benefit (the primary insurance amount, PIA) to AIME, which is sometimes also used in policy analysis (Biggs and Springstead 2008). Increases in the effective replacement rate will induce a worker to claim benefits earlier, in what is typically called a substitution effect in the literature on labor supply. This substitution effect will add to the income effect from changes in the lifetime value of benefits typically analyzed.

A large literature on common labor market programs has shown that the rate at which benefits replace workers’ earnings have a significant and potentially large negative effect on labor force participation. This has been shown convincingly in the case of unemployment insurance and workers compensation (e.g., Meyer 2002). It has also been shown for the effect of changes in the relative generosity of Social Security Disability Insurance (e.g., Gruber 2000, Autor and Duggan 2003). Based on this large body of evidence from labor economics, it is relevant to ask the question as to the effect of incentives stemming from the labor market on the timing of claiming of OASI benefits.

The strongest case that the structure of OASI benefits may interact with trends and outcomes in the labor market to lead workers to claim early is coming from the analysis of disability insurance (DI). DI has the same benefit structure as OASI (albeit a different time horizon over which the AIME is calculated). Relative to other labor market programs of more temporary nature, DI shares with OASI that typically entry into the program is an absorbing state (though this is not as extreme in the case of OASI, and changed over time). Autor and Duggan (2003) discuss at length how increases in earnings inequality and worsening labor market outcomes for low skilled workers should have raised their incentives to apply for DI. As we will see below, similar incentives should hold for workers deciding whether to claim OASI.

A long literature has documented important trends in the U.S. labor market since the early 1970s that could interact with the OASI benefit rules to change claiming incentives. First, there has been a rapid increase in inequality and a rise in the return to education. An important part of these trends has occurred from the mid-70s to mid-1980s especially for changes in the

lower tail of the wage distribution (e.g., Card and DiNardo 2002). Since then, there has been a continuing increase of earnings at the very top of the distribution, with relative stability for the majority of workers (e.g., Kopczuk, Saez, and Song 2007). The source of these changes has been subject to an ongoing debate. Candidate explanations for the observed shifts include technological change, minimum wage, the decline in unionization, and the strong 1982 recession (e.g., Katz and Autor 1999).

A second important trend occurring in the U.S. labor market has been the change in industry decomposition of employment, including a strong decline of employment in manufacturing sector and a rise in professional services. These changes have been triggered among others by increasing trade, outsourcing, as well as technological developments. All of these trends are likely to have been accompanied by or triggered by shifts in the demand for labor, in particular for less skilled workers.

Finally, there have been important fluctuations in the degree of educational attainment across cohorts (Card and Lemieux 2001). In particular, the trend towards rising educational attainment has slowed in the 1970s. This change can affect claiming rates directly, because more educated workers are likely to claim later. Changes in the relative supply of high and low skilled worker do also have an affect on relative earnings. In so far as earnings inequality affects the incentives to claim OASI, changes in the distribution of educational attainment may affect the incidence of OASI claims.

If wages are completely flexible, labor demand changes do not affect employment or labor force participation. However, the situation of older workers is special for at least two reasons. On the one hand, wages of older workers have been shown to move less with outside with changes in current labor market conditions than that of younger workers (e.g., Katz, Loveman, and Blanchflower 1995). Thus, employed older workers are to some extent sheltered from trends occurring in the wider labor market. Similarly, older workers are often protected from dismissal from implicit or explicit seniority rules in layoffs. On the other hand, earnings losses of older workers job losers are much larger than that for younger workers, and they have more difficulties in finding reemployment (e.g., von Wachter, Song, and Manchester 2009).

These findings have potentially important implications for incentives to claim OASI benefits. To see this, consider the OASI benefit formula. For a worker  $i$  retiring at time  $T$ ,

retirement benefits are based on an indexed average of the average monthly earnings ( $y_{it}$ ) from the highest 35 years the work history,

$$AIME_{iT} = \sum_{t=1}^T y_{it} \max \left\{ \frac{\bar{Y}_{60}}{\bar{y}_t}, 1 \right\},$$

where the index is based on the growth of average earnings ( $\bar{y}_t$ ) during the period in which an individual was working relative to the average monthly earnings at age 60. The benefit from OASI (the primary insurance amount) is a non-linear function  $f(\cdot)$  of AIME, where the bend points are also indexed by the growth of average earnings. To see how labor market trends could affect the incentives to claim, consider our definition of the ‘effective’ replacement rate the worker would face whether to retire in period  $t^*$

$$rr_{it^*} = \frac{PIA}{E\{y_{it^*}\}} = \frac{f(AIME_{it^*})}{E\{y_{it^*}\}},$$

where  $E\{y_{it^*}\}$  is the earnings level a worker can expect to earn where he decide to work in period  $t^*$ .

A permanent increase in earnings inequality in the labor market may have several effects on the replacement rate. First, if earnings opportunities of low skilled older workers fall, expected earnings of a worker considering whether to retire might fall. As a result, the effective replacement rate rises. Since OASI benefits are based on a lifetime average of earnings (AIME), any reduction in older workers’ earnings outcomes is likely to have only limited immediate impact on their benefits.

Second, after an initial drop, the replacement will rise again gradually for successive cohorts of retirees. How long the rise will last depends at which age workers are affected by the change in the wage structure. If mature and older workers are being paid based on long-term earnings contracts that prevent wage, hours, or employment adjustments, their AIME and their benefits will not be affected even if the wage for their skill in the outside labor market has fallen. In this case, the new regime would only affect younger workers, and the rise in the replacement rate could extend for decades.

As we will see below, even though they are less affected by current changes in the labor market, it is likely that older workers will experience at least some adjustment. In this case, the rise and ensuing decline in the replacement rate will not be as protracted. However, it can still

take many years for AIME to be substantially affected. If at the same workers' earnings opportunities close to retirement remain low, then the incentive to retire early may remain relatively high for many years. A key difficulty in understanding claiming incentives, then, is to assess what the earnings opportunities for older workers are. Are older workers losing their job paid as much as similar younger workers? Or will they retain some of their wage premium deriving from labor market or job experience? We will return to this question below. What matters for the main point is that their earnings opportunities close to retirement are affected by current labor market trends in inequality, while their AIME only adjusts slowly.

Third, changes in earnings inequality also influence the effect of indexing by average wages (Autor and Duggan 2003). If an increasing number of low skilled workers experience earnings growth below the average, then both their AIME and the bend points for calculation of PIA will benefit from indexing. Thus, for these workers indexing means an even larger increase in the 'effective' replacement rate through an effect on benefits. Finally, the concavity of the benefit schedule is likely to further raise the average replacement rate if an increasing number of workers fall into the lower brackets of the PIA formula.

Since the previous arguments suggest changes in the wage structure can affect retirement incentives, they are also likely to affect claiming behavior. There is likely to be both an income and a substitution effect. In the aftermath of a permanent increase in earnings inequality or a worsening of average labor market outcomes of lower skilled workers, the incidence of early claiming should rise due to the substitution effect. The strength of this effect should fade over time as the average replacement rate declines again. In the long run, the new rate of early claiming should be lower than before due to an income effect stemming from workers' lower lifetime earnings. This income effect is muted by the effect of indexing and the concavity in the benefit schedule.

Ideally, we would obtain measures of the replacement rate and the lifetime value of retirement benefits, and directly estimate the substitution and income effect. Yet, even if we knew what the correct denominator for the 'effective' replacement rate of an individual was, a long literature has shown that it is very difficult to precisely and convincingly estimate models of labor supply decisions at the individual level (e.g., Card 1994). There are many potential biases stemming from omitted variables, reverse causation, or sample selection. In general, it is simply too hard to tell whether other worker characteristics jointly caused low earnings, a low AIME,

and the decision to claim early. Changes in health or differences in the preferences for leisure are just two of many hard-to-measure factors at the individual level.

Here we follow the approach taken by Angrist (1991) and use variation in at the group level to estimate the effect of replacement rates on the incidence of early claiming. In particular, we use variation in replacement rate between education groups over time to identify the effect of changes in the replacement rates on the probability of claiming OASI at age 62. The regression model we estimate is

$$p_{et}^{62} = \alpha_e + \beta_e rr_{et} + e_{et},$$

where  $p_{et}^{62}$  is the proportion of workers claiming OASI benefits at age 62 in a given calendar year  $t$  in a given education group,  $rr_{et}$  represent various measures of the average replacement rate in year  $t$  by education group, and where we allow a separate coefficients for each education group. The models are weighted by the number of observations in each cell (which is the number of new OASI claimants in a given calendar year).

The identification assumption underlying the cell-level model is that changes in the replacement rate over time at the level of education groups represent genuine shifts in the incentives facing covered workers eligible for OASI benefits, and do not represent changes in sample composition or changes in other factors influencing both replacement rates and claiming rates. Below, we will make the case that the variation in replacement rates we use is related to changes in earnings inequality in the labor market. In this case, it is reasonable to assume that these changes are not related to changes in other average characteristics of education groups, and are affect the claiming decision directly through the replacement rate.

There are several other benefits of the cell level approach. It is easier to find approximate measures of workers' earnings opportunities  $E\{y_{it^*}\}$  at the group level, since it is reasonable to assume that the average worker is likely to be paid the average wage of a given education group (yet it remains to establish in what age bracket). For individual workers, it is much harder to predict an expected wage, since one has little information on other unobserved characteristics that average out at the group level. Averaging also reduces the problem of measuring other characteristics, since one does not need to include group-level controls unless one believes them to be correlated with both changes in the replacement rate and the incidence of early claiming.

Finally, the group-level model implicitly delivers conservative standard errors that control for group-level error components.

The benefits of the group-level approach come at a cost. In particular, there is much less variation in replacement rates and the incidence of early claiming at the group level (yet, in case of OASI the variation of the dependent variable is bounded anyways, so this effect should be of less importance). The reduction in variation makes it difficult to assess alternative channels through which changes in the replacement rate operate. It leads also to a lack of precision, which we will try to address explicitly. Finally, one has to accept that it is difficult to show the exact source of changes in replacement rates over time at the aggregate level. While this is true with any non-experimental approach, the fact that labor market conditions can affect AIME and PIA through multiple and persistent channels over a long period of time makes the task more difficult in the analysis of OASI.

In the absence of other sources of variation (such as variation coming from the notch generation, see Krueger and Pischke 1992), and unless we specify a potentially restrictive structural model, this is a promising approach that has not been exploited in the analysis of retirement behavior or let alone claiming of OASI benefits. Even if one were to not fully believe the necessary identification assumptions, an interpretation of our estimates as describing the relationship between variation in retirement incentives and early claiming of benefits is an informative result that has not yet found attention in the literature.

Based on the estimates of this model, one can predict the effect of future changes in the education decomposition of covered workers and changes in the replacement rate by the following formula

$$\hat{P}_t^{62} \equiv \sum_{e=1}^E s_{et} \hat{p}_{et}^{62} \equiv \sum_{e=1}^E s_{et} [\hat{\alpha}_e + \hat{\beta}_e rr_{et}],$$

where  $s_{et}$  is the share in a given education group  $e$  of eligible workers a given year or cohort  $t$ , and the prediction is based on our estimated regression coefficients. Using this formula, information on changes in the educational attainment of future cohorts of eligible workers, and projections of the replacement rate, one can thus predict variation in the rate of early claiming.

### 3. Matched Administrative and Survey Data

We use two main data sources for our empirical analysis. Our main source of information on OASI claiming and benefits is a matched data base combining information from the Survey of Income and Program Participation (SIPP) and administrative Social Security data. This data source is confidential, but has been made accessible to researchers via a ‘synthetic’ version. The synthetic data has been constructed to match the sample characteristics of the original data without revealing information on individual workers. Even though the , without having access to the original data, the results based on this data in this paper have to remain preliminary. For this reason, we have complemented this source of information with results from other data sets. In particular, since the main focus of the paper is on changes at the education level, we have used data from the monthly files of the Current Population Survey (CPS) to obtain averages at the level of year, education, and age groups. We use this additional information in our analysis below. We have also used it to check similar aggregates from the synthetic SIPP, and we found a high degree of overlap, giving us comfort in our findings.<sup>6</sup>

From the matched SIPP, we retain a sample of male claimants whose first claim is for OASI benefits (i.e., we have dropped conversions from Social Security Disability Insurance) and who claim on their own earnings history. Only the 1990 panels of the SIPP were merged to administrative data.<sup>7</sup> The administrative data is retrospective and spans the period until 2002. To maximize the amount of years in our sample, we use the data to calculate rates of claiming of OASI benefits by age beginning in 1980 and until 2002. Clearly, the further back we go the more likely workers may have died by the time of the survey. Thus, we place less weight on the year-group 1980-1984. However, to affect our findings any effect of mortality on our measures of claiming had to be different by age-groups. Below, we find that the rate of claiming at age 62 has increased over time, especially for lower educated workers. If older claimants from the early 1980s are more likely to drop out of the sample, this would lead us to find the opposite pattern. Yet, if among the less educated workers unhealthy individuals claim at younger ages and are more likely to die, this could explain some of the pattern we see. However, the increases we find appear too large to be driven solely by this pattern.

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<sup>6</sup> It is an acknowledged problem – and one can see in our tabulations – that the synthetic SIPP overstates the fraction of workers claiming at age 64 relative to claims at age 65. While unfortunate, this tendency should have little bearing on our analysis of changes over time. One approach could have been to merge claiming at age 65 and 64, which would have had little impact, since our main results focus on claiming at age 62.

<sup>7</sup> These were the panels introduced in 1990-1993, 1996,

To obtain the final data set on which most of our findings are based, we collapse the individual level data to averages at the level of four education groups, various age-groups, and either single years or year groups. Thereby, the main variables from the administrative data are PIA, AIME, and age of claiming. In addition, we obtain average earnings from administrative earnings records (both from the topcoded Summary Earnings Record (SER) and the Detailed Earnings Record (DER), which has no topcode) over various age ranges prior to retirement.<sup>8</sup> The main variables from the survey data is educational attainment. When needed, we merged this data with information from the CPS, and compared it with published data from the Social Security Administration.

#### **4. Empirical Results**

In this section we describe the evolution of the educational attainment and earnings inequality of current and future cohorts of new OASI beneficiaries, and assess their likely impact on the incidence of claiming OASI benefits early. Using cell-level averages from various public and administrative data sources, we obtain the following key findings.

- There will be important changes in the characteristics of new beneficiaries: the current growth in educational attainment will level off; at the same time, future cohorts are likely to be exposed to higher inequality in life-time earnings.
- These changes have the potential to affect future claiming. We show that lower educated workers are considerably likely to claim benefits early. We also show how the incidence of early claiming has risen among lower educated workers in the 1980s and 1990s.
- We then assess the impact of changes in education shares on the incidence of early claiming. Despite differences in the level of claiming, we find that the majority of changes in historical early claiming was due to changes in claiming rates by education themselves. Thus, the predicted effect of changes in shares for future claiming is limited.
- We document potentially large increases in the effective rate of replacement – the fraction of pre-retirement income that is replaced by OASI benefits – for lower educated workers in the 1980s and 1990s. We argue that these increases are likely to be related to changes in earnings inequality in the labor market.

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<sup>8</sup> More details on what data is available in the synthetic SIPP is available from the website of the Cornell Census Research Data Center <http://www.vrdc.cornell.edu/news/wp-content/uploads/2007/11/technicaldescriptionsippsyntheticbetaoct42007.pdf>

- Regression results confirm that these increases in the effective replacement rates have contributed the incidence of early claiming for lower educated workers we document. However, we also confirm findings of a long literature that it is difficult to precisely estimate models of labor supply.
- Consistent with recent increases in earnings inequality, current projections predict significant increases in the replacement rate for lower wage workers. Our findings suggest that these changes may increase the incidence of early claiming.

Overall, these findings suggest that there are potentially important incentives to claim benefits early related to the structure of OASI benefits and trends in the labor market. We show that these incentives are likely to change across cohorts of new beneficiaries, leading to predictable trends and fluctuations in the incidence of early claiming. Yet, we also conclude that more work needs to be done to obtain more precise and robust relationships between labor market incentives and claiming decisions.

#### **4.1 Cohort Trends in Education and Earnings Inequality**

There has been a steady downward trend in the age at which individual's begin to claim OASI benefits in the past decades. Using data from the Annual Statistical Supplement, Figure 1 shows the age distribution of new OASI claims by major age-group since 1970.<sup>9</sup> The figure clearly shows a steady decline in the incidence of claiming at age 65, and an increase in the incidence of claiming age 62, especially in the mid 1980s. Descriptive statistics on for age of claiming in Table 1 show how the median age of new awards has fallen from 65 in the mid 1970s to 62 in the late 1990s. The bulk of the change occurred in the 1980s, with a further decline in the 1990s.

These trends have attracted concern from policy makers concerned with the future solvency of the Social Security Trust Fund. Part of this concern stems from demographic trends relating to the aging of the 'baby boom' generation. Figure 2 shows the actual and project number of OASI beneficiaries per 100 covered workers, which was derived from the 2009 Trustees Report. The figure shows a dramatic increase in the predicted number of beneficiaries relative to covered workers even in the more optimistic projection. A reduction in the typical age of claiming raises the total number of OASI beneficiaries to covered workers, and exacerbates

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<sup>9</sup> the fraction claiming OASI benefits among the population of individuals by age-group is very similar.

the trend based on demographic factors. Understanding the reasons behind the trends towards early claiming is also important to assess the impact of policies designed to raise the average claiming age, such as increases in the normal federal retirement age.

Existing analyses of the claiming decision tend to focus on the total life-time social security benefits as the main factor underlying take-up. However, as discussed above, there may be important incentives stemming from the labor market that have received little attention. Existing studies have also shown that an individual's education is an important factor in the decision to retire or to claim benefits. Neither aspect has received much attention in the existing literature. Yet, there have been important changes in the education structure and the labor market, with potential salient implications for claiming behavior.

These patterns are summarized in Figures 3 and 4. Using survey data from over 25 years from the Current Population Survey, Figure 3 displays the well-known slow down in the increase in educational attainment beginning for cohorts born in the 1950s. The figure graphs the fraction of workers that have at least some college education by age 30 to 35 against the year in which the cohort is first eligible for retirement benefits. It is clear that the slowdown in educational attainment will begin to make itself felt in the next five years, and may have some influence in the decades to come.

Using the same data source, Figure 4 gives an overview over much-studied trends in earnings inequality in the United States' labor market. The figure shows one typical measure of inequality, the ratio of annual earnings of workers with at most a high-school degree over workers with at least some college. The ratio is shown for two age groups, younger workers and workers about to retire, again for the year the relative cohort is turning 62. For both age groups, the evolution of the relative wage has followed a hump-shaped pattern, with an initial rise followed by a protracted decline.

For older workers, the pattern imply that those lower educated workers becoming eligible for OASI benefits beginning in the mid-1980s saw a steep decline in their relative wage. However, as discussed above, given the formula for the averaged indexed monthly earnings (AIME), these declines will have a limited impact on retirement benefits (the primary insurance amount, PIA). Yet, the changes may have a direct impact on the effective replacement rate – i.e., the retirement benefit relative to the wage the worker can expect to currently earn in the labor market. The trends in the figure suggest these workers saw an increase in the effective

replacement rate. In fact, the pattern appear remarkably parallel to changes in the age of claiming documented in Figure 1 and Table 1. We will turn to this pattern and its potential impact on claiming decisions below.

The fluctuations, which occur in parallel during the same time period, are considerably more pronounced for younger workers. The decline is also steeper. In the age-group of 31 to 40, lower skilled workers born in the early 1960s face lower wages relative to college graduates than those born over 30 years earlier.<sup>10</sup> The literature has also shown that the real average wage at the bottom of the wage distribution has stagnated or even fallen.

These patterns were not as worrisome if we could expect it to affect workers' earnings only over a short period. However, there are good reasons to expect that these changes will lead to changes in relative life-time earnings. First, there is no sign that the trend is reverting. Thus, we would expect relative earnings of lower skilled workers to remain low. Second, it is well known that for the typical worker earnings do not change considerably after the age of 35 to 40. Moreover, age-earnings profiles have not become steeper, which would have implied that part of the relative losses are recovered over time. Instead, age-earnings profiles have remained remarkably stable (e.g., Card and DiNardo 2002). Thus, the relative wage level at age 31-40 depicted in the figure is likely to characterize the cohorts' relative earnings for the remainder of their working life.

This discussion suggests that current trends in earnings inequality may perpetuate themselves throughout cohorts' working lives and substantially retirement benefits. The pattern in Figure 4 then suggests that relative life-time earnings of cohorts becoming eligible for benefits from 2010 to 2030 may be substantially affected. Above, we have discussed multiple channels how this change may affect retirement rates. In the next sections, we will try to directly assess the impact of these labor market trends on the evolution of the incidence of claiming.

#### **4.2 Changes in Education Shares and Early Claiming of OASI Benefits**

The two trends in the labor market we documented both suggest that the trend towards early claiming is likely to continue in the future. The slowdown and reversal in educational attainment for cohorts retiring in the first decades of the 21<sup>st</sup> century is likely to lower claiming ages because less educated workers on average claim earlier than more educated workers.

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<sup>10</sup> This observation is not new, and can be explained by a range of factors ranging from human capital accumulation to contractual arrangements (e.g., Katz, Loveman, and Blanchflower 1995).

Increases in life-time inequality are likely to raise effective replacement rates for less educated workers, and thus lower claiming ages within education groups.

In this section, we document the potential effect of changes in education shares on claiming using synthetic data from the Survey of Income and Program Participation (SIPP) matched to administrative data from the Social Security Administration. We calculated the share of claimants by claiming age in four education groups in each of five year groups covering the period from 1980 to 1981 ( $s_e^{CA}$ ). We also calculated the fraction of workers claiming in the four age groups 62, 63-64, 65, and 66 and above ( $p_e^{CA}$ ). As explained in the data section, all calculations are based on men eligible for their own worker benefits. The total rate of claiming in year  $t$  at any given age can be expressed as a function of education-specific shares and claiming rates, i.e.,  $P_t^{CA} \equiv \sum_{e=1}^E s_{et}^{CA} p_{et}^{CA}$ . Below, we will use this association to assess the effect of shifts in population shares between education groups and of changes in claiming rates within education groups on the total incidence of claiming by age.

Consider first the evolution of claiming rates and shares separately. The level and change in rates of claiming clearly differs across education groups. This is shown in Figure 5A, which depicts the rate of claiming at ages 62 and 65 by year and education group. On average throughout the period under study, more highly educated workers claim retirement benefits later on average. The difference between education groups was small in the 1980s, and widened in the 1990s. For example, 42% of claims from individuals with a high school degree in 1990-94 occurred at age 62, whereas the proportion was only 33% for workers with a bachelor degree or more (see Appendix Table 1 for the exact values). On the other hand, 14% of claims with a bachelor degree or more occurred on or after 66, whereas this was the case for only 6% for less educated workers.

The differential trends in claiming age for low and high educated claimants are shown explicitly in Figures 5B and 5A. Figure 5B shows the ratio of the proportion of claims occurring at age 62 for workers with a less than high school degree (or with exactly a high school degree) and workers with a bachelors degree or more. The figure shows clearly how the rate of early claiming was similar in the 1980s, but then diverged in the 1990s. The pattern was particularly pronounced for claimants with less than a high school degree, and more gradual for workers with

a high school degree. The increase is driven by rising rates of early claiming for less educated workers, whereas the incidence of early claiming held steady for highly educated workers.

The proportion of initial OASI claims by education and year group in our sample is shown in Figure 6.<sup>11</sup> Consistent with the pattern shown in Figure 3, there has been a rapid decline in the fraction of lower educated workers among new OASI claims in the years we study. At same time, the fraction of workers with a high school diploma, with some college, or with a college degree has steadily increased over time. The pattern in Figure 3 suggested that the rate of increase will decline and partially revert for future cohorts of new claimants.

To assess the effect of these changes in education shares on the total rate of claiming, Table 2 shows the evolution of the total rate of claiming for various counterfactuals for the four age-groups. The first column in each panel shows the actual incidence of claiming over time for the respective age. The second column shows the rate of claiming obtained holding the education-specific rates of claiming constant at the level of 1985-89 (i.e.,  $\tilde{P}_t^{CA} = \sum_{e=1}^E s_{et}^{CA} P_{e85-89}^{CA}$ ).

Thus, the changes in this column must be entirely driven by changes in the education share. The third column shows the rate of claiming obtained holding constant the education share among claimants (i.e.,  $\hat{P}_t^{CA} = \sum_{e=1}^E s_{e85-89}^{CA} P_{et}^{CA}$ ). Changes in this column are thus driven entirely by changes in the rate of claiming within education groups.

The message from this exercise is clear. While shifts in education shares do lead to some changes in total retirement rates, the majority of the evolution of the overall rate of claiming is due to changes in claiming rates in within groups. Part of the reason is that while changes in shares are substantial, the differences in claiming rates are not large enough to generate important shifts. To take an extreme example, the fraction of claimants with less than a high school degree dropped from 32% to 16% between 1985-89 and 2000-2002. The difference in the incidence of claiming in 1985-89 at age 63-64 between claimants without a high school degree and claimants with a bachelor degree or more was 8 percentage points. Thus, if the entire shift occurred between these two groups, the reduction of the total claiming rate at that age group would be 1.3 percentage points. Since shifts in education are more gradual, and differences in claiming rates more muted, share changes have a small overall impact. Part of the problem is that

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<sup>11</sup> The values of the education distribution in all year-groups is shown Appendix Table 2.

all groups but workers with a bachelor degree or more tend to claim early, such that a shift towards, say, workers with some college will not lead to a large change in the age of claiming.

Another reason why the effect of shares is small in our case is because the difference in the age of claiming between education groups was modest in 1985-1989, our base year. Thus, the small effect might be partly driven by our choice of base year, and might be different for future changes in education shares that interact with larger differences in claiming age between education groups.

To assess this possibility, we used the changes in education shares underlying the pattern in Figure 3 to predict the future incidence of early claiming. For the prediction we used claiming rates by education in 2000, a year in which the age differences in claiming were more pronounced (see Figure 5A and Appendix Table 1). The results are displayed in Figure 7. By construction, the changes in claiming of OASI by age of claiming shown in the figure derive entirely from changes in education shares. While the pattern reflect the cohort-specific changes in educational attainment we discussed above, the predicted changes are again always below 2 percentage points.

To summarize, our findings suggest that while large changes in the education distribution among covered workers have the potential to affect average claiming ages, at the current level of differences in claiming between education groups the effects are likely to be small. However, this result is sensitive to the differences in claiming among education groups. In general, the larger differences in outcomes or behaviors between education groups, the larger the effect of changes in the education shares.

### **4.3 Changes in Effective Replacement Rates Within Education Groups**

Since it is change in claiming ages within education groups that can explain most of the trend towards earlier claiming ages, it is important to understand what can explain this trend. One indicator of the incentives to claim inherent in the social security system is the ratio of benefits relative to earnings opportunities in the labor market. This ‘effective’ replacement rate can differ substantially from the ratio of benefits (PIA) to average indexed monthly earnings (AIME), because AIME represent an average over life-time earnings, not a covered worker’s actual earnings level. Given the substantial increases in earnings inequality, it is likely that the ‘effective’ replacement rate has increased for low educated workers.

We have used the matched SIPP to generate measures of ‘effective’ replacement rates. The difficulty is, of course, to establish what the earnings level is a worker can realistically expect to obtain in the labor market. Is it the earnings level he held on past jobs? This may not reflect the actual earnings he would obtain were he to work in the next period? Or is it the average earnings level among workers of similar age? Or is it instead the average earnings level for younger workers? From a theoretic point of view, all of these are plausible, and all of these have some drawbacks. For example, if the earnings distribution among low and high skilled workers diverges, it is likely that the worker cannot obtain a job with similar pay as his old job was he to apply for a job as unemployed. On the other hand, there is evidence that firms honor implicit long term contracts with workers, and thus they may not lay them off even if the outside earnings have declined.

Here, we show two pieces of evidence that ‘effective’ replacement rates facing lower educated workers implicit in OASI benefits have increased in the 1990s. We begin with a measure based on an individual worker’s own earnings in the years prior to claiming. We calculate the replacement rate based as the ratio of benefits over average earnings at age 55-59. To better display the changes in the replacement rates, we obtained the deciles of the distribution of replacement rates in our baseline year group, 1985-1989. Figure 8 graphs the shift in the distribution of replacement rates in late years relative to the distribution in 1985-1989 (the horizontal line at 0.1 marks the deciles in the baseline year). The figure clearly shows a shift in the density at higher deciles of the replacement rate for claimants with less than high school education. A similar shift, albeit weaker, is apparent for claimants with a high school degree. On the other hand, high skilled claimants (with a bachelor’s degree or more) saw a small shift towards *lower* replacement rates.

One draw back of the patterns based on averages over individual-level replacement rates is that workers employed at age 55-59 may represent a non-representative group. We have replicated all of our findings earnings using the age range at 50-55, with similar results. As suggested above, another problem with using individual averages is that these do not represent the earnings workers can expect to obtain in the labor market. There is also a problem of measurement, since many workers have zero earnings during those age ranges, leading to noisy measures.

To counter these potential problems, we have replicated the calculation of replacement rates using group-averages. The result by education groups and single calendar years is shown in Figure 9A. The group shows the ratio of the group-level average PIA to average wages for workers near retirement age. However, older workers suffer very large earnings losses upon job loss,<sup>12</sup> consistent with the notion that a re-employed older worker may actually face earnings schedules of younger workers at re-employment. To capture this notion, Figure 9A also shows ratios of PIA with earnings in three age-groups.<sup>13</sup>

Figure 9A clearly shows that effective replacement rates implicit in OASI are much larger for lower educated workers. The figure also clearly shows how replacement rates increase more for lower educated workers, especially in the 1990s. A prime reason for this increase is the rise in earnings inequality documented in Figure 4. Consistent with this notion, using earnings of younger or middle-aged workers implies an even stronger divergence rise in replacement rates by skill group. For workers with a high-school degree or less, Figure 4 had shown a faster decline in earnings among younger workers than for older workers. This implies a faster rise in replacement rate if we assume that these are the relevant market wages for older workers' skill as well.

As discussed in Section 2, increases in earnings inequality can affect replacement rates can derive through several mechanisms. First, since AIME is a life-time average, reductions in current wages will raise the replacement rate. Second, indexing of AIME based on the average wage also implies that groups of workers with lower than average wage growth experience a rise in replacement rates. Third, indexing of the kink points in the PIA formula by the average wage by the average wage has a similar effect. Finally, concavity of the wage schedule implies that replacement rates decrease with AIME. This implies that the lower the lifetime earnings of a cohort, the higher its replacement rate.

To help assess these mechanisms directly, Figure 9B shows the group-level averages of PIA from the SIPP and earnings from the CPS underlying the replacement rates displayed in

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<sup>12</sup> This finding results from the Displaced Worker Survey in von Wachter (2007) or analysis of administrative data in von Wachter, Song, and Manchester (2009).

<sup>13</sup> Note that the replacement rates based on the ratio of averages are smaller than cell-level averages of the replacement rate. The evolution over time is similar. The difference in level is likely to be due to the incidence of partial employment at older ages that affects the individual level replacement rates, but which gets averaged out when we use group-level average earnings.

Figure 9A.<sup>14</sup> One can clearly see how the AIME grows faster than average earnings for all age groups among all education groups, with exception of the high-skill group, for which the series appear to grow in parallel. It is this difference in trends that ultimately leads to increasing replacement rates. In addition, Figure 9B also shows how for the lowest educated age-group (and in a more muted fashion for workers with a high-school degree) there has been a divergence in average earnings for younger and older workers. This pattern is strongest between 55-64 and 35-44 year olds, but is also visible relative to 45-54 year olds. Thus, taking the earnings of younger age-groups as benchmark leads to even larger increases in effective replacement rates.

The ratio of PIA and AIME is also sometimes taken as an index of the rate of replacement. The evolution of this ratio (not shown) is markedly different than that of the replacement rates shown in Figure 9A. In particular, the measure does not increase over time and does not evolve differentially for higher and lower educated workers. Thus, while under some circumstances this measure may be an appropriate index of whether benefits are sufficient in replacing life-time resources (e.g., Biggs and Springstead 2008), it does not fully reflect the incentives to claim early implicit in the OASI program.

#### **4.4 Effects of Replacement Rates On Early Claiming of OASI Benefits**

It is a natural question to ask whether the changes in replacement rates we documented help to determine the differential trends in claiming rates by education groups discussed in Section 4.2. To answer this question, we turn to estimates of the cell-level regression model described in Section 3. Our main estimates are based on regressions of the fraction of claims occurring at age 62 in a given year and education group on a measure of the group-level replacement rate. The resulting estimate of the effect of replacement rates on the incidence of early claiming is identified off of changes in the average replacement rate over time within education groups.

As discussed in Section 3, an ideal model would use quasi-experimental variation of replacement rates at the cohort level to estimate the effect of replacement rates on claiming. Our models use variation in the age-distribution of claims between year groups, and should yield a good approximation of variation across cohorts. Instead, the key question is whether the variation in replacement rates we use is determined by factors that not also directly affect the

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<sup>14</sup> The figures are in nominal US\$. We compared the measure of average earnings from the synthetic SIPP and the CPS for the same age-group, and found them to be similar.

incidence of early claiming. Our discussion in the previous section suggests this is the case – i.e., changes in ‘effective’ replacement rates appear to be associated with changes in earnings inequality in the labor market. Changes in replacement rates driven by factors originating in the labor market are unlikely to affect claiming other than through the replacement rate. We have seen that the main explanations of these changes in the existing literature do not imply a direct effect on claiming. In particular, trends in labor demand due to technological progress or deindustrialization should affect older workers’ labor supply mainly through changes in earnings. Similarly, changes in the number of higher and lower educated workers are likely to affect claiming through the wage.

By explicitly using only variation in replacement rates at the education level, the group level model focuses on the effect coming from variation in replacement rates and claiming at the education level that is likely to be driven by pattern in the labor market. It thus avoids pitfalls from individual level models deriving from presence of differences in health, wealth, or household decomposition. To affect our cell-level regression estimates, these factors had to change at the education-year level, in parallel to changes of the replacement rate. As with any non-experimental study we cannot fully exclude the possibility that the replacement rate is correlated with factors that have an independent effect on claiming, or that some of the labor market trends we discussed directly affects claiming. Yet, the likelihood of a bias from omitted factors is likely to be much lower at the group level than at the individual level. Of course, the price of working at the group level is that the amount of variation declines noticeably, reducing the precision of our estimates.

To obtain an impression of the basic pattern underlying the cell level regressions, Figure 11 shows a scatter plot of the fraction claims in a given year occurring at age 62 against average replacement rates of all workers claiming in that year. Each panel of the figure corresponds to an education group, thus fully representing the underlying variation we use in our estimation. Despite showing a considerable variance, the figures clearly indicate a positive relationship between replacement rate and claiming at age 62. This relationship appears to be strong for lower educated workers. It is still present for workers with some college, but is weaker for workers with a bachelor degree or more.

These relationships are statistically significant and sizeable. Table 3 shows the first set of group-level regressions, where the weights correspond to number of claimants in each cell. The

columns of the table show estimates for different definitions of the replacement rate, which vary the age-range and the data source over which average earnings are calculated. Since the literature on age-profiles in earnings has shown earnings can decline for workers nearing retirement, our preferred measure uses uncapped average earnings at age 55-59 as the denominator for the replacement rate. However, since the measures we use are noisy, the information from the other measures is useful for assessing our findings.

The upper panel of Table 3 shows for both of our measures of claiming – the fraction of workers claiming OASI benefits at age 62, and the ratio of that fraction to those that claim at age 65 – there is considerable variation in the estimated coefficient on the replacement rate by education and definitions of the replacement rate. However, the overall picture that emerges is a significant effect of replacement rates on the incidence of early claiming. To obtain an impression of the magnitudes, it is helpful to take into account the standard deviation of the respective replacement rate. The average standard deviation for the measure based on ages 55-59 in Table 3 is about 0.7 for workers with less than high school; at a coefficient of 0.026, a change of two standard deviations thus leads to a predicted increase of 4.7 percentage points in the rate of benefit claiming at age 62. At a baseline of 35 percentage points, this is about a 13% increase.

Since the averages of individual replacement rates are quite noisy, we replicated our results using as alternative measure of the replacement rate the ratio of average PIA and average earnings. These two measures exhibit the same overall evolution over time. However, the latter measure is much less noisy. For reasons discussed above, it is also of more reasonable overall level, because individual level earnings at older ages have a high degree of dispersion, leading to very large replacement rates for some workers. (Measurement error in the left hand side variable is likely to lead to attenuation bias. As an alternative strategy to reduce the effect of measurement error, we have used three of our four measures of the replacement rate from the remaining one; as suspected, this leads to somewhat larger coefficients, confirming our main results.)

These results are shown in Table 4.<sup>15</sup> Overall, the table confirms the broad findings of Table 3. There is a significant positive effect of the replacement on the incidence of claiming OASI benefits at age 62 for less educated workers. Focusing on our preferred measures of the replacement rate using uncapped earnings, the effects are sizeable. To obtain estimates

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<sup>15</sup> The corresponding scatter plot is shown in Appendix Figure 1.

comparable in magnitude to those of Table 3, we need to take into account differences in the degree of variation of the independent variable. The average standard deviation for all measures in Table 4 is about 0.1; at a coefficient of 0.25, a change of two standard deviations thus leads to a predicted increase of 5 percentage points in the rate of benefit claiming at age 62. At a baseline of 35 percentage points, this is about a 14% increase. This estimate is of the same order of magnitude as the estimate from Table 3.

To compare these effects to estimates of replacement rates on program participation and labor supply in the literature, it is best to express these effects as elasticity. For example, for our estimates in Table 4, a two standard deviation change in of our preferred measure of the replacement rate for low educated workers is about a 40% increase in the replacement rate. This implies an elasticity of about 0.3-0.4. These estimates are somewhat lower than the benefit elasticities reported by Meyer (2002) for unemployment insurance, but in the same ballpark. As would be expected, they are significantly larger than the elasticity reported for disability benefits reported by Gruber (2000). Overall, we view our estimates as predicting an effect of replacement rates on the incidence of claiming OASI benefits early of a reasonable magnitude.

Our finding of a statistically and economically significant effect of replacement rates on the incidence of claiming benefits early has important implications for our assessment of the evolution of claiming ages. In particular, our discussion of the effect of earnings inequality on future replacement rate suggests that these may first rise and then fall as cohorts affected by a longer period of time by changes in the wage structure begin to retire. Our estimates imply that these changes lead corresponding fluctuations in the age of claiming. The age of claiming would be predicted to first fall and then rise. If we believe the patterns indicated by the trends in earnings inequality in Figure 4, these changes would occur until well into the 21<sup>st</sup> century.

## **5. Summary and Conclusions**

In this paper, we documented changes in the labor market that are likely to affect the decision to claim OASI benefits early, and have assessed their actual impact on the incentives and incidence of claiming. While few papers have studied the determinants of the decision to claim benefits, even fewer have assess the impact of incentives originating from the labor market. Yet, strong trends in earnings inequality and the education distribution could have significantly affected the age of claiming.

To obtain rarely available information on both social security benefits and educational attainment, we have used the synthetic version of a merge between administrative data from the Social Security Administration and the Survey of Income and Program Participation. To study longer term trends, we have augmented this data with information from the Current Population Survey spanning over twenty years.

Our findings suggest that while trends in educational attainment are likely to have only limited effect on average claiming ages, trends in earnings inequality may have potentially important effects on incentives to claim social security benefits early. Regression estimates suggest that changes in the replacement rate can lead to significant increases in the fraction of claims occurring at age 62. Based on the structure of social security benefits, we argue that current changes in inequality can have long-lasting effects on the replacement rate. Thus, our regression estimates suggest that average claiming ages may further decline in the future. However, we conclude that further analysis using better data is needed to obtain additional and more precise estimates of the magnitude of the effect of replacement rates on claiming ages.

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**Table 1: Summary Statistics of Age of Initial OASI Claims by Year, Men**

	<b>Average</b>	<b>Median</b>	<b>25th Percentile</b>	<b>75th Percentile</b>	<b>Standard Deviation</b>	<b>Total Number of New Claims</b>
<b>1970</b>	64.4	65	63	65	1.85	813691
<b>1975</b>	64.0	65	62	65	1.73	902219
<b>1980</b>	63.9	64	62	65	1.66	942017
<b>1984</b>	63.7	63	62	65	1.66	932503
<b>1990</b>	63.4	63	62	65	1.66	951900
<b>1995</b>	63.3	62.5	62	65	1.63	903400
<b>1998</b>	63.3	62	62	65	1.66	895300

Notes: Social Security Bulletin, Statistical Supplement, Table 6.4A, Various Years.

**Table 2: Contribution of Changes in the Education Distribution and Changes in Claiming Behavior to Shifts in the Claiming Behavior by Age**

	Fraction Claims at Age 62			Fraction Claims at Age 63-64		
	Original	Hold Constant:		Original	Hold Constant:	
		Rate	Share		Rate	Share
1980-84	31.2	36.0	30.7	38.1	39.2	38.2
1985-89	36.3	36.3	36.3	38.8	38.8	38.8
1990-94	38.6	36.4	38.7	36.5	38.5	36.6
1995-99	36.5	36.5	36.2	32.5	38.2	33.3
2000-02	50.8	36.7	51.2	23.3	38.0	23.1

	Fraction Claims at Age 65			Fraction Claims at Age 65+		
	Original	Hold Constant:		Original	Hold Constant:	
		Rate	Share		Rate	Share
1980-84	16.6	15.4	17.1	14.1	9.4	14.1
1985-89	15.4	15.4	15.4	9.6	9.6	9.6
1990-94	17.2	15.4	17.2	7.7	9.7	7.5
1995-99	17.2	15.6	17.1	13.8	9.7	13.4
2000-02	14.6	15.5	14.4	11.3	9.8	11.3

Notes: Calculations based on synthetic version of SIPP matched to administrative Social Security records. The calculations are based on four education groups and include men eligible for their own worker benefits.

**Table 3: Results from Cell Level Regressions of Probability of Claiming on the Average Replacement Rate by Year- and Education Groups**

		Replacement Rate (RR) = PIA as Fraction of Mean Earnings before Initial Claim			
		Mean Earnings Defined As:			
	Average (SD) of Dependent Variable	Age 50-54	Age 55-59	Age 50-54	Age 55-59
		Topcoded	Topcoded	Uncapped	Uncapped
<b>Panel A: Effect of Replacement Rate on Probability of Claiming at Age 62</b>					
<b>All Workers</b>	0.345 (0.058)	0.0003 (0.016)	0.0064 (0.010)	-0.0081 (0.012)	0.0041 (0.010)
<b>Less Than High-School</b>	0.328 (0.052)	0.032 (0.055)	<b>0.026</b> (0.011)	-0.043 (0.036)	<b>0.026</b> (0.012)
<b>Equal High-School</b>	0.369 (0.058)	<b>0.064</b> (0.032)	0.048 (0.048)	<b>0.056</b> (0.032)	0.019 (0.035)
<b>Some College</b>	0.364 (0.057)	0.005 (0.030)	<b>0.151</b> (0.063)	-0.026 (0.021)	<b>0.144</b> (0.063)
<b>Bachelor Degree or More</b>	0.314 (0.048)	<b>0.119</b> (0.041)	<b>0.059</b> (0.022)	<b>0.118</b> (0.039)	0.023 (0.026)
<b>Panel A: Effect of RR on Ratio of Probability of Claiming at Age 62 and 65</b>					
<b>All Workers</b>	1.937 (0.633)	-0.119 (0.213)	0.176 (0.134)	-0.117 (0.156)	0.117 (0.135)
<b>Less Than High-School</b>	1.870 (0.654)	0.083 (0.687)	<b>0.271</b> (0.141)	-0.506 (0.522)	<b>0.308</b> (0.156)
<b>Equal High-School</b>	2.062 (0.578)	<b>0.520</b> (0.332)	0.369 (0.483)	<b>0.604</b> (0.252)	0.017 (0.353)
<b>Some College</b>	2.171 (0.714)	-0.099 (0.374)	<b>1.204</b> (0.863)	-0.271 (0.295)	0.781 (0.879)
<b>Bachelor Degree or More</b>	1.721 (0.427)	<b>0.994</b> (0.377)	<b>0.540</b> (0.197)	<b>0.954</b> (0.356)	0.231 (0.232)

Notes: Regressions are based on four education groups and nineteen years, with total number of claimants in a cell is used as weight. The cells include men eligible for their own worker benefits only. PIA is the primary insurance amount. The PIA and average earnings are calculated at the individual worker level and their ratio is averaged up at the level of education-groups and years. Regressions for "All Workers" include fixed effects for education-groups and years. Panel B uses the ratio of the fraction of workers in a cell claiming at age 62 relative to the fraction in the cell claiming at age 65.

**Table 4: Results from Cell Level Regressions of Probability of Claiming on the Average Replacement Rate by Year- and Education Groups -- Replacement Rate Obtained from Ratio of Group Level Averages of PIA and Earnings**

	Average (SD) of Dependent Variable	Replacement Rate (RR) = PIA as Fraction of Mean Earnings before Initial Claim			
		Mean Earnings Defined As:			
		Age 50-54 Topcoded	Age 55-59 Topcoded	Age 50-54 Uncapped	Age 55-59 Uncapped
<b>Panel A: Effect of Replacement Rate on Probability of Claiming at Age 62</b>					
All Workers	0.347 (0.059)	0.213 (0.190)	0.213 (0.190)	0.021 (0.067)	0.038 (0.132)
Less Than High-School	0.327 (0.051)	<b>0.904</b> (0.319)	<b>0.904</b> (0.319)	<b>0.230</b> (0.107)	<b>0.272</b> (0.139)
Equal High-School	0.372 (0.058)	-0.024 (0.553)	-0.024 (0.553)	<b>0.243</b> (0.116)	<b>0.459</b> (0.197)
Some College	0.368 (0.057)	-1.093 (0.604)	<b>-1.093</b> (0.604)	-0.095 (0.156)	<b>0.361</b> (0.229)
Bachelor Degree or More	0.317 (0.049)	-0.077 (0.325)	-0.077 (0.325)	-0.220 (0.198)	-0.058 (0.247)
<b>Panel A: Effect of RR on Ratio of Probability of Claiming at Age 62 and 65</b>					
All Workers	1.970 (0.644)	1.705 (2.530)	1.705 (2.530)	0.504 (0.899)	-0.390 (1.744)
Less Than High-School	1.869 (0.638)	<b>6.451</b> (4.530)	<b>6.451</b> (4.530)	<b>2.478</b> (1.607)	1.701 (1.862)
Equal High-School	2.123 (0.624)	-1.796 (5.896)	-1.796 (5.896)	<b>2.271</b> (1.177)	2.049 (2.356)
Some College	2.213 (0.718)	-10.431 (7.869)	-10.431 (7.869)	-2.653 (2.036)	2.159 (3.029)
Bachelor Degree or More	1.750 (0.434)	-0.022 (2.867)	-0.022 (2.867)	-1.784 (1.703)	-0.515 (2.177)

Notes: Regressions are based on four education groups and nineteen years, with total number of claimants in a cell is used as weight. The cells include men eligible for their own worker benefits only. PIA is the primary insurance amount. The PIA and average earnings are calculated at the worker level and then averaged up at the level of education-groups and years. Regressions for "All Workers" include fixed effects for education-groups and years. Panel B uses the ratio of the fraction of workers in a cell claiming at age 62 relative to the fraction in the cell claiming at age 65.

**Appendix Table 1: Fraction Claiming OASI Benefits by Year-Group and Age of Claiming and By Education Group, Men Claiming on Their Own Work History**

	<b>Age of Initial Award</b>	<b>Less Than a High-School Degree</b>	<b>High School Degree</b>	<b>Some College</b>	<b>Bachelor Degree or More</b>
<b>1980-84</b>	<b>62</b>	0.345	0.316	0.205	0.316
	<b>63-64</b>	0.370	0.390	0.428	0.348
	<b>65</b>	0.139	0.160	0.201	0.217
	<b>66+</b>	0.146	0.135	0.166	0.119
<b>1985-89</b>	<b>62</b>	0.346	0.363	0.386	0.368
	<b>63-64</b>	0.418	0.393	0.378	0.338
	<b>65</b>	0.145	0.172	0.150	0.143
	<b>66+</b>	0.092	0.072	0.085	0.151
<b>1990-94</b>	<b>62</b>	0.369	0.418	0.429	0.327
	<b>63-64</b>	0.388	0.355	0.367	0.346
	<b>65</b>	0.180	0.166	0.155	0.184
	<b>66+</b>	0.061	0.062	0.049	0.142
<b>1995-99</b>	<b>62</b>	0.347	0.398	0.359	0.329
	<b>63-64</b>	0.378	0.325	0.326	0.280
	<b>65</b>	0.163	0.171	0.177	0.176
	<b>66+</b>	0.112	0.106	0.138	0.215
<b>2000-02</b>	<b>62</b>	0.516	0.529	0.528	0.438
	<b>63-64</b>	0.216	0.238	0.239	0.222
	<b>65</b>	0.137	0.139	0.128	0.172
	<b>66+</b>	0.118	0.087	0.097	0.158

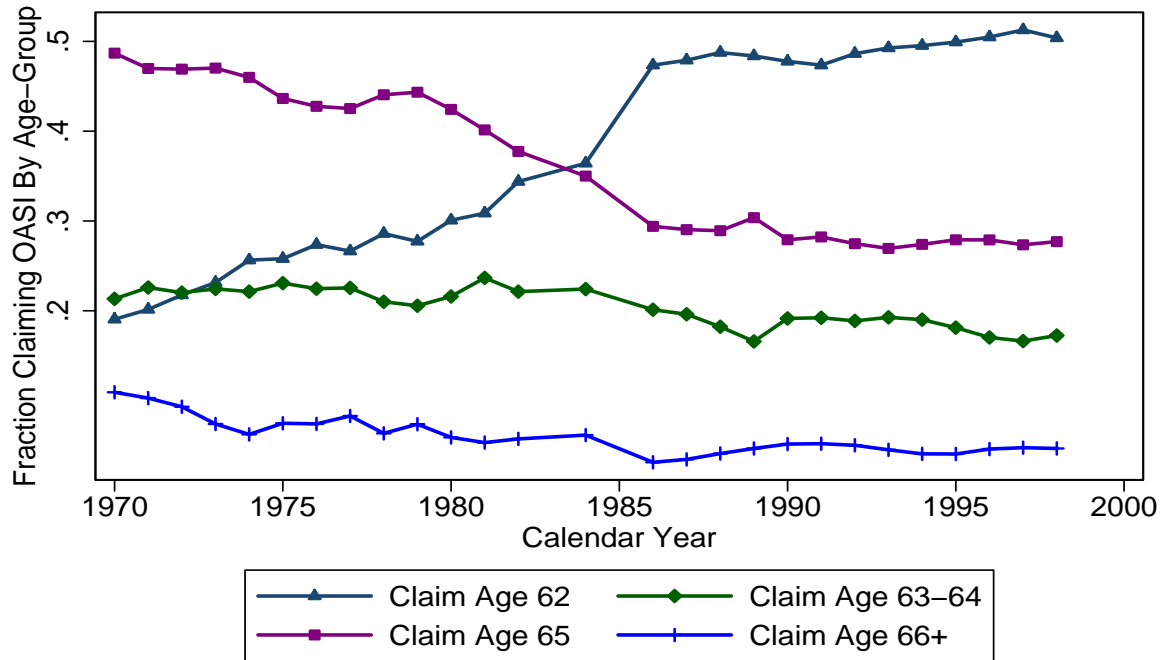
Notes: Calculations based on synthetic version of SIPP matched to administrative Social Security records. The fractions are based on men claiming on their own worker

**Appendix Table 2: Education Distribution for Men Claiming OASI Benefits by Year Group of First Claim**

	<b>Less Than a High- School Degree</b>	<b>High School Degree</b>	<b>Some College</b>	<b>Bachelor Degree or More</b>
<b>1980-84</b>	0.397	0.306	0.143	0.154
<b>1985-89</b>	0.319	0.325	0.166	0.190
<b>1990-94</b>	0.274	0.330	0.173	0.223
<b>1995-99</b>	0.199	0.378	0.195	0.228
<b>2000-02</b>	0.160	0.370	0.217	0.253

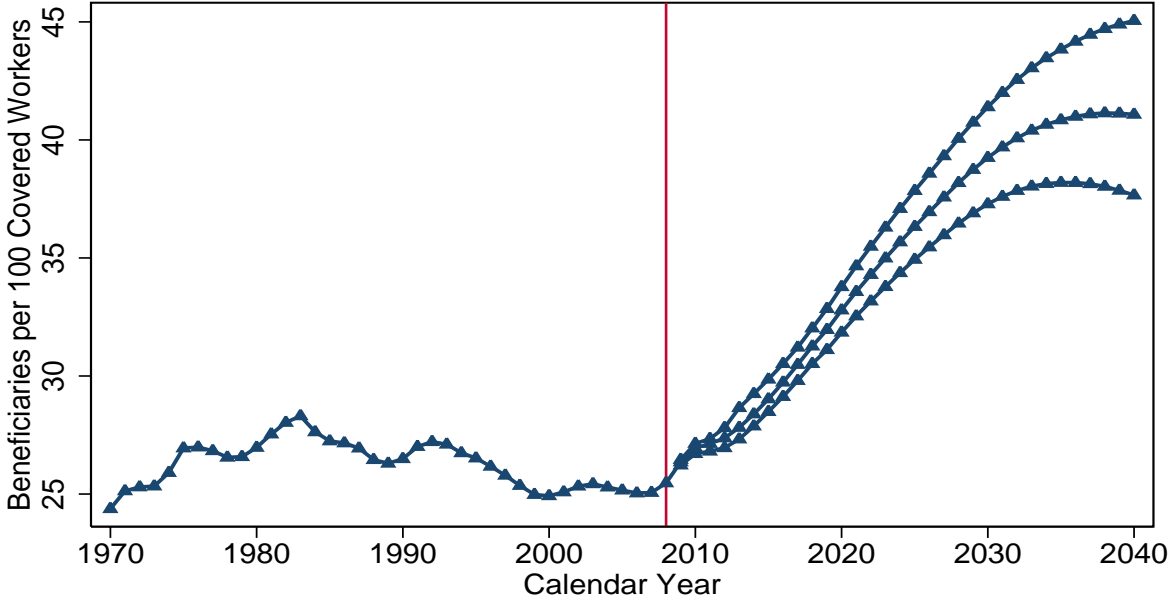
Notes: Calculations based on synthetic version of SIPP matched to administrative Social Security records. The fractions are based on men claiming on their own worker benefits.

Figure 1: Age Distribution of New OASI Claims Over Time, Men



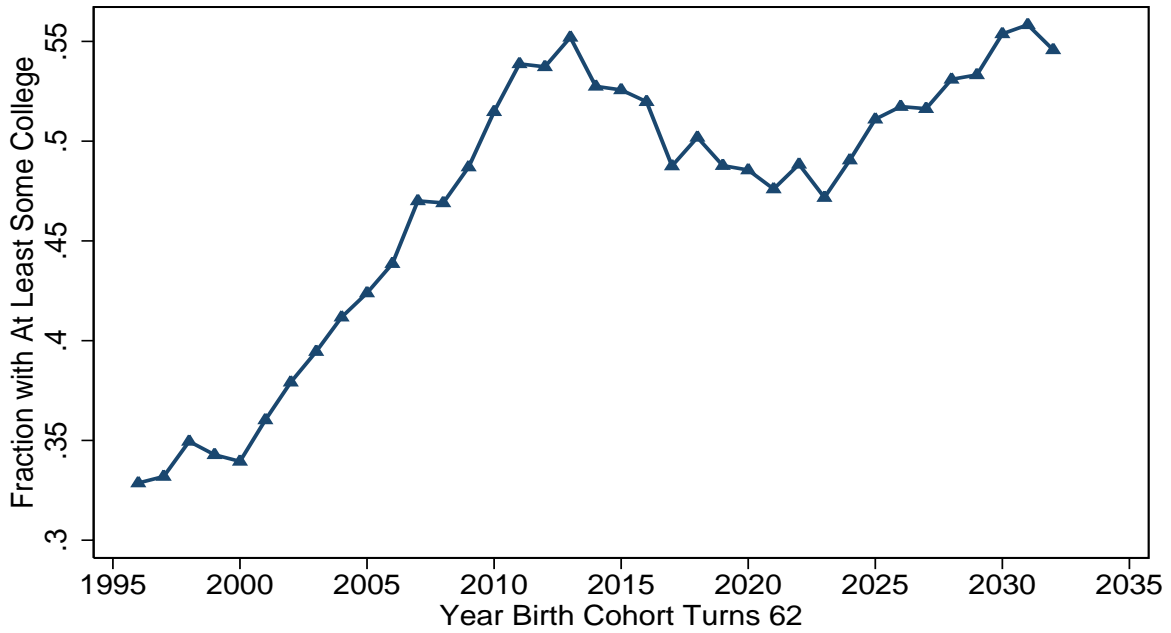
Source: Statistical Supplement, Table 6.A4

Figure 2: Number of OASI Beneficiaries per 100 Covered Workers  
Historical Series Until 2008 and Projections from Trustees Report  
Projections Based on Low, Intermediate, and High Cost Scenarios



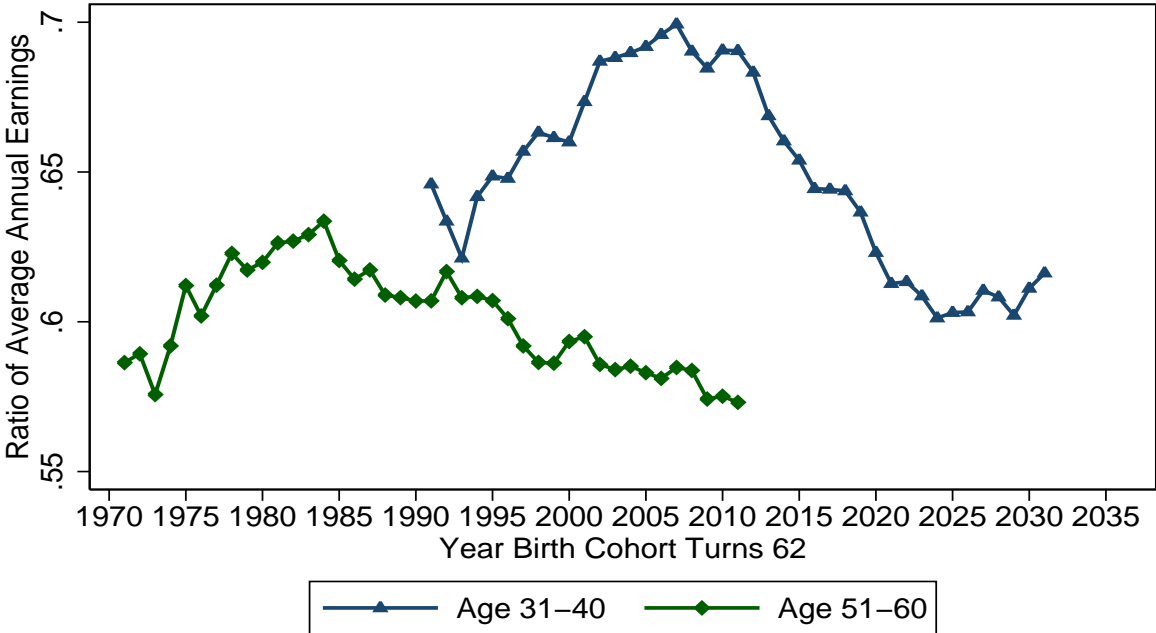
Source: Trustees Report, Table IV.B2

Figure 3: Educational Attainment by Birth Cohort at Age of Eligibility for OASI  
Fraction Men Age 30–35 with At Least Some College



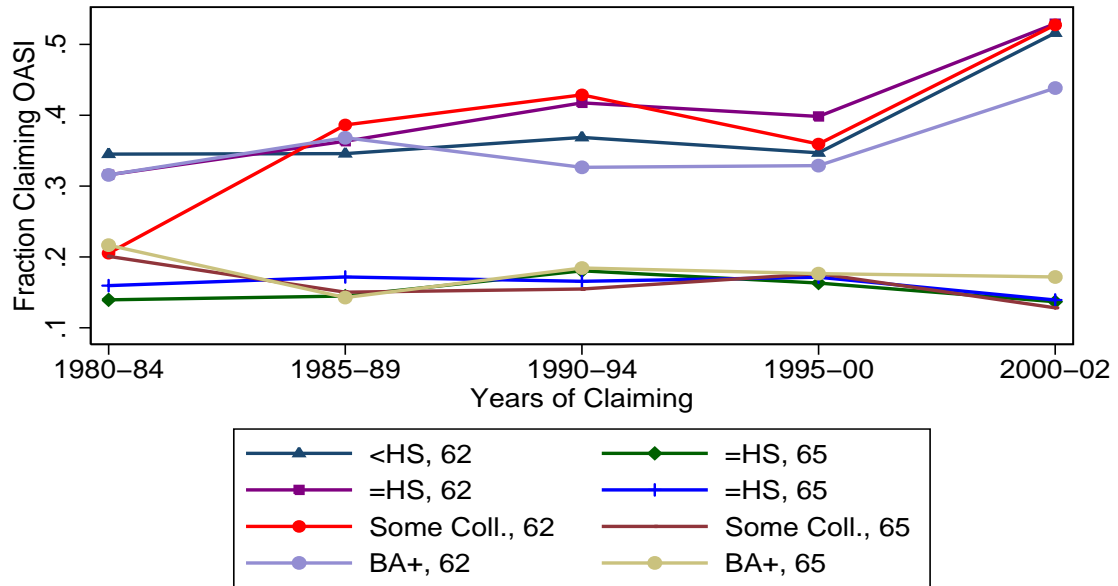
Source: Current Population Survey, Monthly Files

Figure 4: Lower vs. Higher Skilled Earnings by Birth Cohort and Age Group  
Ratio of Mean Annual Earnings for Workers Without and With Some College



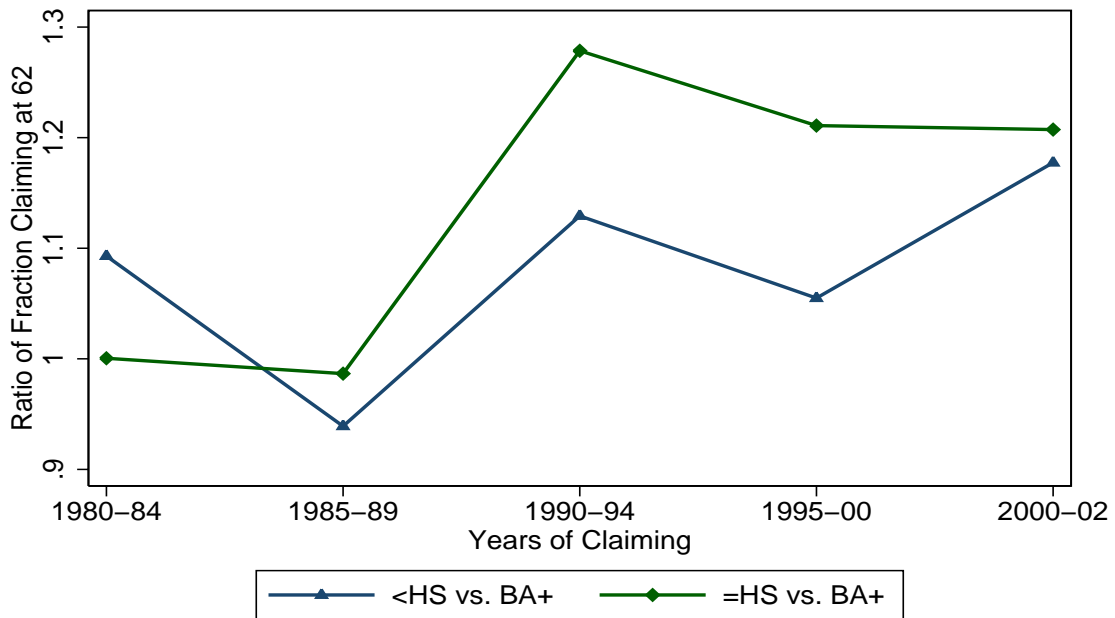
Source: Current Population Survey, Monthly Files

Figure 5A: Rate of OASI Claims by Education Group at Two Modal Ages, Men  
 Fraction of Claims in Year Group at Age 62 and 65



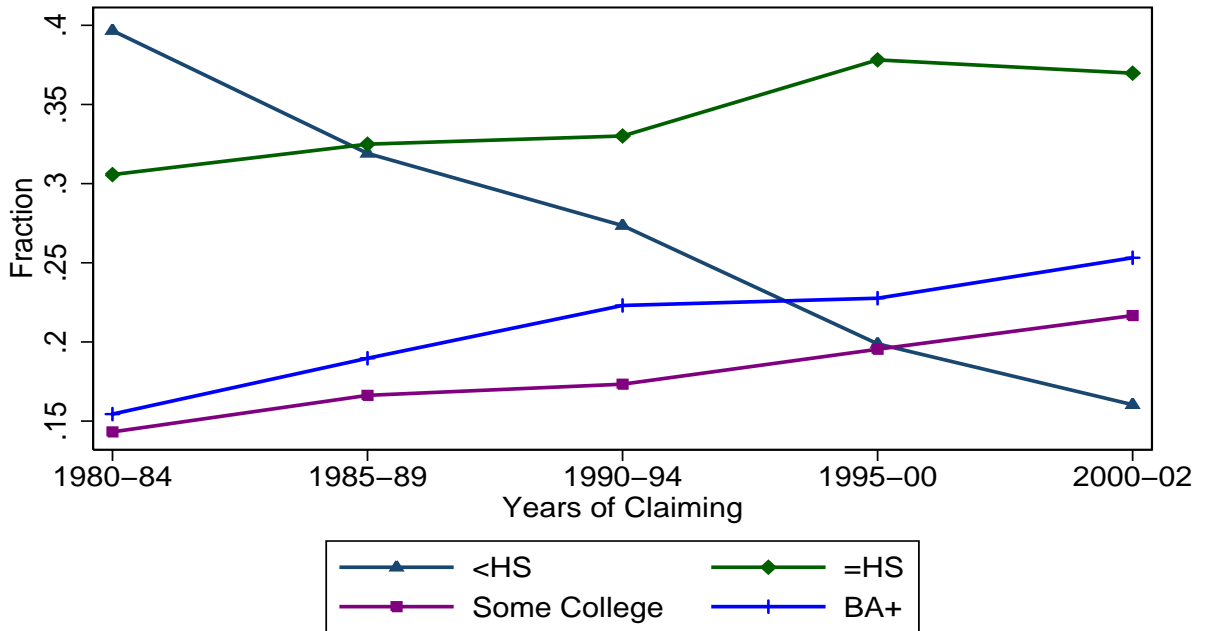
Source: Match between SIPP and Administrative Data, Synthetic Version

Figure 5B: Ratio of Proportion Early OASI Claims for Low vs. High Educated



Source: Match between SIPP and Administrative Data, Synthetic Version

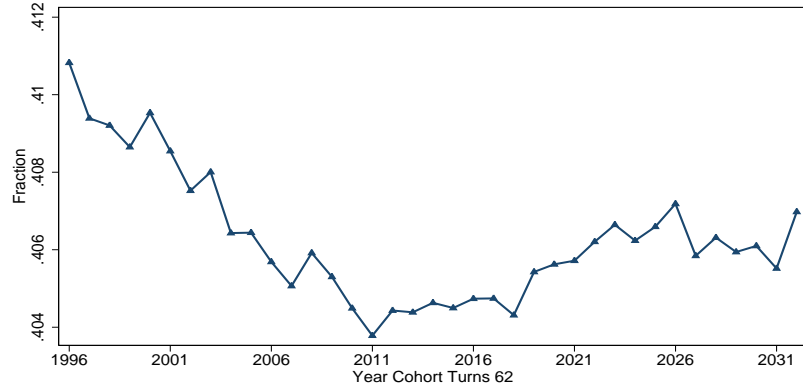
Figure 6: Change in Educational Attainment of Claimants Over Time  
Fraction of New OASI Claims by Year and Education Group, Men



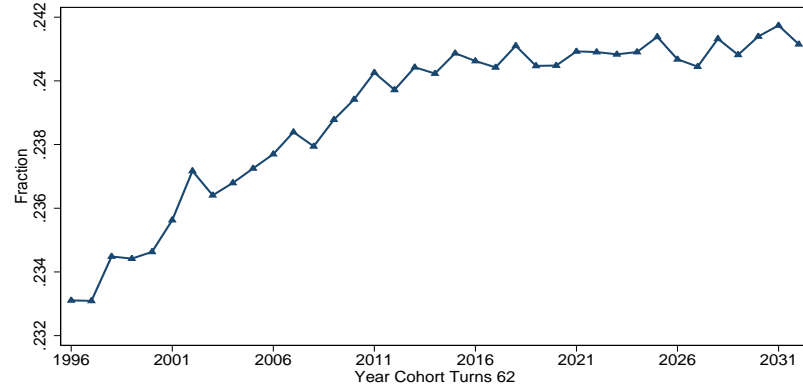
Source: Match between SIPP and Administrative Data, Synthetic Version

# Figure 7: Predicted Changes in the Incidence of Claiming Prediction Based on Changes in Cohort-Specific Education Shares Holding the Age of Claiming within Education Group Constant at 2000 Level

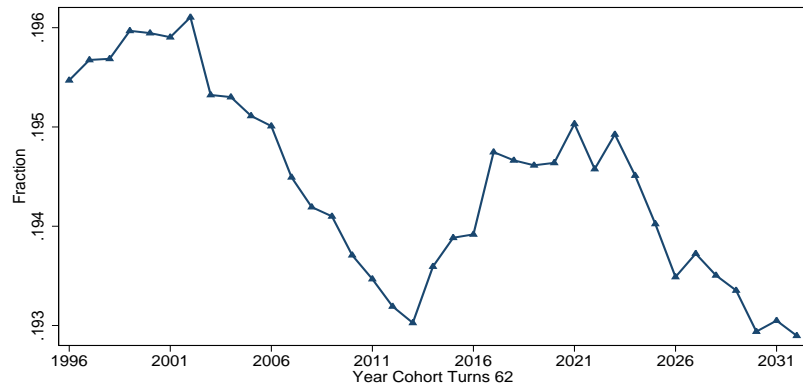
Panel A: Fraction Claiming at Age 62



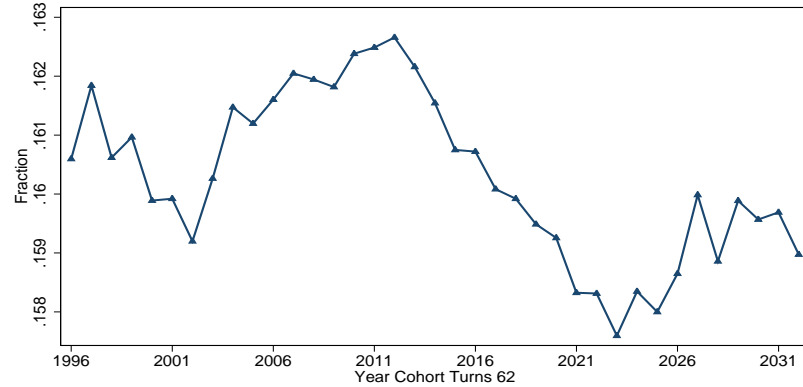
Panel B: Fraction Claiming at Age 63-64



Panel C: Fraction Claiming at Age 65



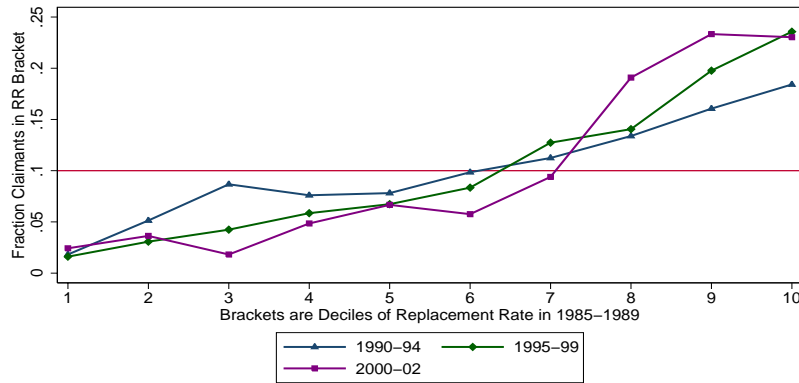
Panel D: Fraction Claiming at Age 66+



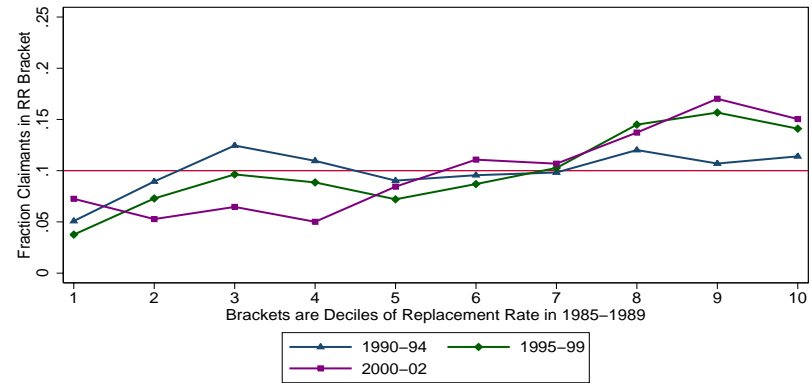
Source: Match of SIPP and Administrative Data, Synthetic Version, and Current Population Survey

Figure 8: Change in Distribution of Replacement Rate (RR) Relative to 1985–89  
 Change by Education Group Relative to RR Distribution in 1984–89  
 Replacement Rate is PIA over Earnings at Age 55–59

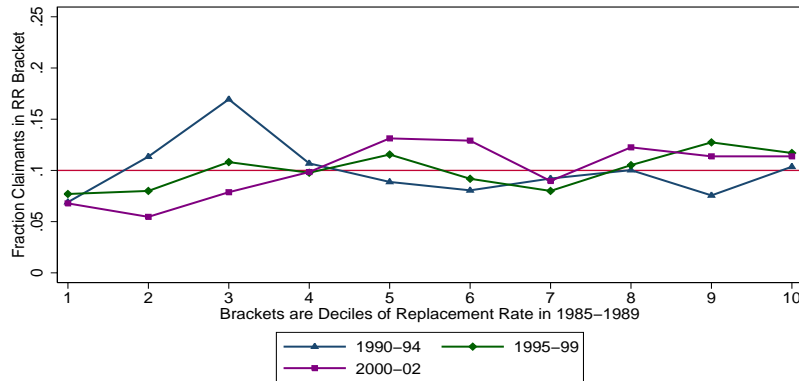
Panel A: Claimants with Less than High School Education



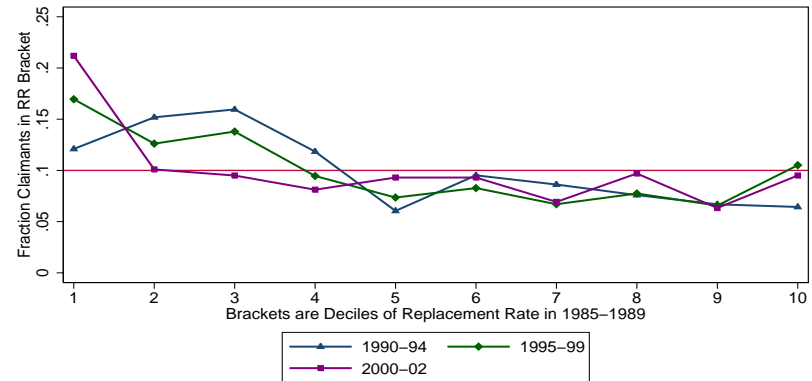
Panel B: Claimants with A High School Degree



Panel C: Claimants with Some College Education



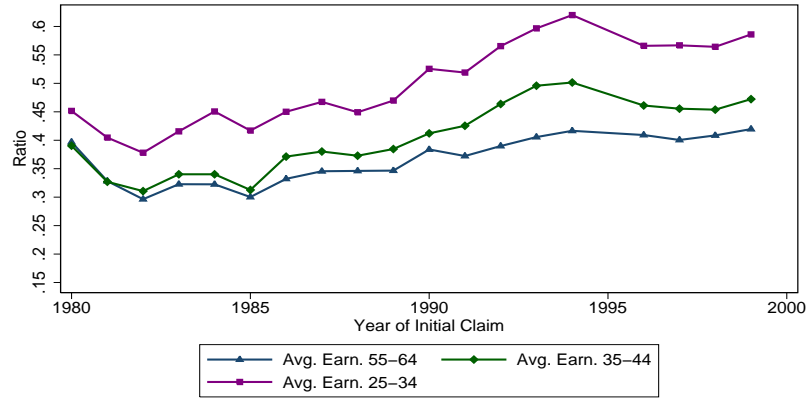
Panel D: Claimants with a Bachelor's Degree or More



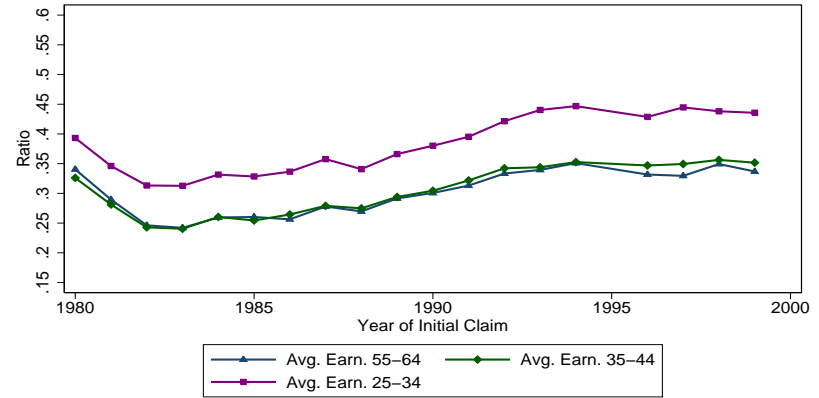
Source: Match between SIPP and Administrative Data, Synthetic Version

# Figure 9A: Ratio of Avg. PIA and Avg. Earnings by Age and Education Group By Year of Initial Claim

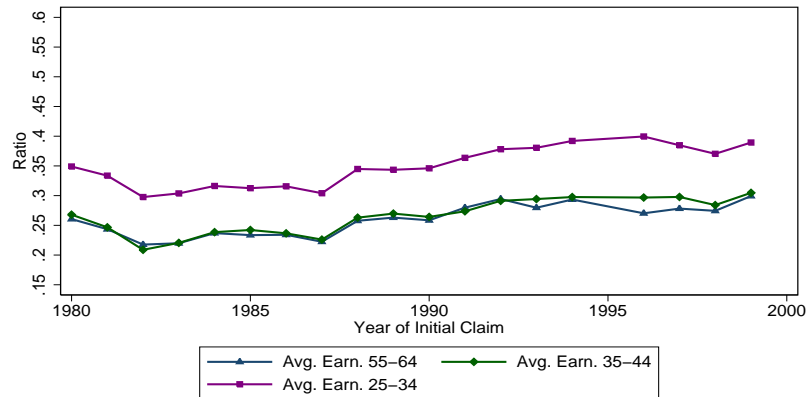
Panel A: Claimants with Less than High School Education



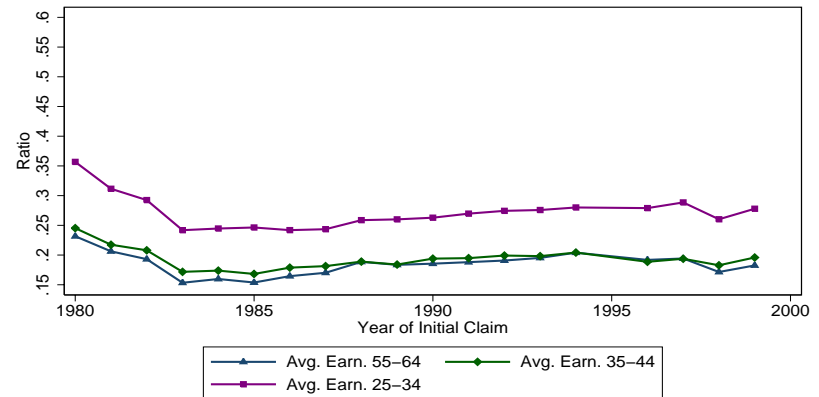
Panel B: Claimants with A High School Degree



Panel C: Claimants with Some College Education



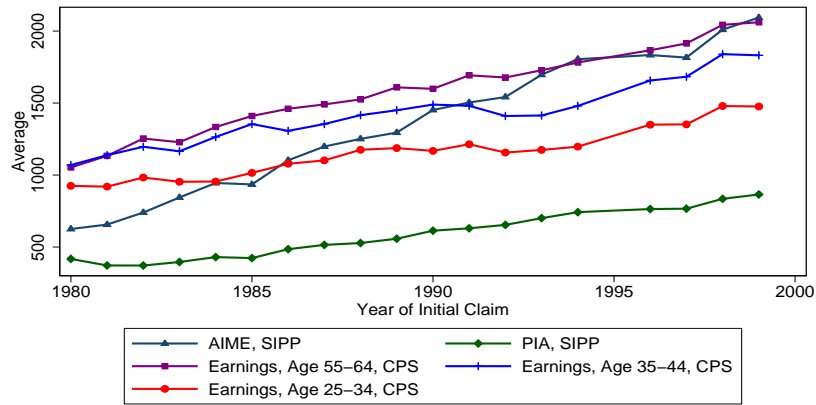
Panel D: Claimants with a Bachelor's Degree or More



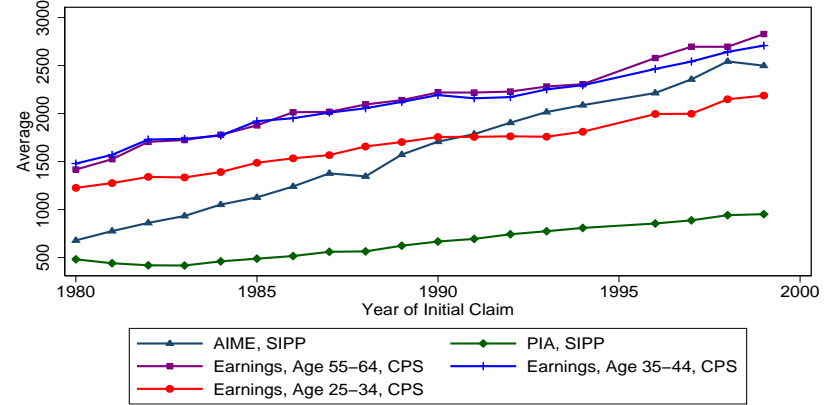
Source: Match of SIPP & Administrative Data, Synthetic Version, and Current Population Survey

# Figure 9B: Average AIME, PIA, and Earnings by Education Group By Year of Initial Claim

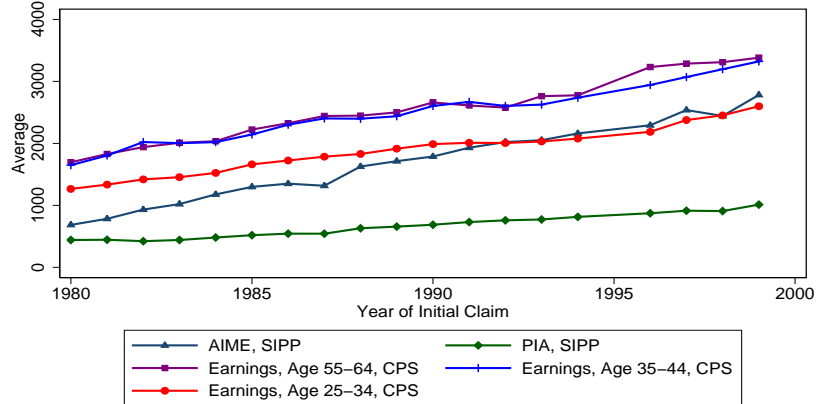
Panel A: Claimants with Less than High School Education



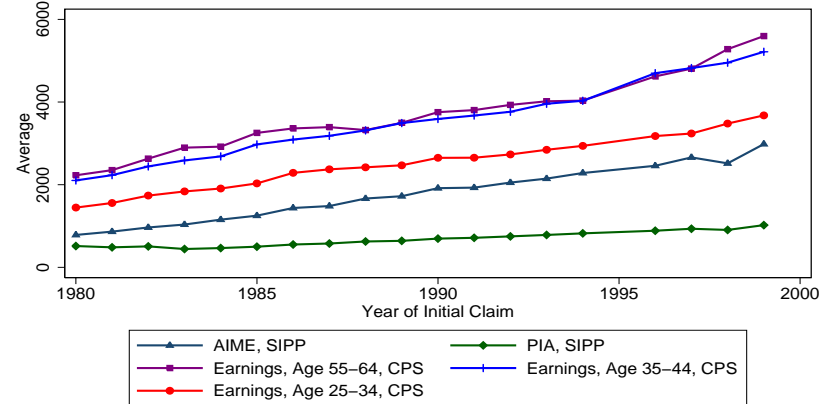
Panel B: Claimants with A High School Degree



Panel C: Claimants with Some College Education

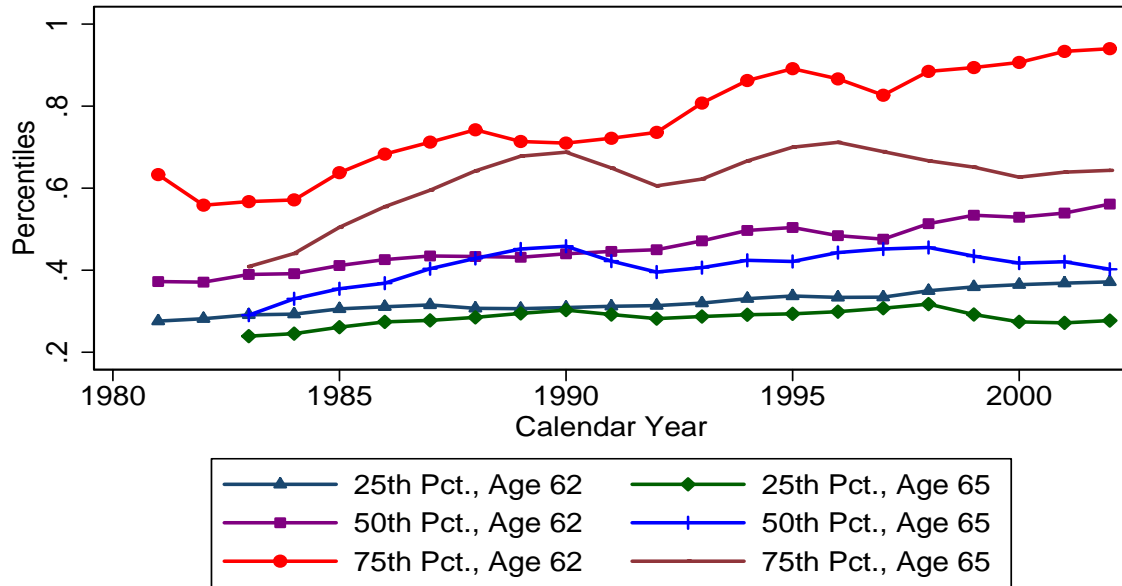


Panel D: Claimants with a Bachelor's Degree or More



Source: Match of SIPP & Administrative Data, Synthetic Version, and Current Population Survey

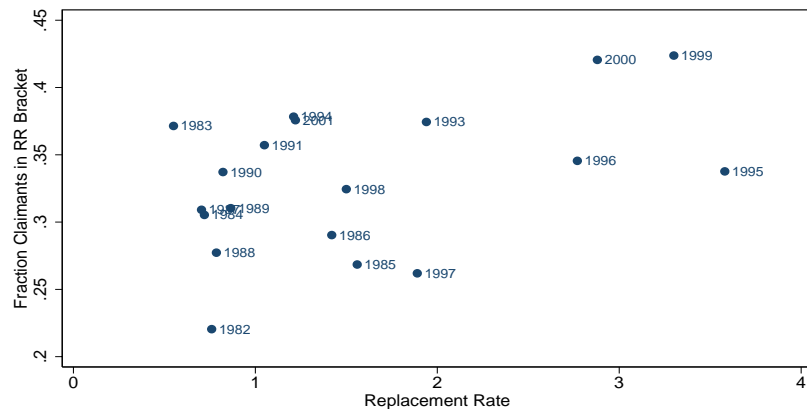
Figure 10: Distribution of Replacement Rate by Claiming Age  
 Men Claiming at Age 62 and 65  
 Replacement Rate is Ratio of PIA to Mean Earnings at Age 55–59



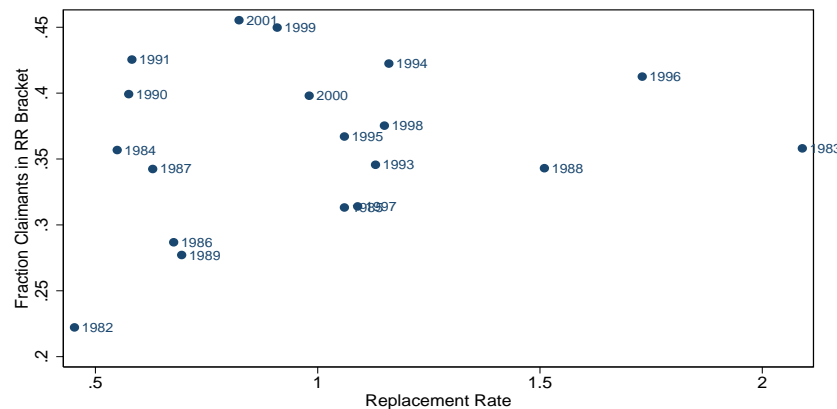
Source: Synthetic SIPP

# Figure 11: Fraction Claiming at Age 62 and Replacement Rate Replacement Rate Defined as PIA Relative to Earnings 55–59

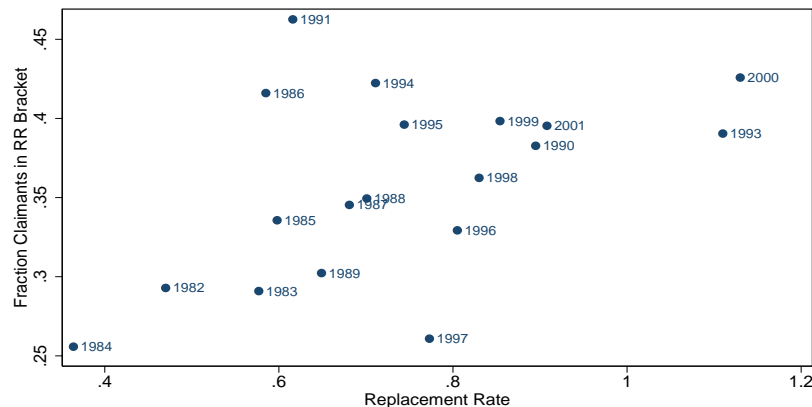
Panel A: Claimants with Less than High School Education



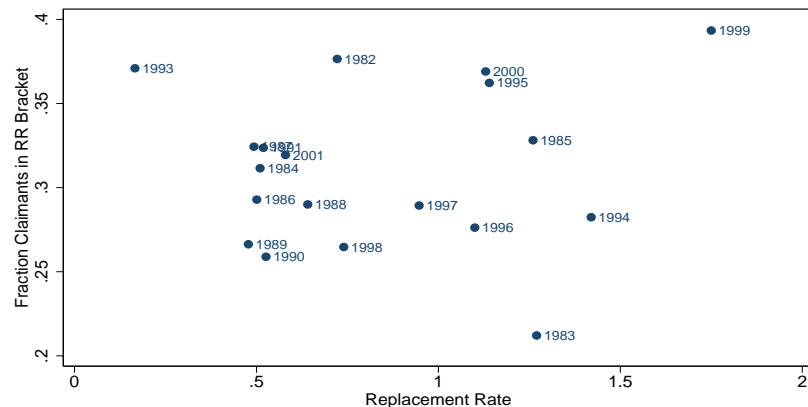
Panel B: Claimants with A High School Degree



Panel C: Claimants with Some College Education



Panel D: Claimants with a Bachelor's Degree or More



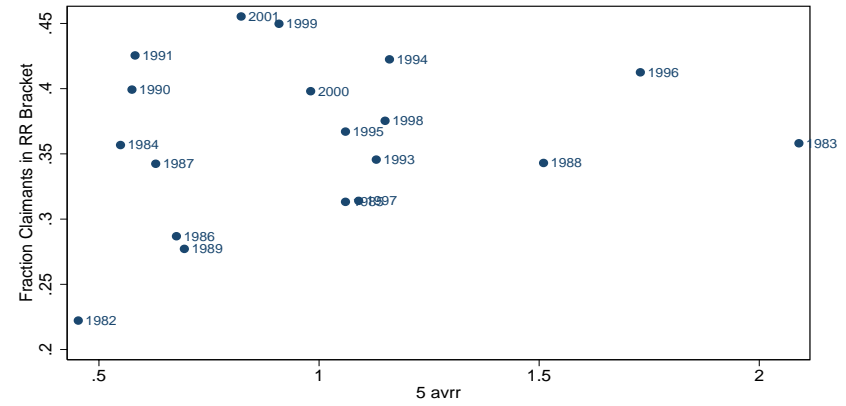
Source: Match between SIPP and Administrative Data, Synthetic Version

# Appendix Figure 1: Fraction Claiming at Age 62 and Replacement Rate Replacement Rate Defined as PIA Relative to Earnings 55–59

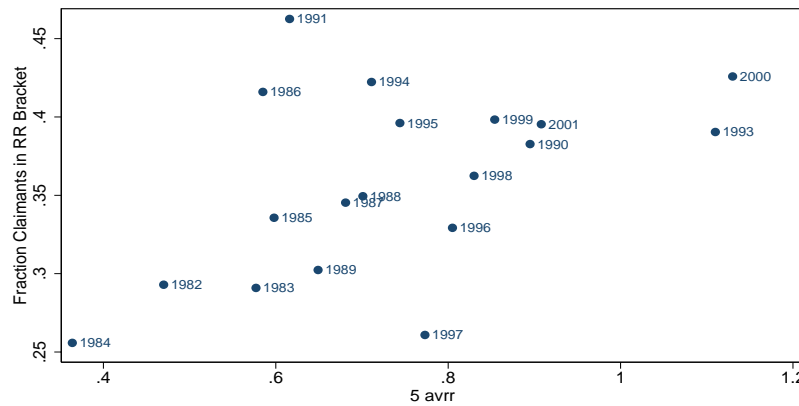
Panel A: Claimants with Less than High School Education



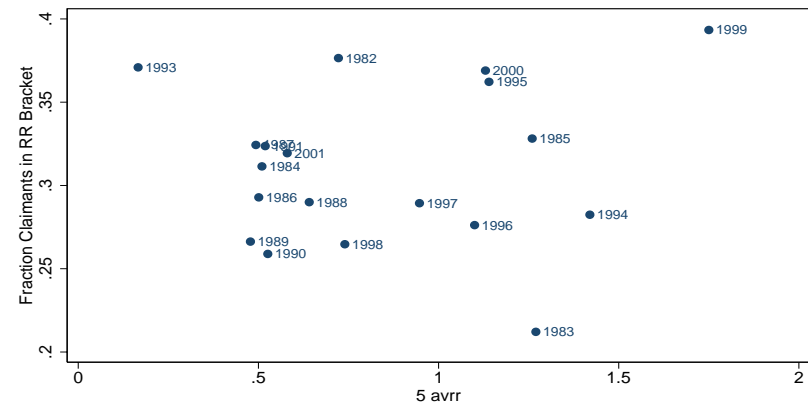
Panel B: Claimants with A High School Degree



Panel C: Claimants with Some College Education



Panel D: Claimants with a Bachelor's Degree or More



Source: Match between SIPP and Administrative Data, Synthetic Version