Political Risk of Social Security: Evidence from Reforms in Hungary and the Czech Republic[1]

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Abstract

We document the political risk of social security in Hungary and the Czech Republic by measuring the changes in the social security wealth induced by the pension reforms undertaken in these countries since the 1990s. Methodologically we follow upon McHale's (2001) study of selected reforms in G7 countries. We compute the changes in social security wealth separately for representative male and female workers in all age cohorts and different educational categories. Our results therefore provide more comprehensive picture of the differential impacts of pension reforms on different workers. The Czech 1996 reform reduced the social security wealth of almost all workers by the magnitude of 2 to 3 annual average earnings. The negative impact was more pronounced for women but was distributed fairly equally across cohorts and income levels. In Hungary, the early (1993 and 1997) reforms had negative impact on workers near the retirement age. The 1998 reform which introduced a privately funded second pillar was highly advantageous for middle-aged and young men with university education but had a negative impact on most other workers, and exposed workers to additional uncertainty about future taxation of benefits. Overall, the paper documents that pay-as-you-go system is not a predictable source of income since legislative reforms, particularly in the Hungarian case, do frequently change the future taxes and benefits in different directions for different people.

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[5] The social security wealth is defined as the expected present value of pension benefits minus the expected present value of social security contributions, as promised by the current legislation.

1. Introduction

The unsustainability of public pay-as-you-go pension systems and possible reform options have received substantial attention by economists. Several countries have adopted, or are considering adopting, a multi-pillar pension system in which a part of the traditional PAYG scheme would be replaced by a funded system of private savings.

A large number of papers (among others World Bank (1994), Koch-Weser (1997), McHale (1999), Mora (1999), Muller (1999), Lindeman, Rutkowski and Sluchynskyy (2000), Feldstein (2005a,b), Lindbeck and Persson (2003)) describes gains from pension reform, highlights basic principles of the reform and discusses the efficiency, distributional, stability, and risk sharing aspects. A shift from the PAYG system to a mixed system with a privately funded pillar can reduce the distortions in the labor market, lift national savings, increase internal rates of return on contributions, and increase the expected future consumption. The transition to such multi pillar system can be done gradually in a way that does not require large deficits, a tax increase or a decrease in retirement incomes.

It has been well recognized that one of the drawbacks of the funded pillar is the investment risk – as contributions are invested into stock and bonds and the returns are uncertain, workers cannot expect to receive a certain level of pension once they retire. Several authors (Feldstein and Ranguelova (2001), Feldstein, Ranguelova and Samwick (2001), Poterba et al (2005)) have quantified the risk contained in private funded schemes, estimated distributions of potential benefits upon retirement, and made expected utility comparisons between the private funded scheme and the PAYG.

These papers assumed, however, that some benchmark PAYG benefit will be provided with certainty. However, the PAYG systems are not free from risk either – workers are subject to the risk that pension legislation will be changed (because of, for example, necessary policy adjustments to increasing dependency rates), and that they will receive lower social security benefits or will have to pay higher taxes than that they were promised by the original legislation.

The importance of political risk is often underestimated or neglected. Appropriate comparisons between the PAYG system and privately funded system require comparing a risky private system with a risky PAYG system, and therefore it is necessary to have some measures of the magnitude and consequences of the political risk. Major pension reforms are the largest manifestations of political risk. A large-scale change in the pension system usually involves numerous adjustments to formulas for computing taxes and benefits that are complicated, not very transparent, and contains a large number of parameters. Such adjustments may affect people of different ages and earnings histories differently, often times in ways that may not have been recognized and anticipated by the legislators.

An emerging literature has already produced some quantifications of the magnitude of the political risk. McHale (2001) computes the change in the social security wealth[5] (SSW) induced by pension reforms that were implemented in the G7 countries during the 1990's for workers with average earnings at age forty-five and at the standard retirement age. He finds that some of the reforms reduced the social security wealth by as much as 29% (the Italian 1992 reform) or 26% (the German 1992 reform). He also finds that those at the retirement age experienced only minor, and in most cases none, cuts in benefits. McHale's contribution was valuable as it demonstrated that cuts in social security benefits do happen and they can be substantial. Shoven and Slavov (2006) take a more systematic look at the political risk of social security in the United States since 1939 until today. They compute the internal rates of return for various age groups under the existing legislation in each year, and find "a considerable variation in the internal rates of return through time for a given birth cohort". They also find substantial differences in IRR's across cohorts. Blake (2004) shows that even the private pensions in the United Kingdom have not been completely immune from political risk, but have been less sensitive than the public pensions.

In this paper, we provide evidence on the magnitude of the political risk of social security in Hungary and Czech Republic by measuring the impact of several pension reforms adopted in these countries since the early 1990's on the social security wealth of workers of different ages, genders, and income levels. Both countries undertook major reforms of their outdated pension schemes a few years after the fall of communism (Hungary in 1993, Czech Republic in 1996), and both made surprisingly similar changes in the key parameters. Hungary is then a particularly interesting country to study since its 1998 reform reduced the size of the PAYG system and replaced it partially with a private funded pillar. In this sense the two countries

provide a somewhat representative picture of the other transition countries, either those who chose simple re-parameterization of the existing PAYG scheme (e.g., Slovenia) or a more radical reform (e.g., Slovakia).

Methodologically, our approach is similar to McHale (2001) but more comprehensive. For each of the reforms, we compute the expected present value of taxes and benefits under the pre-reform and post-reform legislation separately for representative men and women at different income levels (represented by educational categories) and, more importantly, all birth cohorts that were working or born but not yet working at the time of reform. Therefore we not only document that social security wealth has changed for some types of workers, but we observe richer distributional impacts of the reforms on workers of different ages, income levels, and genders.

For the Czech 1996 reform, we find that overall impact was negative for all workers, and somewhat more negative for women whose SSW was reduced, on average, by 3.3 average annual wages. The reform had a fairly similar impact across cohorts and educational categories. Most Hungarian reforms, on the other hand, had differential impacts on workers in different cohorts and education levels. The 1998 reform was most notable in this respect as it increased the social security wealth to men with university education born 1951 or younger by approximately 400% of annual average earnings, while it reduced the SSW by about 100% of average annual earnings for men with the same education level but born between 1941-1950. Particularly in the Hungarian case the social security appears to be a risky asset as the reforms were quite frequent and they were inducing both positive and negative changes in SSW in a pattern that hardly appears to be systematic or predictable.

The rest of the paper is organized as follows. Section 2 provides a brief institutional background on the pension reforms in Hungary and the Czech Republic. Section 3 describes our methodology for computing the social security wealth and the assumptions involved. In section 4 we present the results for individual pension reforms. Section 5 concludes.

2. Description of pension reforms

2a. Hungary

In Hungary the original pension system (mandatory and funded) that covered about half of the working population was replaced by PAYG in the 1950's. The system was gradually extended to cover the whole population, and the Social Security Act of 1975[6] consolidated all previous changes. The Act remained unchanged until 1993 when the first reform came into force, and since then it has been changed on five different occasions. The 1993 reform[7] postponed the eligibility age for women gradually from 55 to 60 and changed the calculation of the entry pension benefit. Before the reform the calculation of the entry benefit was based on average net monthly earnings during 4 years with the highest earnings in the period of 5 years before retirement. After the reform the entry benefit was calculated from average net monthly earnings from 1988 until the year of retirement. The benefit was then set as a certain fraction of the average earnings, referred to as pension scale factor.

Next reform, adopted in 1997[8], postponed the eligibility age for men and women gradually to 62. However, it shifted the eligibility age back by 1 year for females born between 1942-1944. The contribution rate paid by employers to the pension system was reduced from 24.5% to 24%. At the same time the pension scale factor was increased by 1.5% - 8% according to the number of years worked during the life time.

A fundamental reform of the social security system was passed in 1998, when the mandatory PAYG scheme was split into two pillars.[10] The first pillar remained public PAYG and the second pillar was privately funded. The workers already employed had a choice either to switch from public to a mixed system or to stay further only in the public system, and more than 50% of eligible workers did switch[11]. Mixed system contains public PAYG and private funded schemes, where the benefit from the PAYG pillar is equal to 75% of the benefit that the worker would have received had he stayed only in the PAYG pillar, and an additional benefit is provided from privately funded pillar. For new entrants to the labor market participation in the mixed system was compulsory.

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[6] Law No. 1975 II

[7] Law No. 1993 VIII

[8] Law No. 1996 LIX and 1996 LXXXVII

[10] Law No. 1997 LXXX deals with contributions, Law No. 1997 LXXXI regulates the Social Security Pension Scheme (public PAYG, 1st pillar), Law No. 1997 LXXXII establishes the legal framework for the Mandatory Private Pension Funds (2nd pillar)

[11] Augusztinovics et al (2002).

New legislation required employers to reduce contribution to the pension system from 24% to 23% of gross wages by 1999 and to 22% by 2000. At the same time employees' contribution were increased from 6% to 7% by 1998, 8% by 1999 and 9% by 2000. From this percentage employees in the mixed system had to pay 1% to the PAYG pillar and the rest of their contribution went to the privately funded pillar. The pension scale will not change until 2013. After 2013 the formula for computing benefits will switch from the net to the gross principle, meaning that the benefit will then be set as a fraction of average gross earnings instead of net earnings, but the benefits will become taxable. However, the necessary adjustments in the tax and contribution rates are not outlined in the act, which is why it is a rather ambiguous provision (Augusztinovics et al (2002)) and creates addition uncertainty over whether the taxation of benefits would indeed be legislated and what the income tax rates will be after 2013.

Consider the following illustrative comparison of two employees in the public PAYG. One of them retires after 42 years of work in year 2012 at age 62 and his entry pension benefit is calculated as 83% of the net income base. The other retires also after 42 years of work at age 62 but in 2013. His entry pension benefit is calculated as 69.3% from the average monthly gross earnings. This amount is approximately 20% higher than the amount that the first retiree will receive. As the reform was planned, it was accepted that after 2013 the benefits would be subject to income taxation which should erase the 20% difference, but such a provision has not been incorporated into law so far. According to the legislation that is currently on the books, the benefits will not be taxable, and we do not subtract any income tax when we compute the benefits after 2012.

In 2013 the first members of mixed system will have reached the eligibility age and their pension scale factor from the PAYG pillar will be 75% of the pure PAYG pensioners' scale factor.

The indexation rule was changed gradually from the net wage indexation with 1 year lag to the Swiss indexation – initially the indexation rate was constructed of as a weighted average of annually projected CPI (30%) and net wage index (70%), and from 2001 it was to change to 50% CPI and 50% net wage index. Pensioners in the mixed system will pay contributions to the pension funds which invest collected amounts into various financial instruments and

from the retirement age they pay their members annuities which will also be indexed by Swiss indexation.

Mere one year after this radical reform, the new government, that had not supported the private pension system, made minor adjustments that scaled down the importance of the private pillar.[12] It cancelled the increase in employees' contribution to the private funded system from 6% to 7% as had been promised by the previous legislation. Workers in the mixed system had to pay additional 1% to the public system. These changes lead to higher benefits for members of the pure public system than what was intended by the reformers. New legislation required employers to reduce the contribution from 23% to 22% of gross wages by 1999 and to 21% by 2000.

Last reform covered in this paper occurred in 2003[13]. This legislation required that employees' contribution would increase from 8% to 8.5% and contributions to the public system would decrease to 1.5% for the workers in the mixed system. On the other hand contribution rate to the private funded system was increased from 6% to 7%. The major change brought by this reform was a gradual introduction of an additional monthly benefit within the PAYG pillar. Pensioners received additional 25% of monthly benefit in 2003, additional 50% of monthly benefit in 2004, additional 75% in 2005, and finally from 2006 they effectively receive their benefits 13 times per year. The government decided about this additional monthly pension benefit as a compensation for the reduction of benefits during the previous government.

2b. Czech Republic

The Czech pension system is a very traditional pay-as-you-go, defined benefit system. The 1996 reform which we analyze in this paper changed most of its parameters, but the basic structure inherited from the communist regime remained intact. The coverage has always been virtually complete for workers, self-employed, and most other labor income earners. The contribution rate was 6.50% (paid by employees) plus 19.5% (paid by employers) both before and after the reform.

[12] Law No. 1998 LXVII
[13] Law No. 2003 IV

The system has been redistributive not only across cohorts but also within cohorts – the benefit is increasing in past earnings but less than proportionately. This is so for two reasons: One, the benefit consists of two components. The flat component (CZK 680 before the reform) is the same for all retirees and the variable component is a function of the earnings history. Second, the formula translating past earnings into the variable component of the benefit is regressive. Before the reform, only earnings from 5 years with the highest earnings during the 10 years prior to retirement counted into the calculation of benefits. The average monthly earnings from these years were used to calculate the so-called income base. If the average monthly earnings were below CZK 2,500, the income base was simply equal to the average monthly earnings. An additional CZK of earnings up to CZK 6,000 would increase the income base by CZK 1/3, earnings above that would increase the income base by CZK 1/10, and there was a threshold of CZK 10,000 beyond which additional earnings did not contribute to the income base. Effectively this threshold put a cap on the benefits that anyone could receive. Finally, the monthly benefit was computed as 1/2 of the income base plus 1 percent of the income base for each year of employment exceeding 25 years. For those who retired after the eligibility age, the benefit was increased by additional 4 percent of the income base for each year of employment beyond the eligibility age.[14]

The eligibility age was 60 for men; for women, it depended on the number of children – a peculiar feature of the Czech pension system that survives till today. The eligibility age was 57 for childless women, 56 for women with one child, 55 for women with two children, 54 (three or four children) or 53 (five and more children).

Relatively high inflation during the early 1990's exposed the major drawback of the pre-1996 system – lack of any built-in adjustments to inflation. Once granted, the benefits were fixed and the legislation did not provide any explicit rule for their indexation. This probably was not too much of a concern in the centrally planned economy of the 1980's when inflation was virtually non-existent, but turned out very problematic in the first half of the 1990's when inflation exceeded 9% every year and was as high as 50% in 1991. Real value of benefits

[14] Hence, the benefit formula was $B=B_0+0.5*I+0.01*(max\{y-25,0\}+0.04*max\{y-R,0\})*I$, where B is the benefit, B_0 is the fixed component of the benefit, I is the income base, y is the number of years of insurance, and R is the eligibility age.

granted in the past declined. Benefits that were granted to new retirees had also much lower real value because the past wages that entered into the computation of the benefit were not revalued to current levels, and because a higher number of retirees moved into higher income brackets. [15]

The government responded to these shocks by passing ad-hoc increases in benefits. However, it was apparent that a comprehensive overhaul of the system was needed. The new Social Security Act was passed in 1995[16] and the reformed system came into force on January 1, 1996. Among other things, the new system created a stronger link between the worker's lifetime earnings and benefits, introduced automatic inflation adjustments, increased the eligibility age, and allowed early retirement.

The new benefit formula computes the average monthly earnings from the 30 years of employment preceding retirement, or years since 1986, whichever is shorter. The regressive function used to compute the income base is similar except that there is no longer a cap on the maximum possible benefit. The variable component of the benefit is now 1.5% of the income base times the total number of years of insurance.[17] As before, the benefit is increased by 4% of the income base for each year of work beyond the eligibility age.[18]

Importantly, the new law laid out stable rules for adjusting the relevant parameters to inflation. It prescribed a minimum level of indexations of benefits but gave the government discretion to increase benefits more generously. Specifically, benefits had to be increased each time when the increase in the consumer price index accumulated since the last increase exceeded 5%; the increase in benefits had to equal at least 70% of the increase in the consumer price index, and at least once every two years the increase in benefits also had to include at least 33% of the growth in real wages. The past earnings used to compute the average earnings and the income brackets were to be indexed to current levels by the wage index.

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[15] In 1989 the average wage in the civilian sector (including the smallest firms) was 3,170 CZK so the average worker was in the second bracket. In 1995, the last year of the pre-reform legislation, it was CZK 8,172 and therefore the average worker was in the third bracket.

[16] Law No. 155/1995.

[17] The years of insurance encompass not only years of employment but also, for example, maternity leave or unemployment up to 3 years.

[18] Hence the benefit formula after the reform is $B = B_0 + (0.015 * y + 0.04 * max\{y-R,0\}) * I$.

The 1996 reform set in a gradual increase in eligibility age such that it would reach 62 for men and 59 for women with 2 children by 2007. Higher eligibility age was somewhat neutralized by several options for early retirement – for example, workers who were unemployed for more than half a year could retire 2 years before reaching the standard eligibility age, and their pension was somewhat reduced.

The last feature of the 1996 reform relevant to our computations was its safeguard against making some new retirees explicitly worse off. The entry benefit had to be compared with the benefit that the retiree would have been entitled to under the pre-1996 legislation, and if the latter was higher she would still receive the "old" entry benefit. As the income brackets and wages were indexed for inflation under the new formula but not the old one, this provision was applicable to fewer and fewer people over time until being explicitly abandoned in 2005.

3. Methodology and data

3a. Social security wealth

We document political risk by measuring changes in social security wealth as a result of a reform. Social security wealth is a difference between discounted value of future taxes and benefits promised to workers under the current law. Social security wealth for each cohort *(a)* at the time of reform *(T)* is calculated according to the following formula:

$$SSW(a,T) = -\sum_{t=T}^{R-1}\left[\mathrm{w}_{\mathrm{a,t}} \frac{EmployeeTax+EmployerTax}{(1+f)^{t-T}} \prod_{k=T}^{t}(1-d_{a,k}) \right] + \sum_{t=R}^{a+100}\left[\frac{B(a,R)}{(1+f)^{t-T}} \prod_{k=R+1}^{t}(1+i_k) \prod_{k=T}^{t}(1-d_{a,k}) \right]$$

where *a* is a year of birth or cohort, *T* is a year of the reform, *R* is a year of retirement, *t* is a current year, *B* is a value of the initial pension, *f* is a discount rate, *w* is a gross nominal wage, *d* is the mortality rate and *i* is an indexation rate. This method contains three basic steps. First, the discounted value of future contributions is calculated from a projected path of wages and current tax legislation. Note that they include contributions paid by both the employee and the employer. Second, the entry pension benefit is computed according to the formula prescribed in the current legislation. Third, the discounted value of future benefits is

computed using the current rules on the indexation of benefits and some projected path of variables that affect the indexations.

We compute the change in social security wealth implied by each pension reform for all cohorts that were either working as of time of the reform or were born but not yet working. We carry out separate analysis for males and females. We study how the reforms affected the average worker and, in order to see whether the reforms had a differential impact on different income groups, average workers in 4 educational categories: elementary education, lower secondary (apprenticeship), upper secondary (high-school with a school-leaving exam), and college/university.

3b. Wage profiles

Computing the social security wealth requires a number of "micro" and "macro" assumptions. Our "average" workers start working at age 20, work without interruption until the standard retirement age[19], and at each age they are earning the wage that is predicted by the earnings profile specific for their gender, educational category, and calendar year. The wage profiles are estimated from individual level cross-sectional datasets described below and they have the standard form

$$\log w_{ijt} = \alpha_{jt} + \beta_{1jt} a_{ijt} + \beta_{2jt} a_{ijt}^2 + u_{ijt}$$

where w is the monthly wage, subscript i denotes an individual, j denotes the worker's gender and educational category[20], t denotes year, a is the worker's age, and α, β_1 and β_2 are parameters that we estimate. The profiles were estimated on the sample of workers aged between 20 and the standard retirement age who worked at least 6 months in a given year.

[19] Workers with college education in the Czech Republic start working at age 22. The assumption on the time of retirement is probably the most problematic in the sense of missing an important distributional aspect of the reforms. Social security wealth clearly depends on whether a particular worker exercises the early retirement option or continues working till the standard retirement age. However, modeling the individual decision to retire is beyond the scope of this paper.

[20] To obtain the wage profile for the average workers, we run the regression on a sample of all men and women.

The regression estimates and the corresponding wage profiles are not reported here but are available upon request.

We constructed the wage profiles from the following data sources: For Hungary, we used the Harmonized Hungarian Wage Survey of the Public Employment Service[21]. This dataset collected in 1986, 1989 and annually since 1992 to 2003 contains data of 100 000 to 200 000 employees depending on year.

Records contain information about randomly selected workers of the branch, the company (or budget institution), the industry and the geographical environment of the branch. For each worker it reports the basic information such as the age, gender or highest qualification (five and nine grade qualification code). It contains also detailed information on employment status and income such as gross, net and real monthly wage, number of normal working hours a week, number of employees of the company.

For the Czech Republic, we used the Czech Microcensus, a representative household survey conducted once every 4 or 6 years by the Czech Statistical Office. The surveys that we use were collected in 1992, 1996, and 2002[22] and they cover approximately 44,000, 64,000 and 19,000 individuals in the respective years. For each household member they report the basic information such as the age, gender or education, and relatively detailed information on income and employment status (whether the person is employed, self-employed, or non-employed, the number of months of employments, and the annual gross earnings from each source of employment). We compute their before-tax monthly earnings simply by dividing the annual gross earnings by the number of months of full-time employment.

Since in the case of both countries the micro samples allow estimating the wage profiles only for some years[23], while we need to have profile for all years since 1988 (Hungary) or 1986

[21] The Wage Survey is a property of the Hungarian Public Employment Service. Part of the research was carried out while one of the authors was visiting the Institute of Economics, Hungarian Academy of Sciences.

[22] Unfortunately, the 1988 microcensus was not usable for our purpose, since all observations are recorded at a household level but not individual level. Even though it does report the earnings of the head of household and his spouse, it does not allow identifying the gender of workers who live in households other than the traditional families of married couples.

[23] The Hungarian Wage Survey is not available for 1987-1988, 1990-1991 and 2004+. Moreover, the surveys from 1993, 1998-1999 and 2002 appeared to contain data problems since the estimates of the wage

(Czech Republic), we impute the profiles for the remaining years. We assume that the coefficients on the age and age squared are the same as in the nearest adjacent year for which the profile was estimated[24]. Then we adjust the intercept α such that the average fitted wage in the sample is equal to the actual average wage in the year for which the wage profile is being imputed.[25]

3c. "Macro" assumptions

To compute the expected present value of a future stream of taxes and benefits, we need to make additional assumption about the future. The length of life is probabilistic, and the future taxes and benefits are discounted by the survival probability. We had survival probability tables for both countries, separately by men and women (but unfortunately without a finer breakdown by education categories) until 2004. For years 2005 and onwards, we assume that the survival probabilities are the same as in 2004.[26]

We assume that as of the time of the reform people had perfect foresight about the evolution of all economic variables that affect future taxes and benefits (aggregate and individual wage growth, inflation, survival probabilities). That is, taxes and benefits in years up to 2005, as expected as of time of the reform, are computed from the wages and inflation rates as they

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profiles in these years produced estimates that were substantially different from the estimates for adjacent years and, more importantly, were economically implausible. As states above, the Czech Microcensus was available for 1992, 1996, and 2002.

[24] For example, the coefficients on age and age squared estimated from the Czech 2002 Microcensus were used to generate wage profiles for 2000-2004.

[25] The average wages of employees by gender and education level were taken from the Czech Statistical Office publications "Průměrné hrubé měsíční mzdy v letech 1996 - 2004 v třídění podle vzdělání a pohlaví zaměstnanců", "Mzdová diferenciace v čs.národním hospodářství - zhodnocení vybraných aspektů odměňování na základě jednorázového šetření o mzdách pracovníků za červen 1984", and "Mzdy pracovníků za červen 1988 (z jednorázového výběrového šetření o mzdách za červen 1988) - I.díl", which altogether cover the year 1984, 1988, and 1996-2004. For the years 1985-87, and 1989-95, the average wages by education levels are not reported, only averages across all education levels. We imputed the average wages by education level by linearly extrapolating the ratios of the average wage in each education level to the overall average wage, and then multiplying this ratio with the overall average wage in each year for which the wages by education level were missing. For Hungary we computed the average wages from the Wage Survey and extrapolated them for the missing years.

[26] We acknowledge that our assumption leads to an underestimate of true survival probabilities since the life expectancies have been increasing in both Hungary and the Czech Republic since the 1990's and are expected to increase in the future. However, we were not able to obtain specific projections of future survival probabilities.

were actually realized up to 2005. For the years 2006 onwards, we assume a 3% growth rate of real wages for all education categories and genders, and a 2% inflation rate.[27]

In Hungary, the indexation of benefits in the future from the PAYG is according to Swiss indexation, i.e. 50% CPI + 50% net nominal wage growth. Annuities from the 2nd pillar are unisex also with Swiss indexation. Projected interest rate of contributions accumulated with pension funds is calculated as the weighted average of real net interest rate of all Hungarian pension funds during the period 1998-2005, which was 3.4%, plus the projected 2% inflation rate. This projected rate of return is linearly decreased to the level of projected 2% inflation for workers who are going to retire in 15 years or less. As workers approach the retirement age they may prefer a gradual switch to a complete risk-free portfolio as their risk aversion increases. Thus we assume that they will rebalance the portfolio each year such that the real rate of return will gradually decrease until it reaches zero at the age of retirement.

Computing future indexations of benefits in the Czech Republic required additional assumptions. The pre-1996 reform legislation did not prescribe any indexation of any variable, yet it is implausible to assume that the benefits or other underlying parameters would never be indexed. In fact, benefits were being indexed in an ad-hoc manner prior to the 1996 reform with a clear goal to prevent a significant reduction in the real value of benefits. Therefore we assume that once granted, benefits would have been indexed for inflation, and the income brackets in the benefit formula would be indexed for wage growth. Under these assumption, the replacement ratio[28] remains at a similar level (48-50%) as it was during the years just preceding the reform.[29] After the 1996 reform, the law prescribed minimum indexations, but the government frequently provided more generous increases. Therefore until 2005 we again assume perfect foresight and compute the benefits as they were actually indexed, and only after 2006 we index them conservatively by the minimum prescribed by the legislation.

[27] These are roughly the rates of wage growth and inflation currently experienced by both countries.

[28] The ratio of the benefit to the (gross) wage in the last year before retirement

[29] In addition, before 1995 the new benefits were computed according to the old formula but were increased immediately (by 32% in 1995) to make up for the inflation that accumulated since 1990. In our computation, we also increase the new benefits by this add-on, which is further being indexed by the inflation accumulated during the last 5 years before the benefit is granted.

4. Results

4a. Hungary: Reform 1993

The changes in the expected present value of taxes, benefits and the social security wealth due to the Hungarian 1993 reform are plotted in Figures H.1.-H.4.

For men there is no change in taxation. Figures H.1-H.2 on the other hand show that for women close to retirement age there is a large negative change in the discounted value of future contributions paid to the pension system. The reason is clearly the postponed retirement age. The contribution increased by 30%-50% and the increase was by construction the same for all education levels and differed only between cohorts and genders. Figures H.3.-H.4. plot the changes in the social security wealth, normalized as a ratio to the average annual earnings in the economy in the year of reform. The 1993 reform reduced the SSW by about 80% of the average annual earnings for most cohorts of women with primary education, and by about 200% of average annual earnings for women with university education. Therefore the negative impact of the reform was almost 2.5 times higher for women with university education than for women only with primary school.

The change in the computation of benefits affected negatively the workers close to retirement age and positively the younger ones, and it was relatively more favorable to workers with lower education. The former effect is due to the fact that as the new system based the computation of benefits on earnings from a longer time period, the very low wages in the early transition years became reflected in the computation of benefits for cohorts retiring in the second half of the 1990's. The latter effect is due to differences in wage profiles among educational categories. The pension was based only on earnings during the 5 years before retirement before the reform, and a much longer period after the reform. As the wage profiles for workers with university education are steeper, counting in more years implies that their pension is reduced by relatively lower wages they earned when they were young.

For women, the present value of benefits was generally positively affected by the change in the benefit formula and negatively by the postponed eligibility age. The sum of the two effects turns out to be positive for younger women with lower education level (as shown in Figure H.1.) and particularly negative for women with university degree (Figure H.2.).

4b. Hungary: Reform 1997

The changes in the expected present value of taxes, benefits and the social security wealth due to the Hungarian 1997 reform are plotted in Figures H.5.-H.6.

The reform was clearly beneficial for women in 1942-44 cohorts whose retirement age was reduced by one year. For the younger women, the increase in the pension scale factor and a reduction in contribution rates were not sufficient to compensate for the postponed retirement age, and their SSW fell by approximately 0.4 average annual wages (women with secondary education) and 0.8 average annual wages (women with university education).

For men[30] close to retirement age the 1997 brought a large increase in the present value of future taxes induced by the postponed of the retirement age. Similarly to women, this reform implied a small reduction in SSW for younger cohorts at all levels of education.

4c. Hungary: Reform 1998

The changes in the expected present value of taxes, benefits and the social security wealth due to the Hungarian 1998 reform are plotted in Figures H.7.-H.14. The future taxes and benefits naturally depend on whether a worker stayed in the PAYG system or switched to the mixed system; hence we report separate results for the stayers and the switchers.

The discounted value of future taxes for all working male and female cohort in the pure PAYG system and in all education level increased by 3.3% as a result of the gradual change in taxation. On the other hand discounted value of future benefits changed differently for different cohorts, education level and gender. Already retired men will receive gradually smaller benefits, because the indexation rule gradually decreased from nominal net wage growth with one year lag to the Swiss indexation. Cohorts 1938-1939 were particularly harmed by the reform as they were exactly before the eligibility age, which was postponed. That is the reason why they received even less benefits. Further cohorts 1942-1950 received

full pension benefits with Swiss indexation instead of the more generous indexation before the reform, which leads to a 11% reduction in the discounted value of future benefits which is the same in percentage terms for all education categories but of course much larger in absolute terms for workers with higher education (the same is true for the increase in the present value of taxes).

The main change in the benefit formula introduced in 1998 concerned cohorts 1950 and younger. For these cohorts there is a very large positive change in discounted value of future benefits in pure PAYG system. The reason is the following. Since the year 2013 the pension benefits will be set as a given fraction of gross earnings (specifically, 69.3% after 42 years worked) while currently they are set as a fraction of net earnings. As the gross salary is much higher than the net salary, this change in the benefit formula implies a substantial increase in benefits. At the extreme, the present value of benefits increased by 80% (!) for men with university education born in 1951. The increase in benefits for post-1950 cohorts is less dramatic for men and women with lower earnings since for them the gap between the gross and net salaries is smaller. (Compare Figures H.7. and H.9.) The overall change in benefits is actually smaller for women with primary and lower secondary education since they are being harmed more severely by other changes in the system's parameters, namely the less generous indexation of benefits which is lower than the projected wage growth

Comparing the outcomes of the reform between the workers who switched to the mixed system and those who stayed in the PAYG system reveals a surprising result. For the cohorts 1951 and younger, the change in benefits was more favorable to those who stayed in the PAYG than for those who decided to switch. This is clearly evident by comparing Figures H.9. and H.11. which plot the change is the present value of taxes and benefits for the group that supposedly has most to gain from switching to the private pillar, i.e., men with university education. The increase in benefits for participant in the mixed system is 50% for the oldest eligible cohort and is gradually greater for younger cohorts (up to 70% for the 1978 cohort). This is because the older cohorts contribute to the funded system for only 15 years, which is not enough to cover 25% benefit lost from the PAYG system. Each younger cohort contributes to the funded system for a longer working period, and receives higher total benefit. However, the increase in PAYG benefits stipulated by the 1998 legislation was so

[30] Results are available upon request.

generous that even men with university education turn out to be better off by staying in the PAYG system – the reform increased the social security wealth of men born in the 1950's by 3.5 to 4.3 annual average earnings if they stayed in the PAYG system, but only by 2.3 to 2.5 average annual earnings if they switched to the mixed system.

The differential impact of the reform on the switchers and stayers is similar, although less pronounced in magnitude, for other types of workers. Figures H.13. and H.14. allow the comparison of the change in the present value of taxes and benefits for women with lower secondary education. Compared to the benefits promised by the pre-1998 legislation, the present value of benefits actually fell for most cohort of women who switched to the mixed system (by 17.4% percent for the 1951, and the change in benefits is positive for the 1977 cohorts and younger). On the other hand, the change in benefits for women with lower secondary education who stayed in the PAYG system is negligible, and taxes changed in the same way for both groups.

4d. Hungary: Reform 1999

The changes in the expected present value of taxes and benefits due to the Hungarian 1999 reform are plotted in Figures H.15.-H.16. for men worker with an average wage profile (the results are the same for all education levels).

The reform was intended to make the mixed system less attractive relative to the pure PAYG system, and the results clearly confirm this fact. All participants in both systems experienced a 3% reduction in the present value of taxes due to a lower employer's contribution rate. However, members of mixed system have to pay higher contribution to the PAYG pillar and lower contribution to the funded pillar, which leads to lower savings in the pension funds. Since the funds provide a higher return on contribution than the PAYG, the benefits were reduced. The differential impact of the 1999 reform on the participants in the pure PAYG and mixed system is clearly demonstrated in Figures H.15.-H.16. which plots the percentage change in the present value of contributions and benefits for men with average earnings.[31] The reduction in benefits for participants in the mixed system was relatively smaller for the

[31] The results are qualitatively similar for all education categories as well as men and women. In fact, the percentage change in the present value of taxes is the same for all educational categories.

cohorts born in the early 1950's (2.5%) than for younger cohorts (the average worker born in the late 1970's experienced a 5% reduction in benefits). The reason is that as younger cohorts accumulate savings in pension funds for a longer time, the gap between the benefit from the funded pillar and the benefit from the PAYG pillar, for a constant annual contribution, is greatest for younger workers .

4e. Hungary: Reform 2003

The changes in the expected present value of taxes, benefits and the social security wealth due to the Hungarian 2003 reform are plotted in Figures H.17.-H.20.

The new government tried to compensate the cuts in benefits to participants in the mixed system, implemented in the 1999 reform, by re-shifting the contributions from the PAYG pillar to the private pillar, but it also gradually introduced the 13^{th} pension benefit in the PAYG pillar.

As a result, the present value of contributions increased slightly by 2% for all workers. On the other hand men cohorts 1933-1943 and women cohorts 1938-1945 gradually utilized the additional monthly benefit. Younger cohorts in the PAYG system who fully utilized the 13^{th} monthly benefit received an 8.3% increase in present value of benefit. This percentage change is the same for all education levels but of course workers with university degree received more in absolute amount received. The situation of members in the mixed system is even better. The younger cohorts, both men and women, received even higher pension benefits (almost a 10% increase), because their contribution rate to the funded system was increased (but the total taxation is the same for workers in the pure PAYG) for an example see Figure H.20. They have higher savings in pension funds which leads to the higher pension benefits from them. Here is also true that workers, both men and women, with higher education level (higher salary) receive higher additional pension benefit. However, the increase in contributions combined with the additional monthly benefit produced a negligible change in the social security wealth.

4f. Czech Republic: Reform 1996

The changes in the expected present value of taxes, benefits, and the social security wealth due to the Czech 1996 reform are plotted in Figures C.1.-C.7.

Figure C.1. shows the results for men with average earnings. The 1996 reform increased the present value of taxes for all cohorts since the tax rate did not change but the retirement age was postponed. The percentage increase is naturally most dramatic for the cohort close to retirement in 1996 since for them the reform implied a large percentage increase in the length of working life.

The present value of benefits declined for all cohorts except the 1936 cohort which was just about to retire, and declined most severely (by 21-24%) for the 1941-1942 cohorts. These cohorts were almost fully affected by the postponement of the eligibility age and at the same time the benefits they lost were not heavily discounted.

Since taxes rose and benefits fell, the SSW must have declined. This is illustrated in Figure C.2. which shows the level of the SSW before and after the reform and the change in SSW for each cohort, normalized as the ratio to the average annual gross wage in 1996 (the year of reform). If the system does not redistribute across cohorts in a life-time sense, the SSW should be zero for the average member of the cohort at the time when he starts working. The pre-reform system was too generous in this sense, as the SSW for the 1975 cohort was 2 annual wages above zero, while the reform reduced it to -0.4. Almost all cohorts lose from the reform and the differences in losses are not dramatic – for the older cohorts, they exhibit a U-shaped pattern where the 1941 cohort loses most (2.5 annual wages). The losses are smaller for a few younger cohorts up to the 1947 cohort, which lost 1.4 annual wages, and then increase slightly for all subsequent cohorts. For those just born in 1995 the reform implied a decline in SSW on the order of 3 annual wages.

The patterns are identical for women with average wage, but the magnitudes are more pronounced (Figures C.3. and C.4.). The reform implied a greater percentage increase in taxes and a greater percentage reduction in benefits for women than for men in all cohorts, and overall most cohorts of women lost 2.5 to 4 annual average wages. The main reason is that the eligibility age increased by 4 years for women but only by 2 years for men after the full phase-in of the reform. On the other hand, women have much higher levels of SSW than men both before and after the reform – while for men it varied between 2 to 8 annual wages

across cohorts, for women the SSW was between 8 to 12 annual wages before the reform.[32] Since women experienced a larger reduction in SSW, a mitigation of the built-in redistribution of income from men to women was one of the major distributional consequences of the 1996 reform.

Our findings are surprising. After all, the current pension system, 10 years after the major reform, is apparently unsustainable.[33] However, our results indicate that if the 1996 reform is to blame for the glooming future pension deficits, it is not because of the way it treated the workers who choose to work until the standard eligibility age. For them, the increase in the eligibility age dominated over other factors and reduced the SSW across all cohorts. The impression that the pre-1996 system was cheap seems to be based on the naïve presumption that as the system had no official adjustments for inflation, the newly granted benefits as well as the indexed benefits would have been very low. As we already argued, the government was rather frequently indexing new and old benefits without being required to do so by any law. Such adjustments would undoubtedly continue in the absence of the reform, and we incorporated these hypothetical adjustments in our calculations. Once we do this, the new system does not appear to be more generous than the old system.

We also checked whether our main result is not driven by a rather conservative assumption on the indexations of benefits after 2005 would be set only at the minimum levels prescribed by the 1996 legislation. The minimum was rather scanty; benefits could increase by less than inflation and real wage growth would have to be taken into account once every two yeas[34] and in fact the actual increases were more generous. As a robustness check, we re-ran our computations with a more generous indexation rule, namely the one that was legislated in 2002 and which required that benefits are indexed annually at least for inflation plus 33% of real wage growth.[35] It turns out that this assumption had a negligible effect on the results – as Figure C.5. demonstrates, the reduction in SSW for women (for whom indexation rules are more important as they live longer) is smaller by 0.5 to 1 annual average wage.

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[32] The reasons are straightforward: women live longer, retire earlier, and also have lower earnings therefore they gain from the within-cohort redistribution built into the system.

[33] According to the study by the government commission on pension reform (Bezděk et al, 2006), the gap between the pension system's expenditures and revenues is projected to reach 4% of GDP by 2050.

[34] The fact that indexations are more generous every other year is responsible for the "chain saw" pattern of the change in benefits in Figures C.1. and C.3.

[35] Law No. 264/2002.

The 1996 reform had fairly equal impact across income levels. Figure C.6. shows the SSW for men with elementary education, and apparently the reduction in SSW is virtually the same as for men with average wages for all cohorts. For men with lower secondary and upper secondary education, the results are also almost identical[36], only the levels of SSW decline as one moves to higher income groups.[37] The only group for which the impact of the reform is different from the average is men with university education (Figure C.7.). Their SSW declined much less in absolute terms, by 1.2 to 2.2 annual average wages depending on the cohort; this is about 0.5 annual average wages less than in other education categories. For women, the reductions in SSW in all educational categories are almost the same as for the women with average earnings; again, only the levels of SSW are smaller for women with higher education.

To summarize, we found that the 1996 pension reform in the Czech Republic reduced the social security wealth across all income groups and cohorts, mainly by increasing the eligibility age. The negative impact was more pronounced for women – taking a simple average across cohorts, women's' and men's' SSW declined by 3.3 and 2.2 annual average earnings, respectively. Still, the pension system remains highly redistributive in favor of women after the reform. There were no substantial differences in the distributional impact of the reform across cohorts and income groups. The impact was more negative on the cohorts who had 4-6 years to retirement in 1996, and for the youngest cohorts. The negative impact of the reform was smallest for the men with university education; for other educational categories the reductions in SSW are similar to the gender average.

Interpreting our findings, one needs to bear in mind that the changes in SSW were computed for workers who retire at the standard eligibility age. However, the 1996 also made early retirement more generous, and a substantial fraction of the population did take up the early retirement option. By revealed preference argument, those retiring early must have preferred early retirement with lower pension to retiring at standard retirement age with higher pension,

[36] Detailed results for all educational categories are available upon request.

[37] For the 1975 cohort, the SSW according to the new legislation was 1.11 annual average wages for men with elementary education, 0.81 for men with lower secondary education, -0.81 for men with upper secondary education, and -5.15 for men with university education.

and therefore for those who did retire early the impact of the reform must have been less negative than what is shown in our results, and may have been even positive.

5. Conclusions

The purpose of this paper was to document and quantify the political risk of social security by computing changes in benefits, contributions, and the social security wealth induced by pension reforms in two transition countries, Hungary and Czech Republic. While both countries made similar adjustments to their pension systems in 1993 and 1996, respectively, their subsequent developments diverged as Hungary implemented some reform every three years on average.

Our findings confirm that the political risk is real and it can be substantial. We also show that the PAYG system exposes workers to both aggregate risk (when the reform changes the social security wealth for an average worker) and idiosyncratic risk (when the reform has a differential impact on different workers). For example, the 1993 Hungarian reform and the 1996 Czech reform were typical manifestation of the aggregate risk, cutting the social security wealth to most workers by amounts equal to several years of labor earnings. The idiosyncratic risk is clearly shown by the 1998 and 1999 Hungarian reform (and to a much smaller extent the Czech 1996 reform). Some of the reforms affected different cohorts and education groups in quite peculiar ways. For example, the 1997 Hungarian reform provided sizeable gains to women born in the early 1940's while simultaneously hurting everyone else.

The introduction of the two-pillar system in Hungary in 1998 reform sharply divided the workers into those born in 1950 and before (who, according to our findings, are clear losers from the reform) and those born in 1951 or later (who either lost less, or, in the case of workers with high earnings, received large gains). Such idiosyncratic treatment of different individuals is, in our view, impossible to justify on economic efficiency grounds, and we have doubts whether the idiosyncratic effects of the reforms were even anticipated by the policy makers. Additional uncertainty about the future level of benefits is being created by the fact that (at least in the Hungarian case) the reforms were frequent and therefore workers should expect that *some* reforms are very likely to happen again in the future and affect their social security wealth in either direction.

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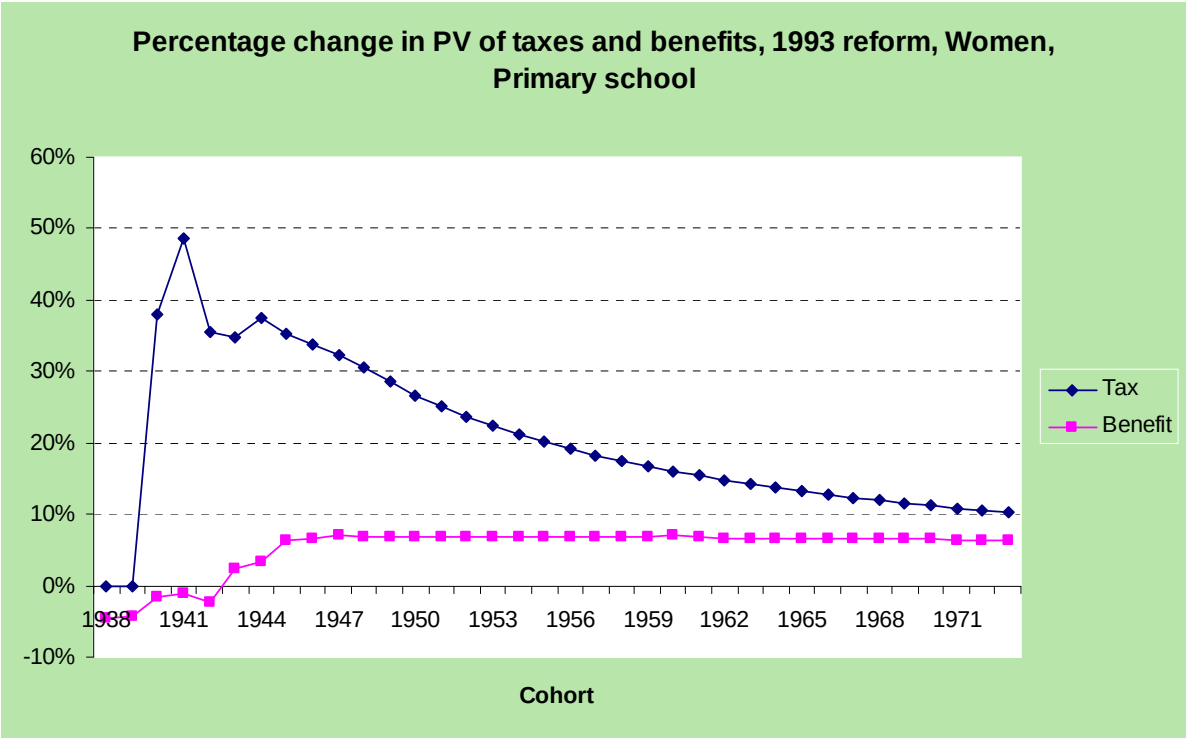
Figure H.1.



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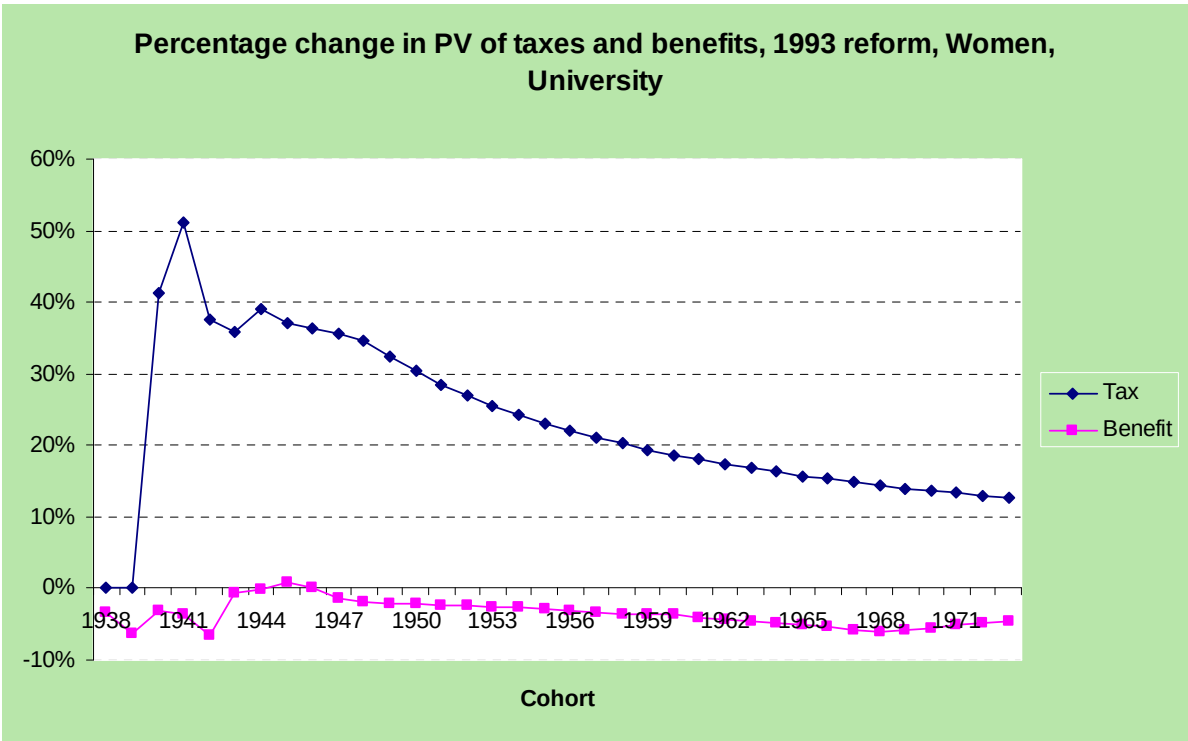

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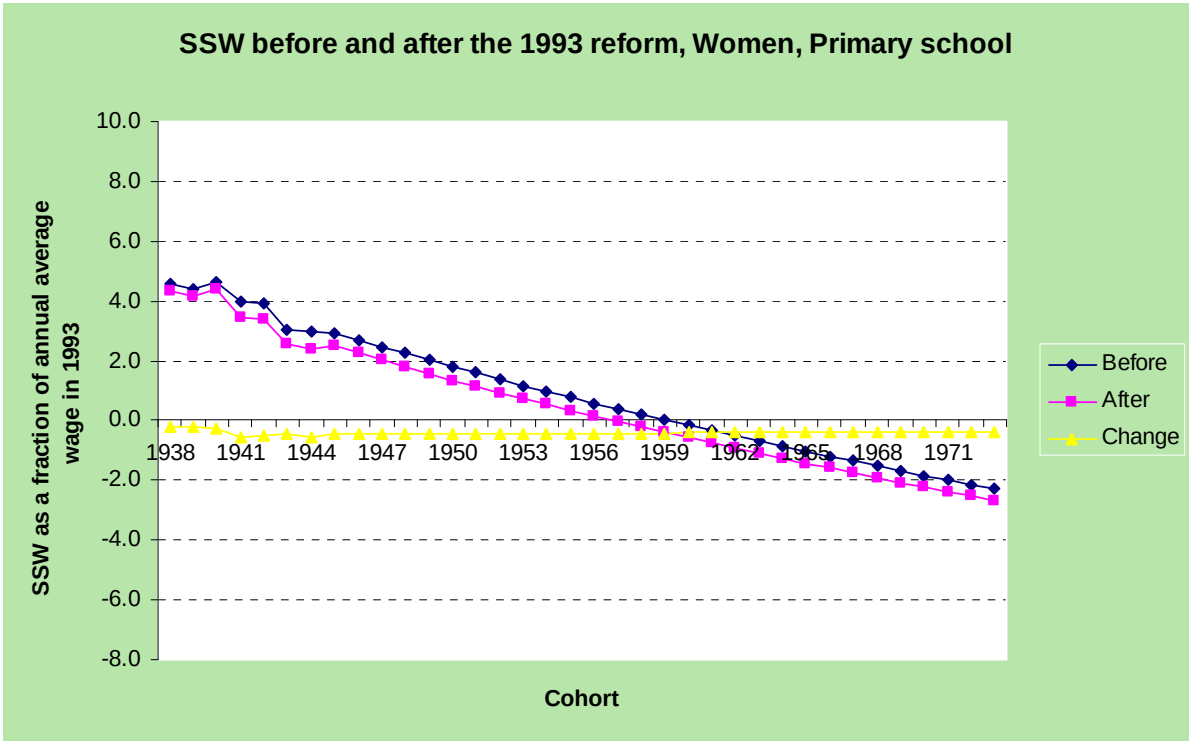

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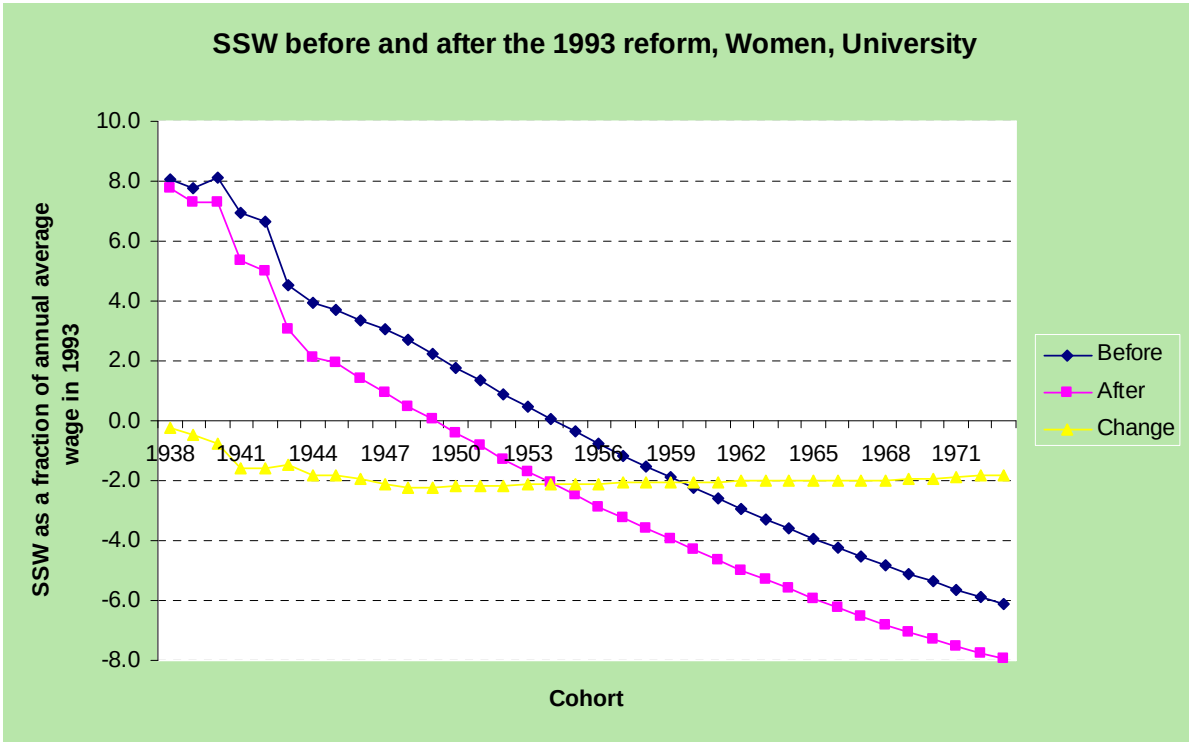

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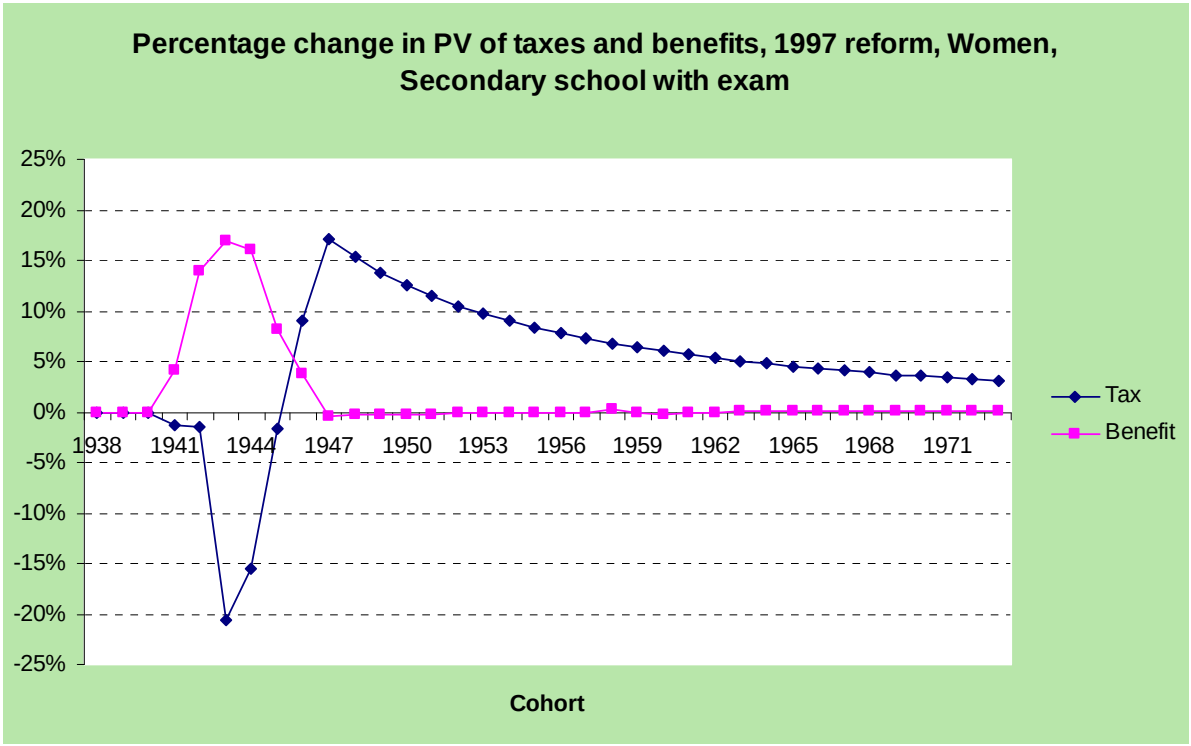

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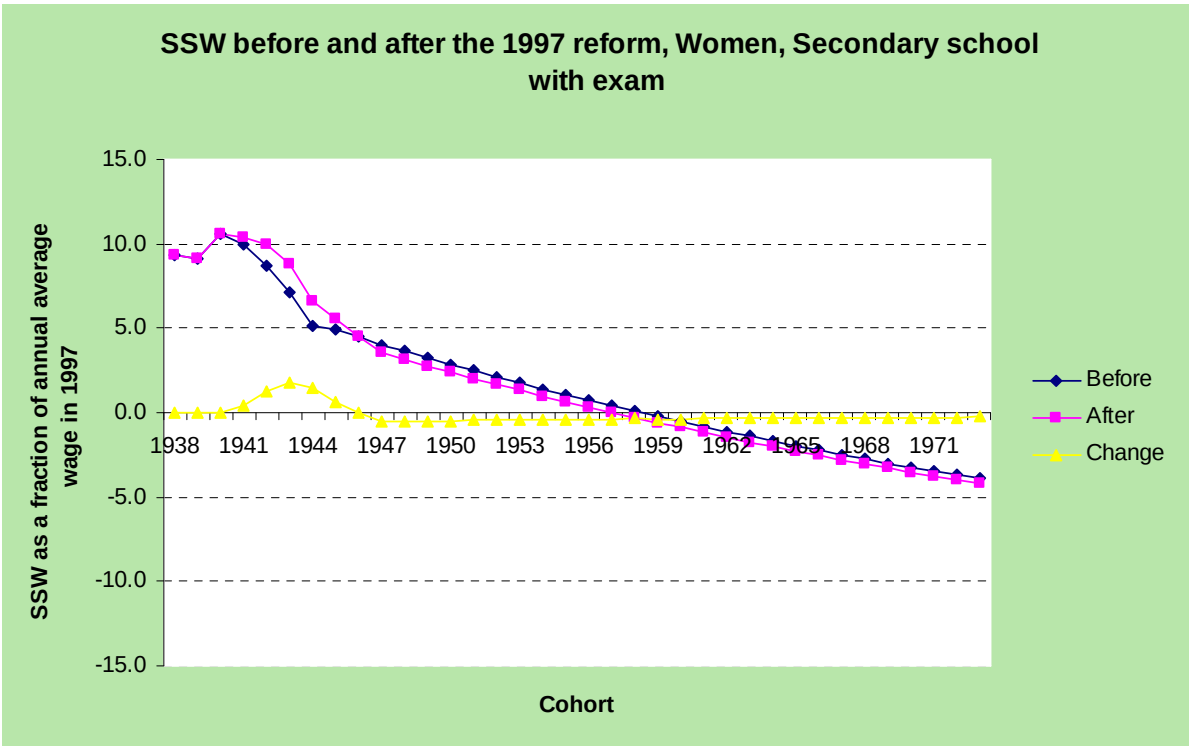

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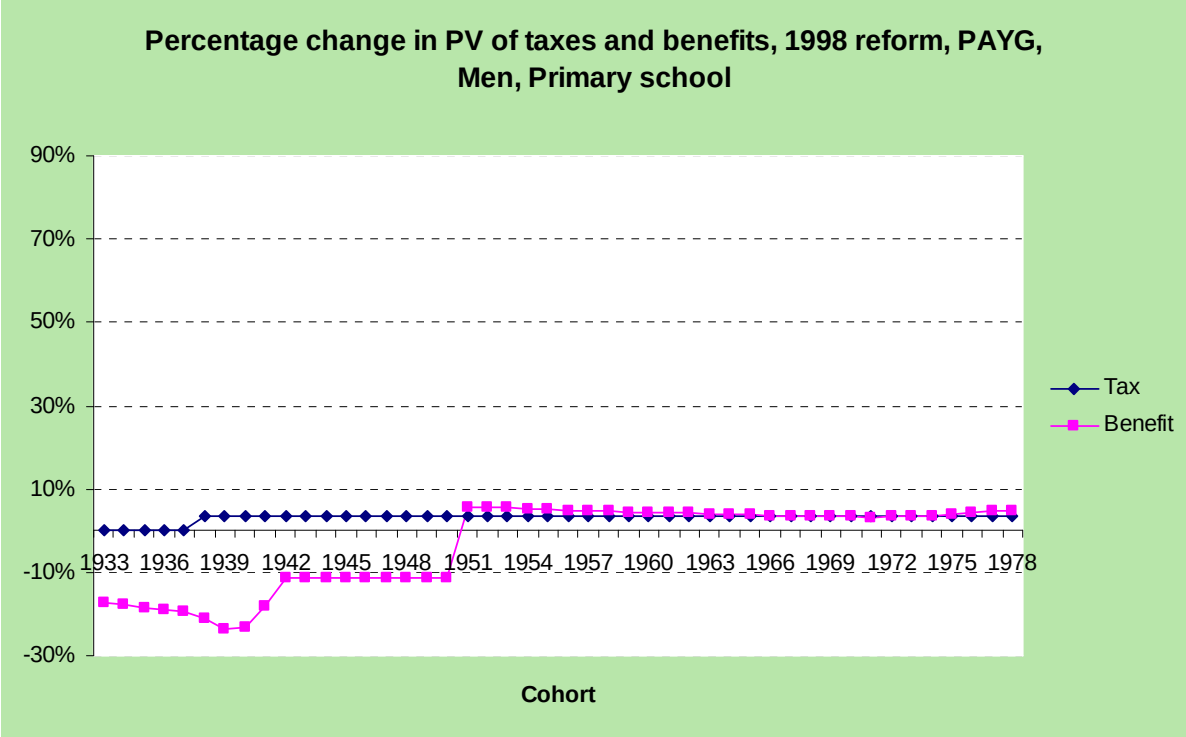

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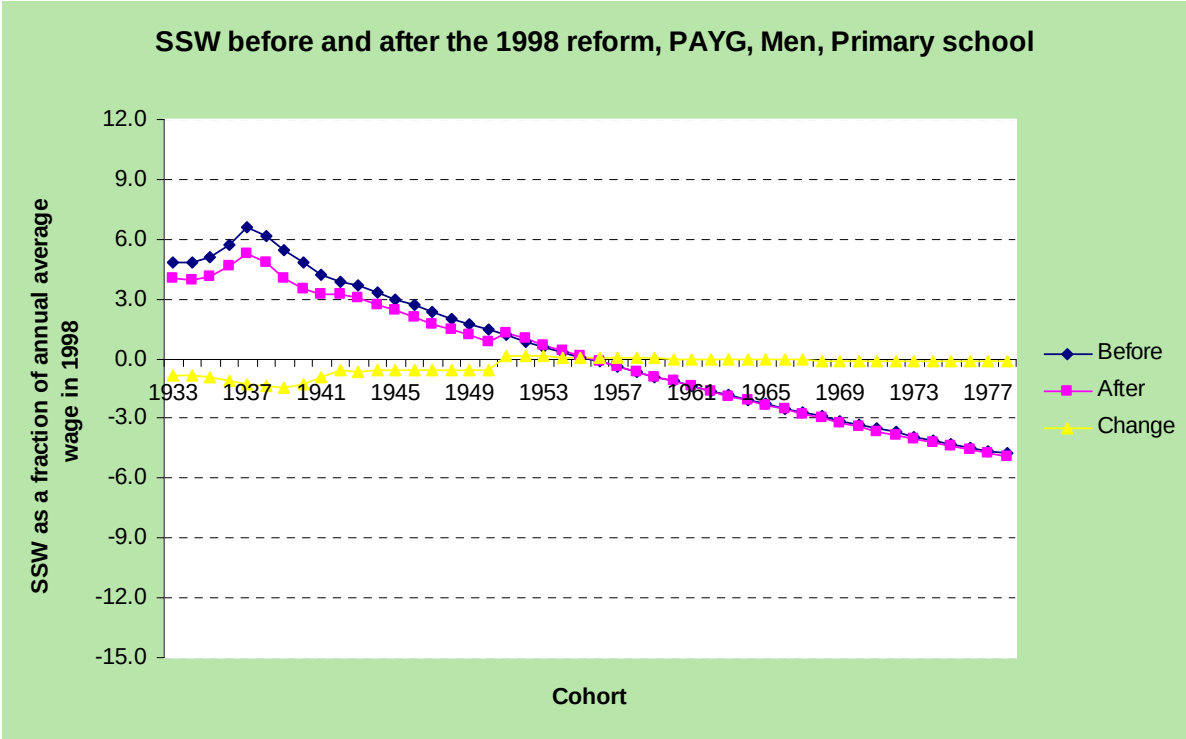

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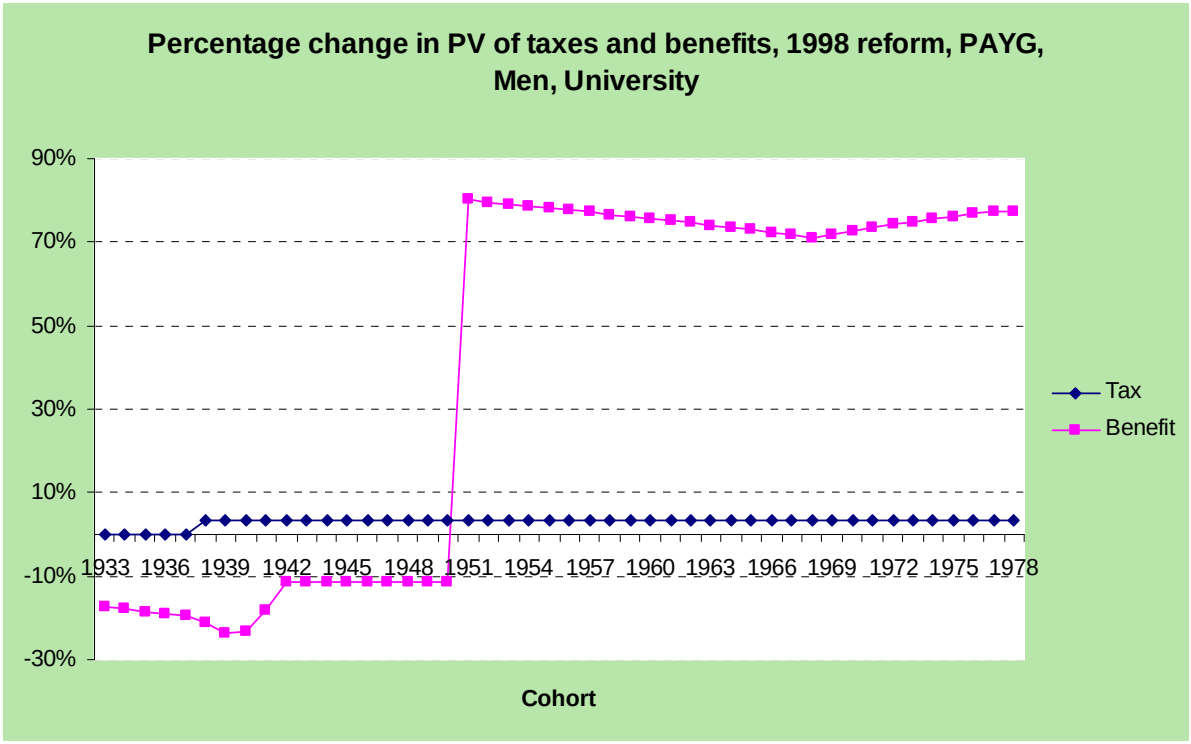

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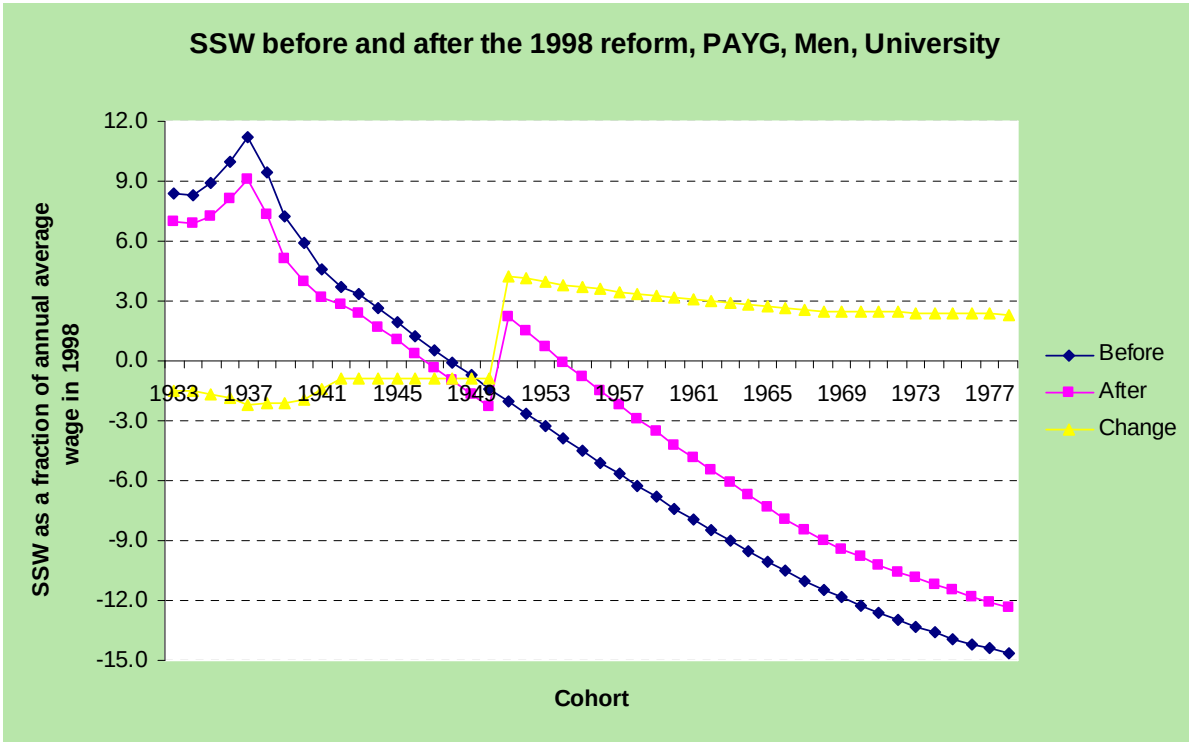

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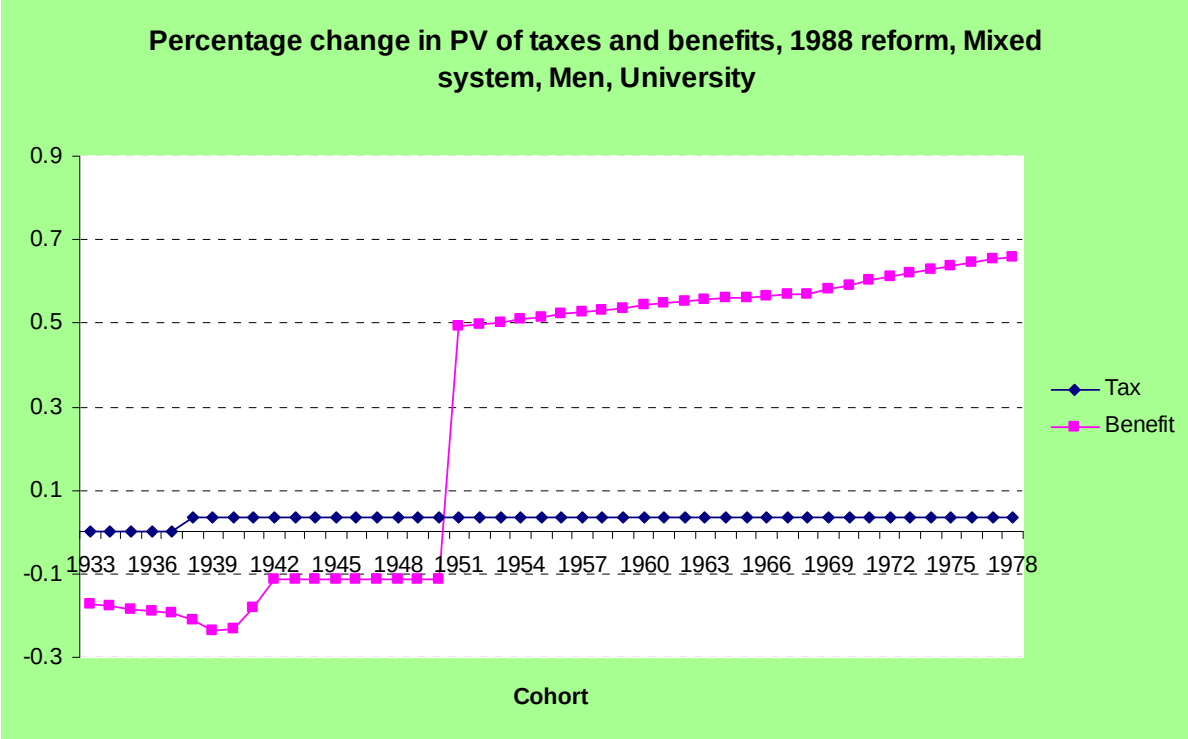

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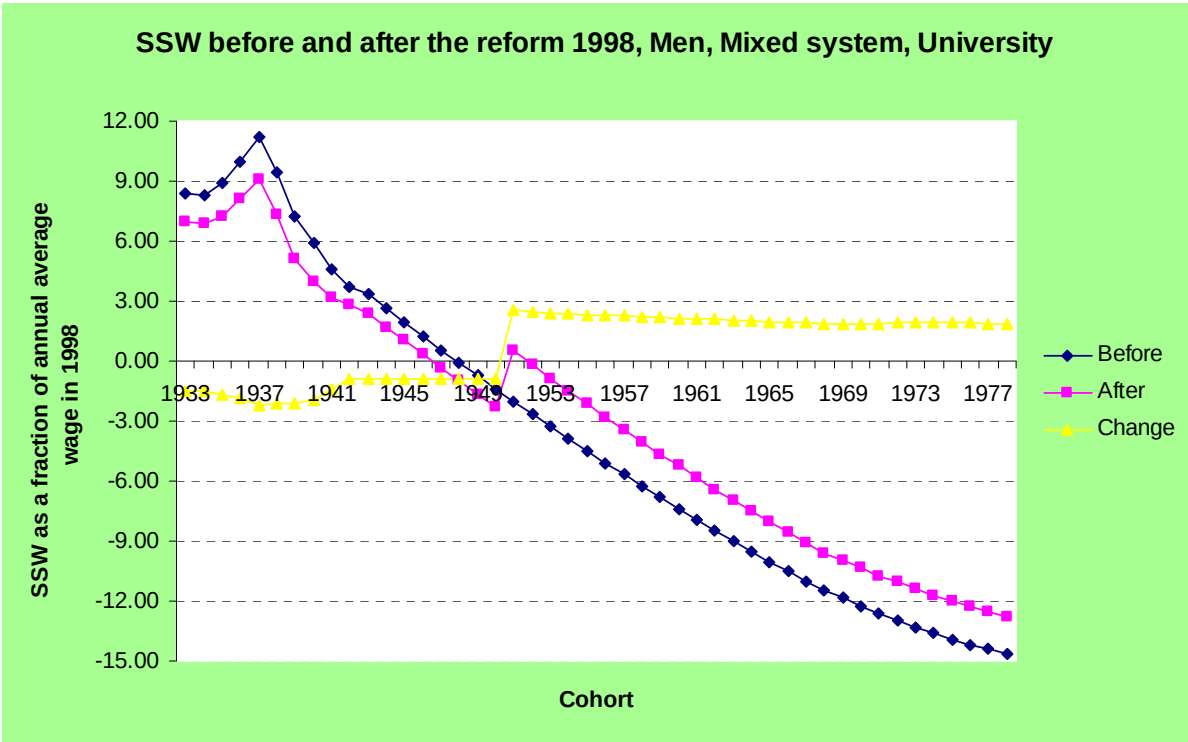

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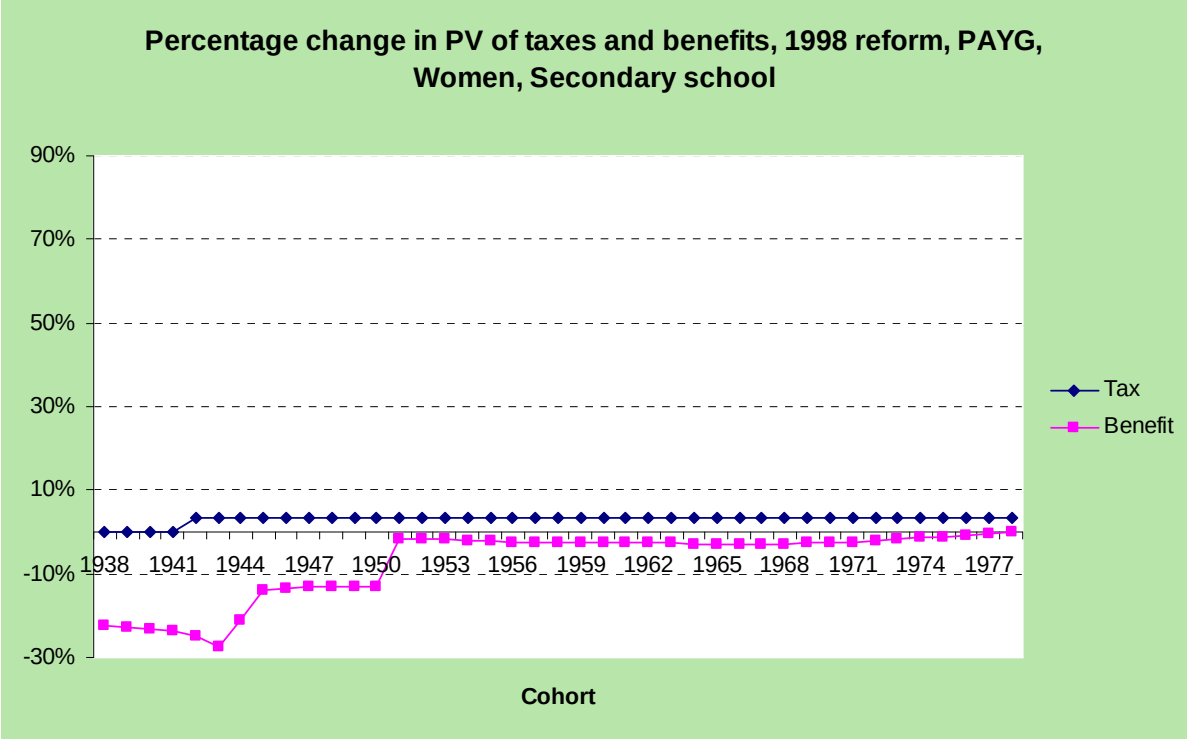

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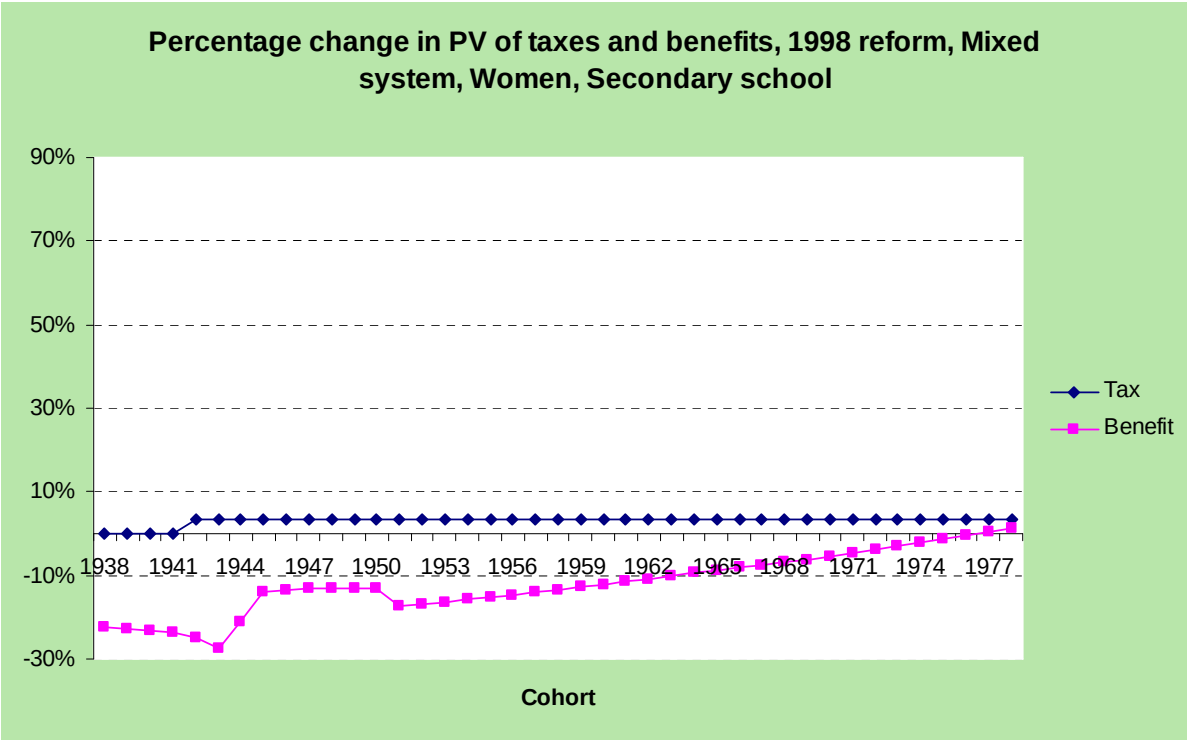

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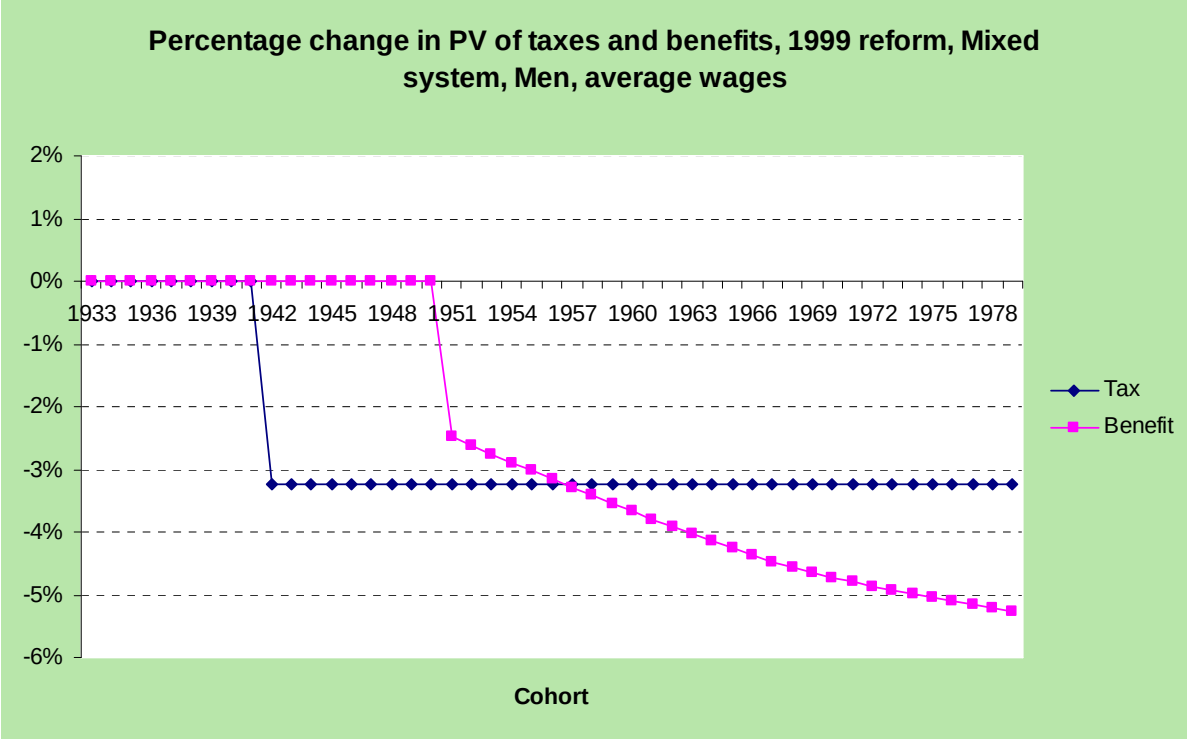

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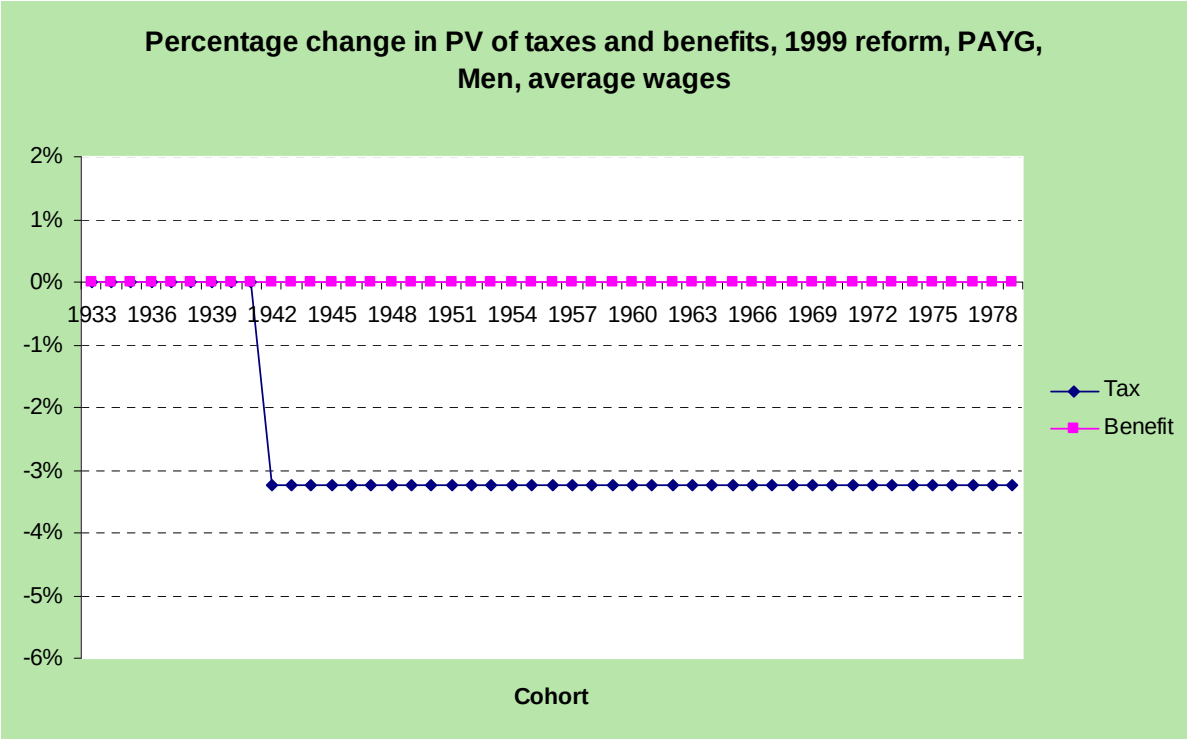

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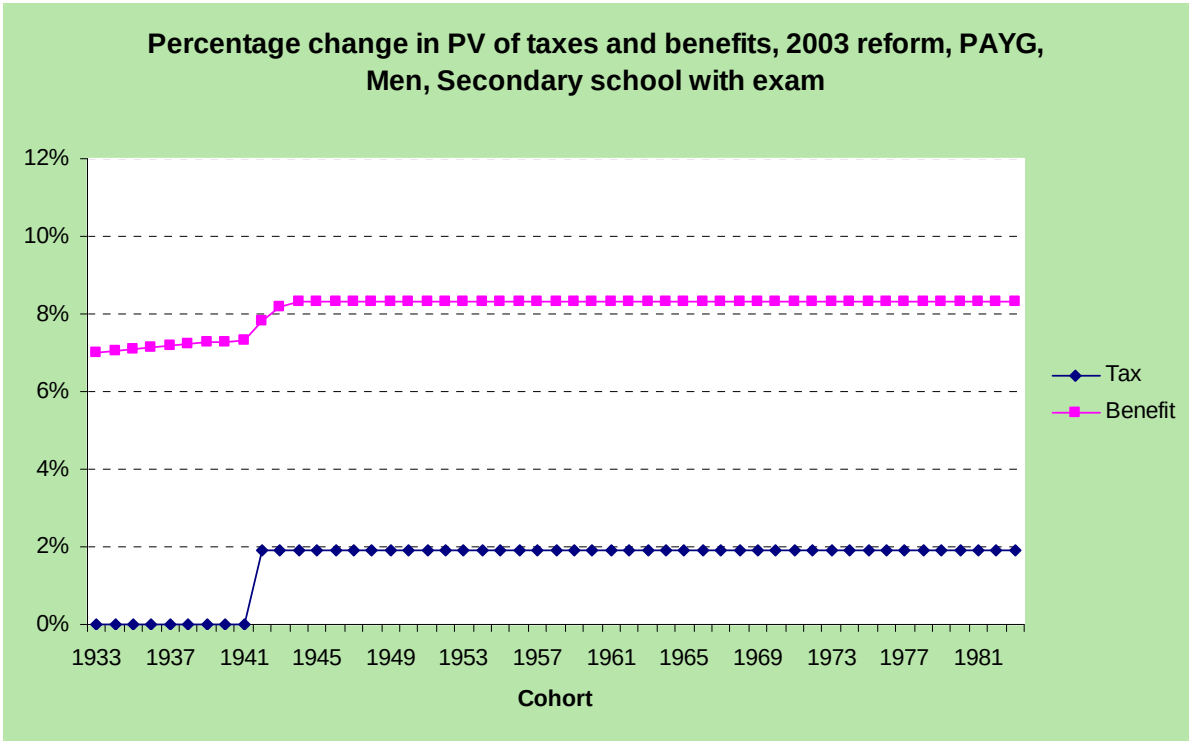

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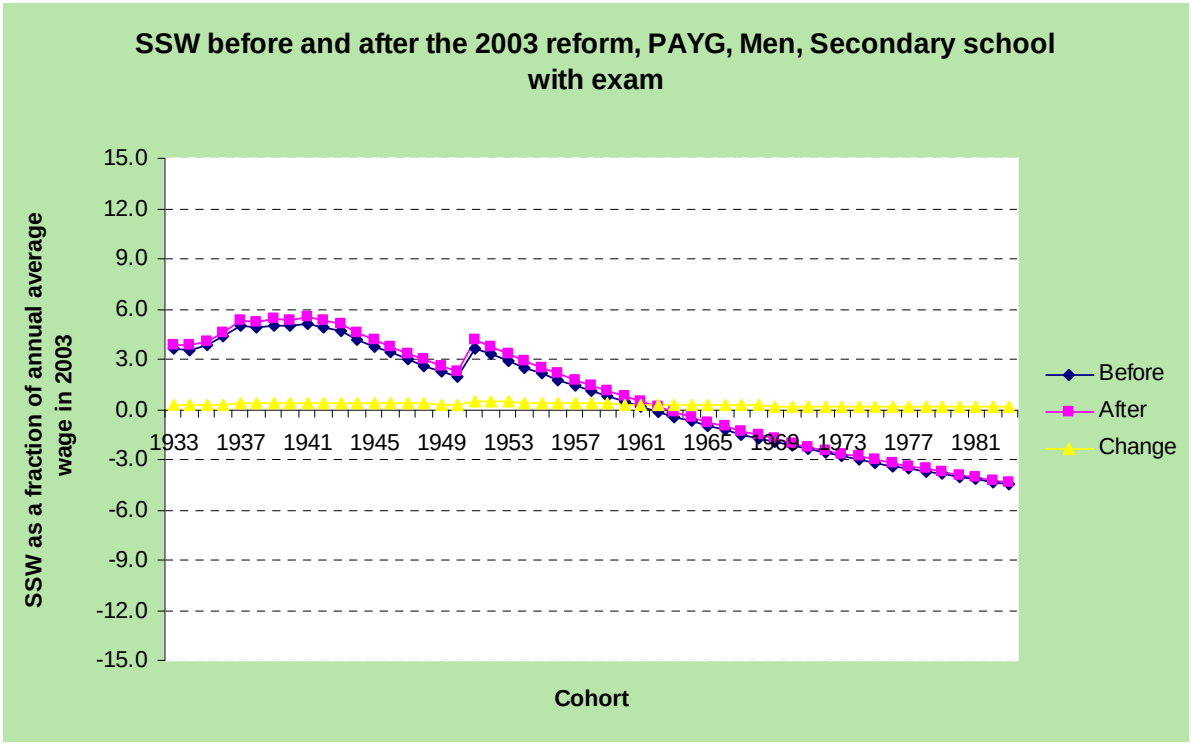

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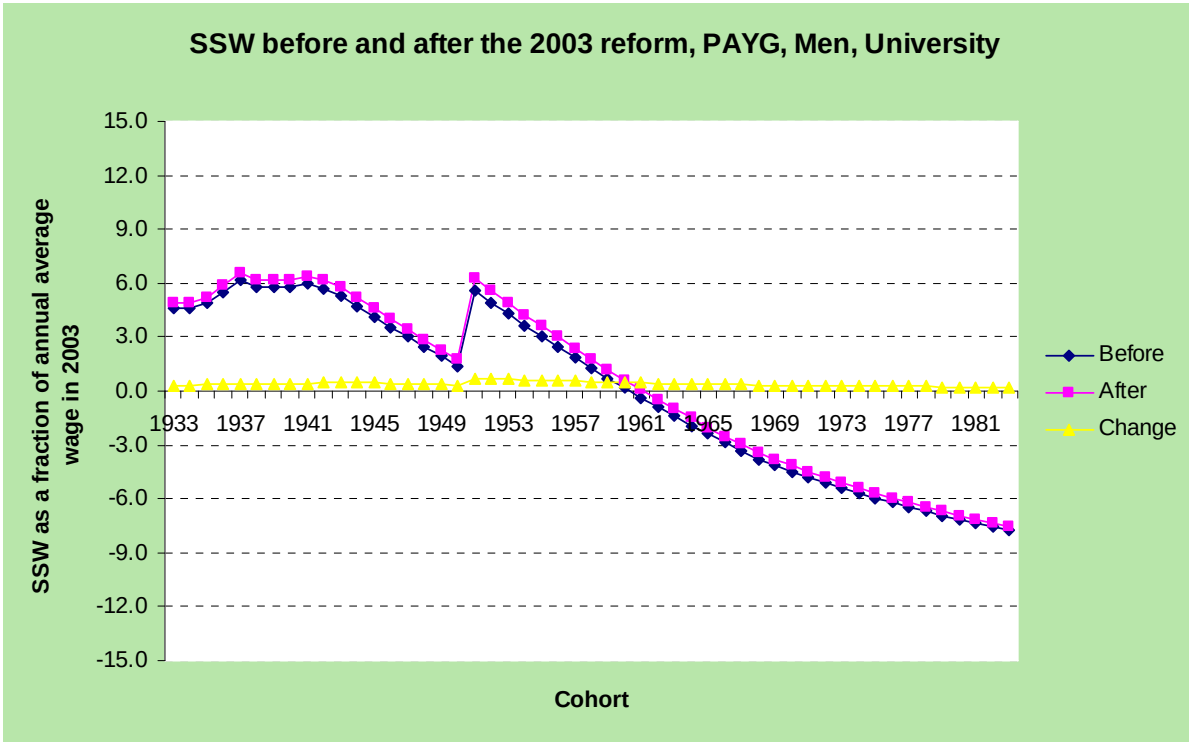

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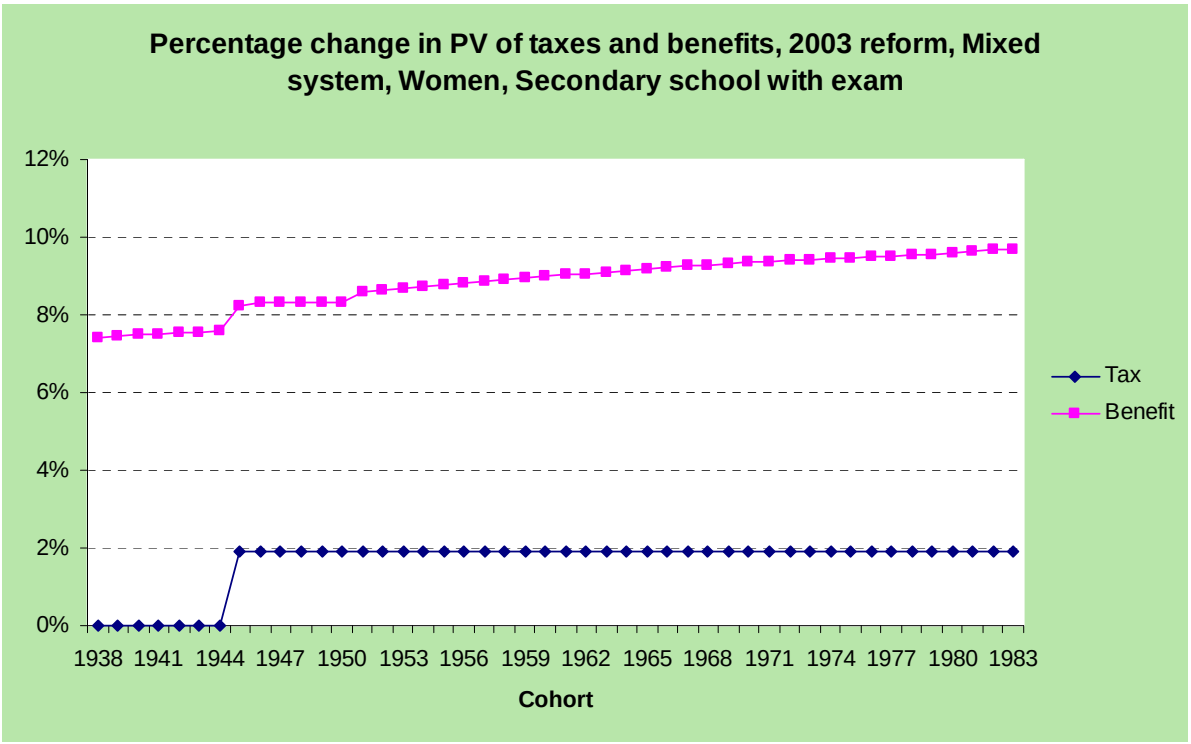

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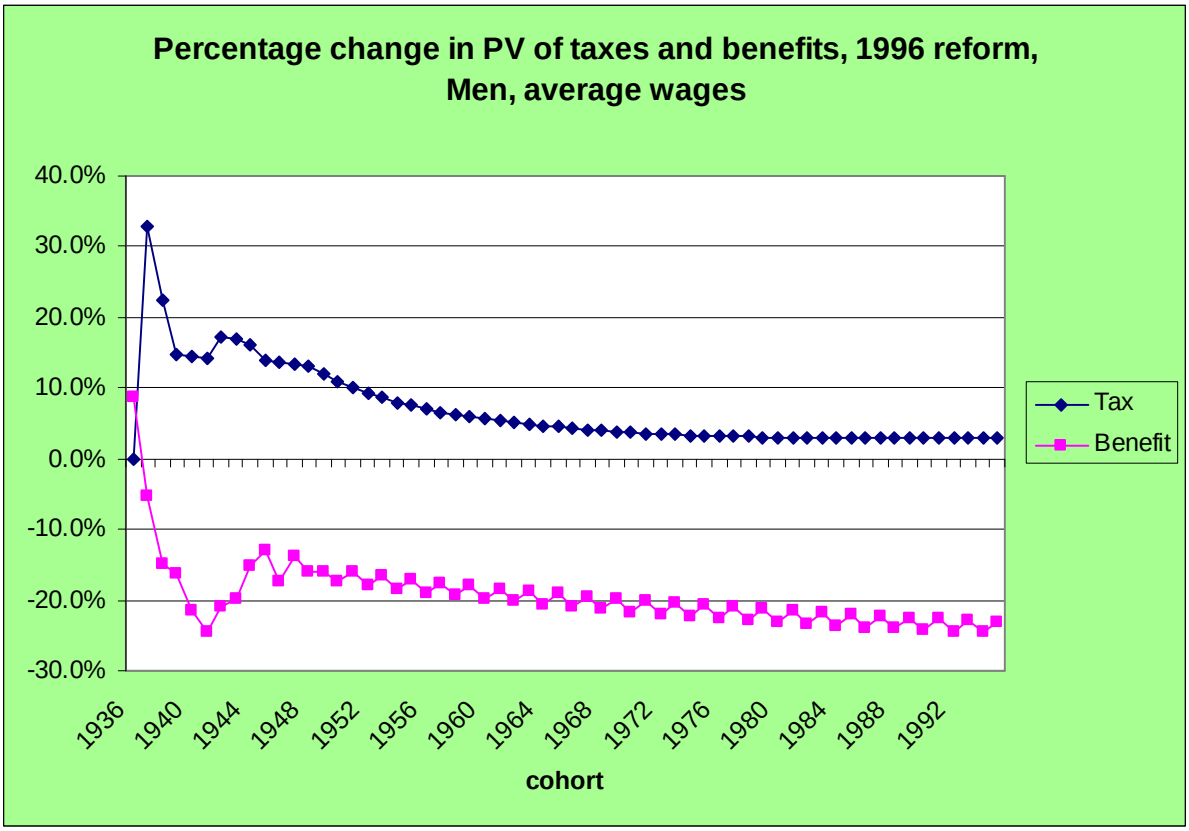

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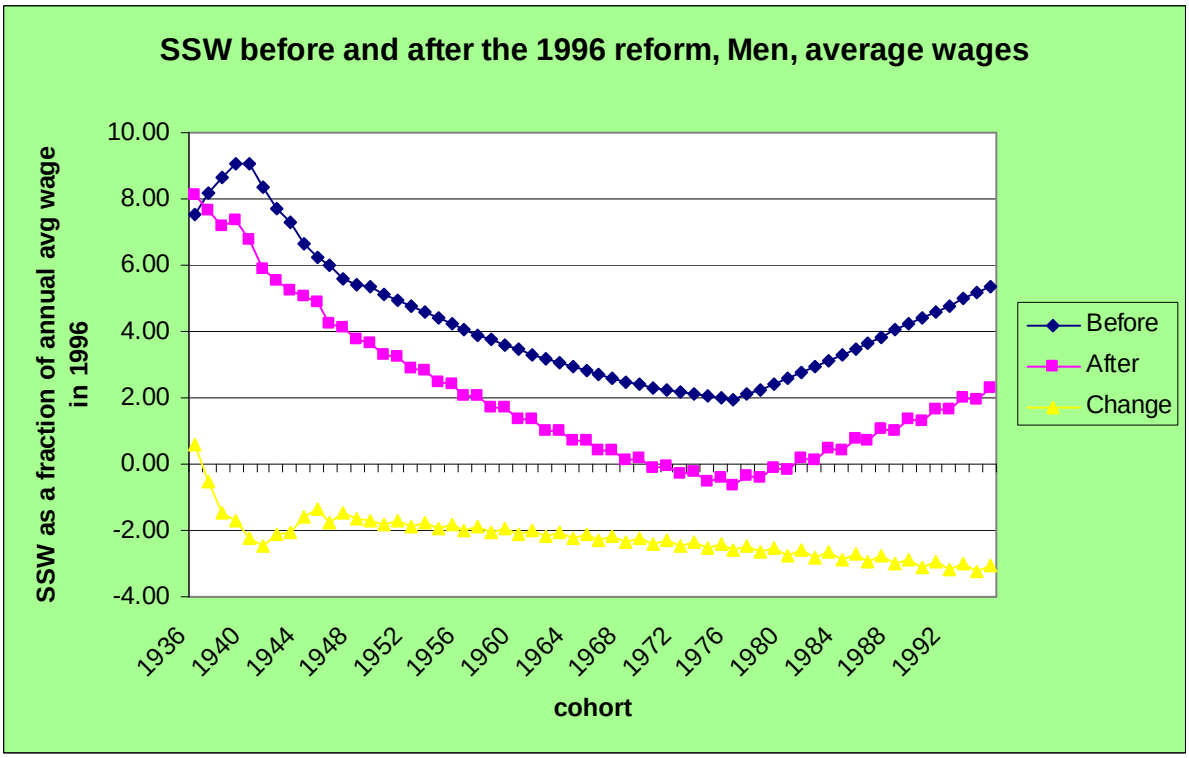

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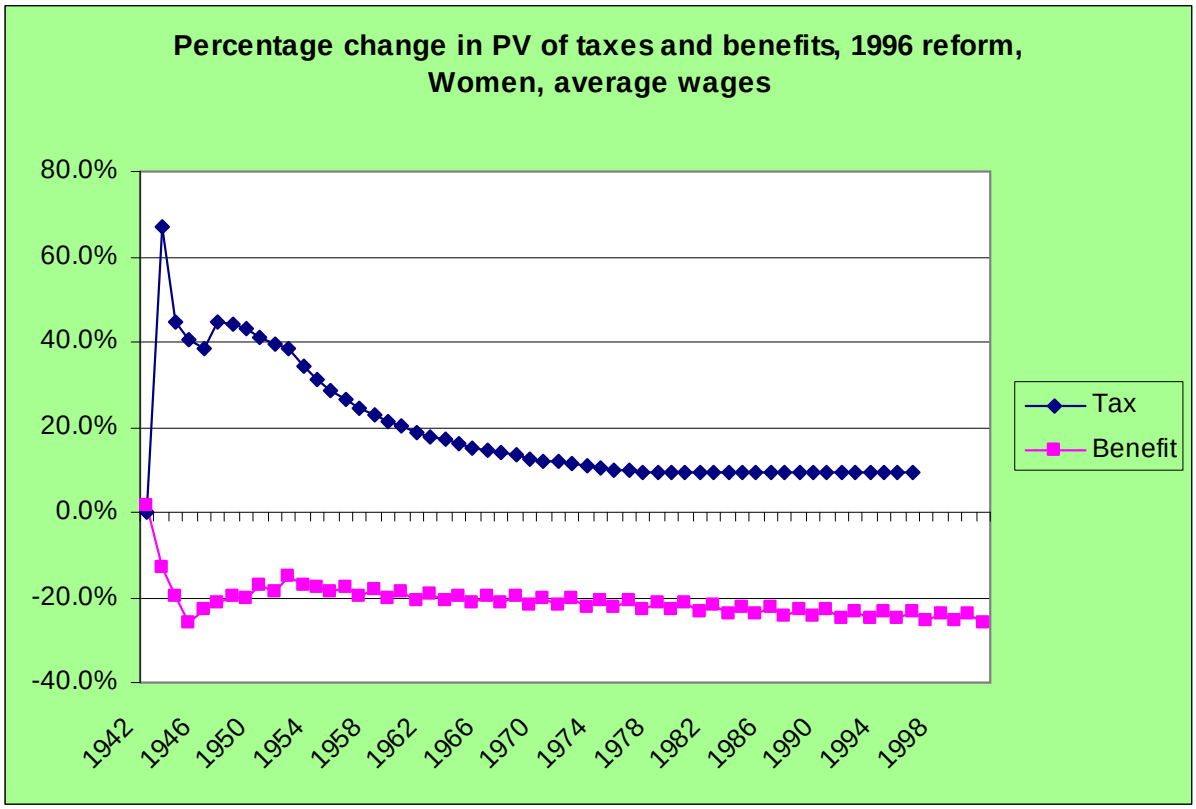

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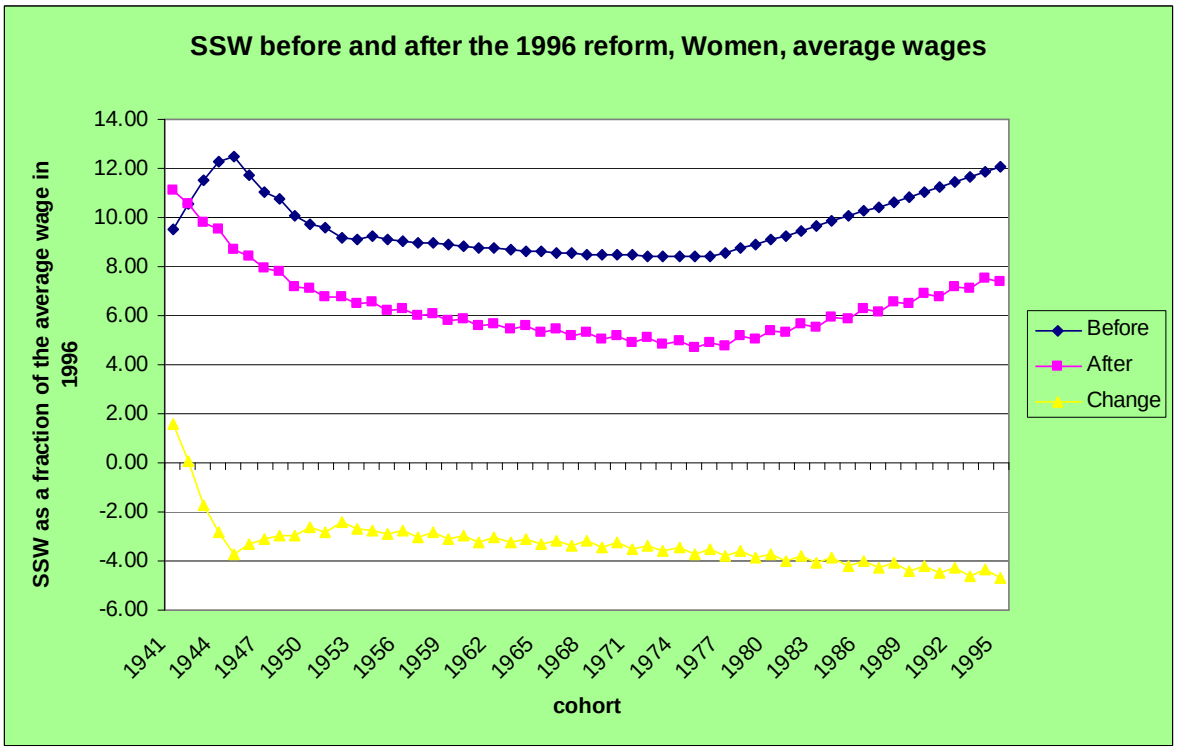


Figure C.5.

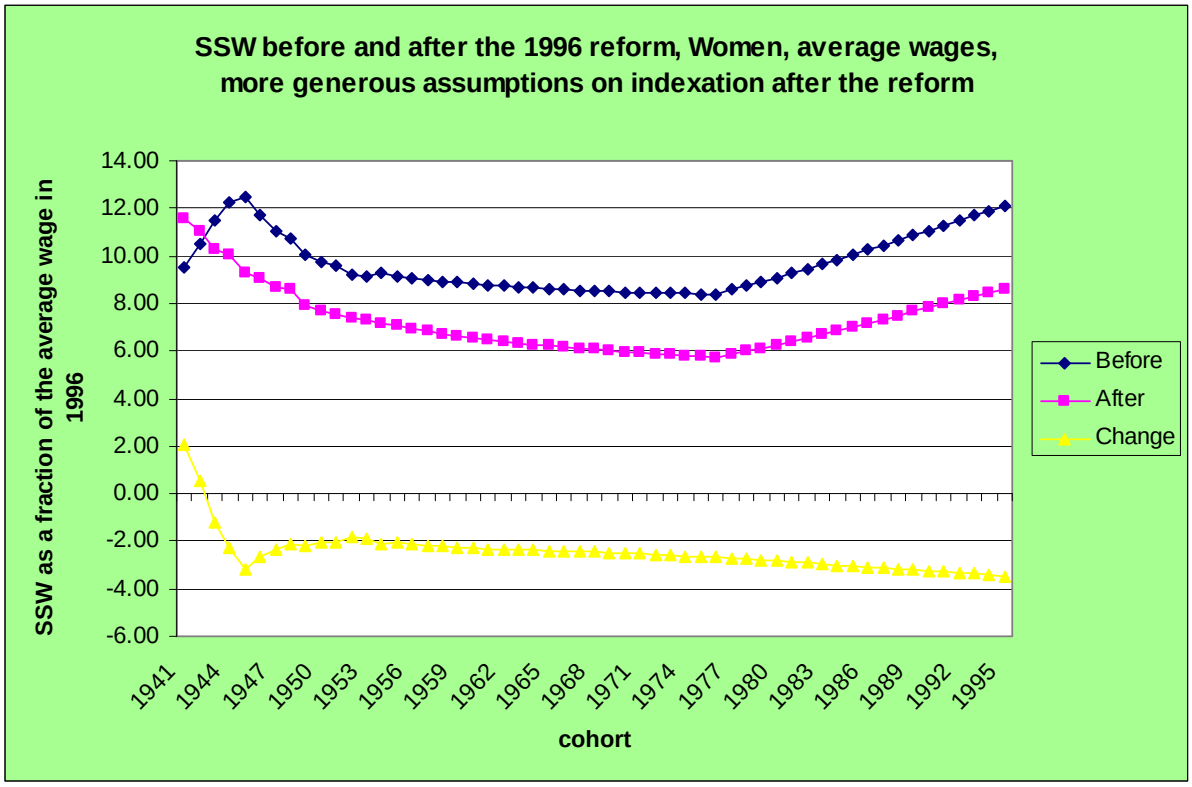


Figure C.6.

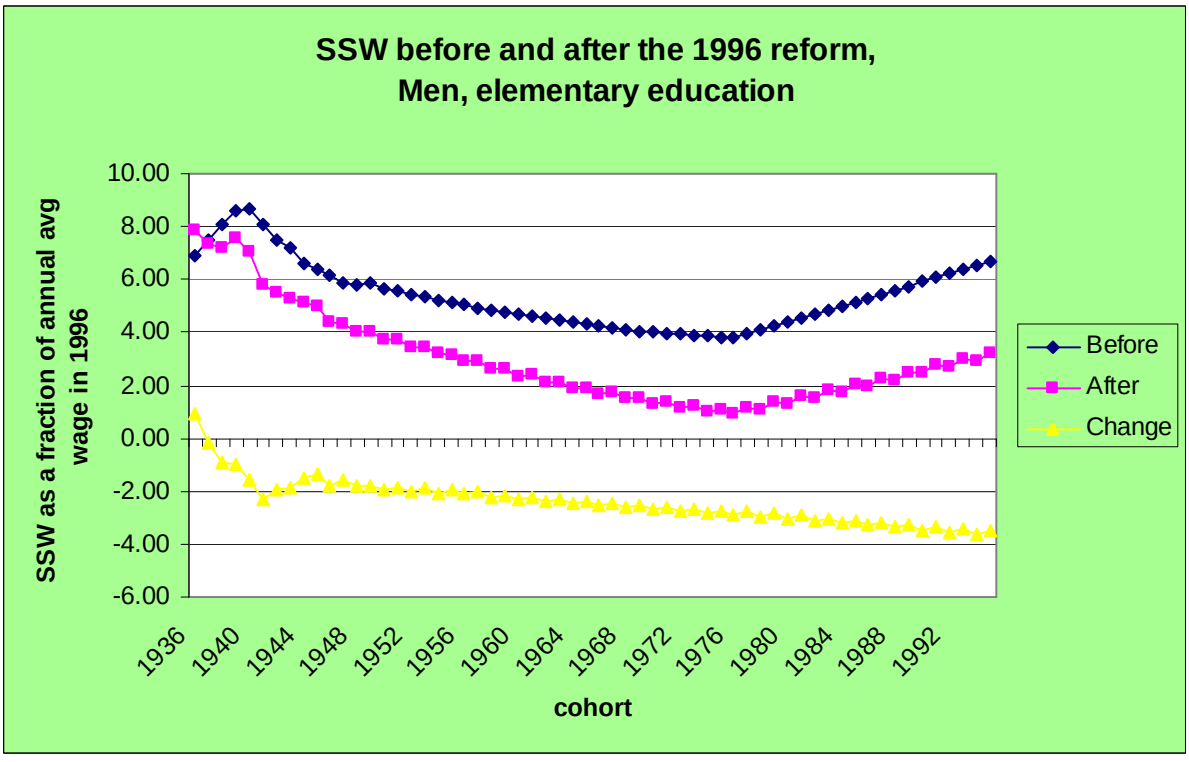
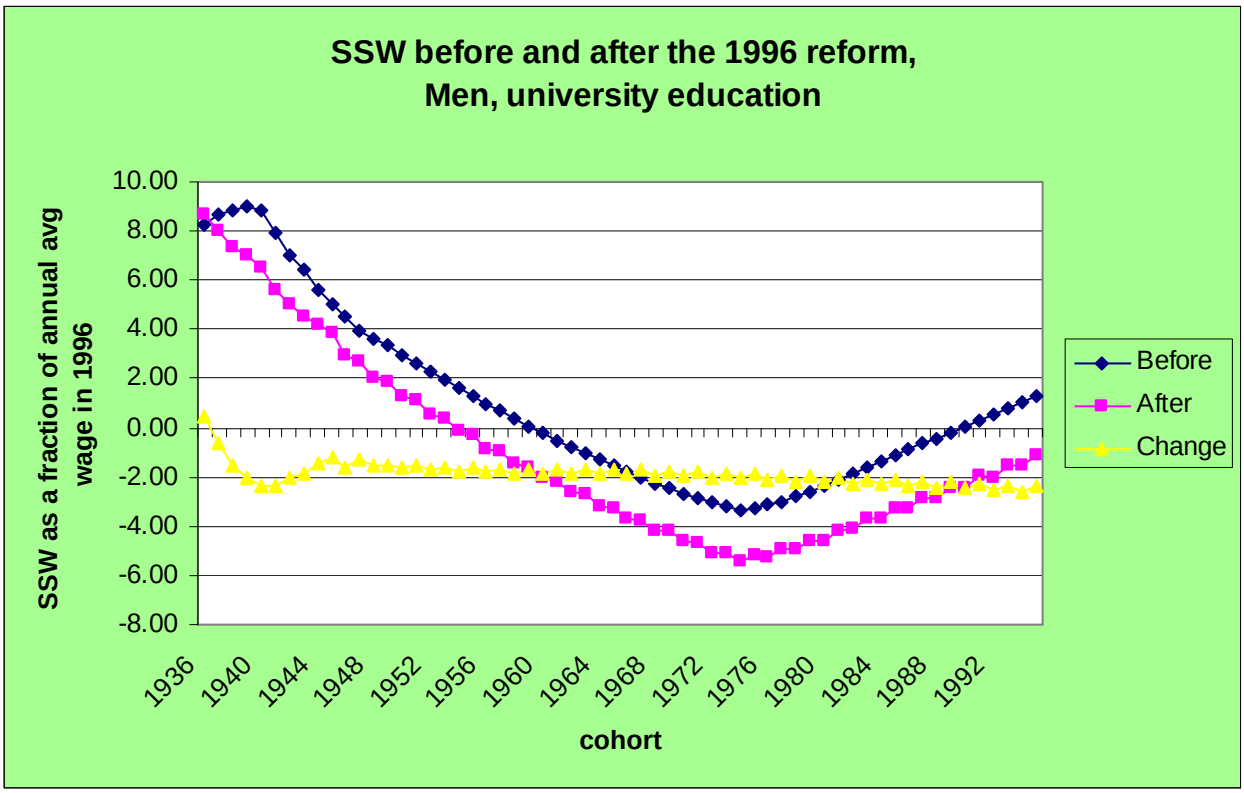


Figure C.7.


SSW before and after the 1996 reform,
Men, university education
SSW as a fraction of annual avg wage in 1996
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
cohort
Before
After
Change