

STOCKHOLM SCHOOL OF ECONOMICS

5350 THESIS IN ECONOMICS

Taxation and Married Female Labor Supply

A Study of the Swedish Separate Filing Reform of Labor Income in 1971

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Abstract

Sweden's separate filing reform of labor income in 1971 was important for the decision of wives, often secondary earners historically, regarding whether or not to start working in the market. In this paper, we develop a static model of labor supply, exclusively focusing on the labor supply decision of the wife. We estimate the importance of a change in the labor income tax filing- and tax rate structure for the Labor Force Participation (LFP) rate. We also consider the impact of variation in the intra-household labor income gap during this period, as well as the change in the labor income distribution composition. The results indicate a significant positive labor supply reaction along the extensive margin. Our findings bear relevance for countries with an aging population currently using a joint filing system of labor income. These countries can activate a potentially important part of the labor supply reserve to accommodate future rises in the demand for labor.

JEL Classification: H31, H71, J21, J22

Keywords: Tax filing system, Tax progressivity, Secondary earner, Married female labor force participation

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All remaining flaws are the responsibility of the authors.

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1 Introduction

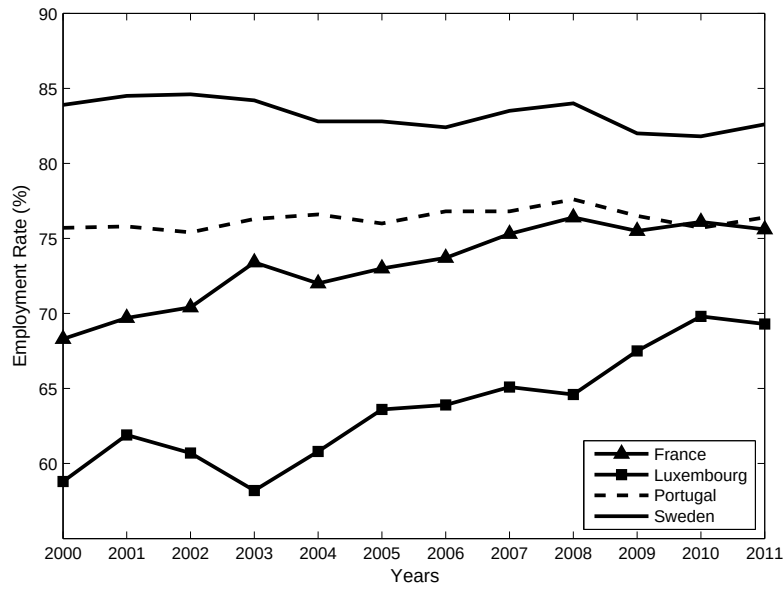
The design of the tax filing structure of labor income in different countries today is far from standardized. One major variation is the way in which the unit of taxation is defined, where most countries focus on the individual through the use of a separate filing scheme, while elsewhere the tax system is targeting married couples and their accumulated labor income jointly. This question of how to tax couples has received some attention in recent years, and the importance of it was aptly expressed by Apps & Rees (2007), who argued that it is “the single most important problem in personal income taxation”. The choice of system can have important implications for labor supply decisions within the married household, since secondary earners in a joint filing system will face the same marginal tax rate as the primary earner, thereby causing great disincentives for further work or entering the labor force altogether.

Separate filing of labor income however avoids this problem by taxing each of the spouses individually. For this reason, it becomes relevant to ask oneself how the labor supply decisions of married women, often considered to be the secondary earners of the household, are affected by a transition from joint to separate filing. Estimations of the effect of this kind of change on the LFP of different demographic groups have been carried out for countries which have gone through transitions towards a more individually based tax system. Callan, van Soest & Walsh (2007) and Crossley & Jeon (2007) are examples of papers studying the Irish and Canadian cases, respectively. Both find significant increases in married female LFP rates. The latter particularly finds an increase along the participation (extensive) margin and especially among the women married to high-earning husbands, where the decrease in marginal tax rates following the reform is the greatest. Reform simulations have also been performed by Steiner & Wrolich (2004) and Gustafsson (1992) for German labor income tax reforms. The former finds a substantial increase in the labor supply provided by wives in West Germany following a switch to strictly separate filing, while the latter finds a similar result by simulating the labor supply decision of West German women under the Swedish tax code (of separate filing). A further review, particularly covering the extensive US literature on the subject, will be provided in Section 1.1.

Overall, there seems to be a clear case for considering this kind of separate filing reform if a country employs a system of joint filing of labor income, while at the same time having a large married female labor supply reserve. In Figure 1 and Figure 2 we can see OECD employment statistics for married women in prime age groups for a sample of countries currently using a mandatory system of joint filing¹ (although not very common, both Germany and the US provide households with the option of filing separately. Ireland has also undergone several steps towards a more individually based system). Compared to Sweden, that actually went through the switch from joint to separate filing, we see consistently lower numbers for France, Luxembourg and Portugal, particularly in the upper age group (50-64).

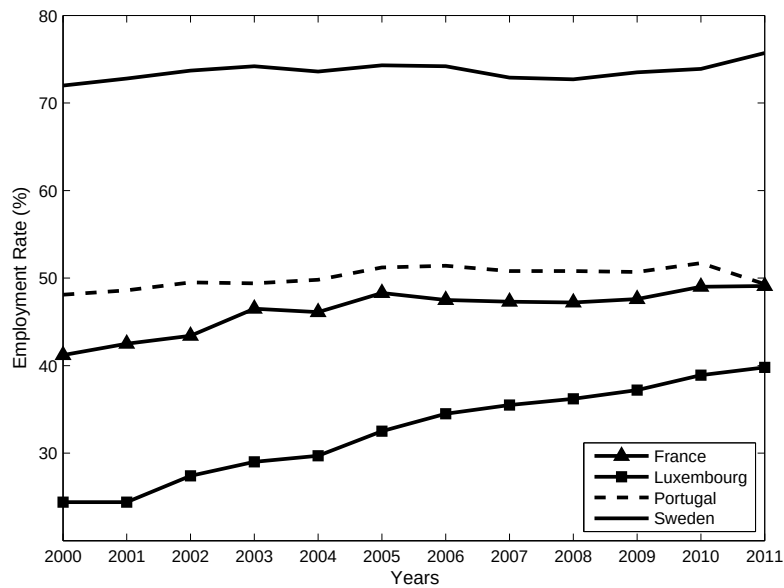
¹Based on data from Alm & Melnik (2004) and Jaumotte (2003), these are the countries that show no degree of choice between joint and separate filing.

Figure 1: Married females employed, age 25-49



Source: UNECE Statistical Database (2000-2011)

Figure 2: Married females employed, age 50-64



Source: UNECE Statistical Database (2000-2011)

Seeing as OECD countries in the future will have to deal with the accommodation of increasingly aging populations², and since the proportion of married households typically is concentrated in the upper age groups, the introduction of separate

²As an example, according to OECD (2008), the old-age dependency ratio, i.e the population of age 65 or above divided by the population of working age, is approximately set to double between 2000 and 2050 for the three countries in the example. This is however true for many other countries with low participation rates for married women, for example Italy and Japan. In these two countries, married women also face a cultural entry barrier that keeps them off the labor market. More on this in section 5.4.

filing could have important implications for the provision of incentives for older, married women to work and help satisfy the future demand for labor.

This paper will look at the particular case of the Swedish introduction of mandatory separate filing of labor income for spouses in 1971 in order to exploit the exogenous variation in tax structure that actually took place.

The paper will proceed as follows. Section 1.1 will cover related literature on this subject. Section 2 will provide relevant historical facts about the road to the taxation reform, followed by a brief overlook of the development of married female LFP rates and average weekly working hours from the mid 1960's to the beginning of the 1980's. Section 3 will present the data. Section 4 contains model and methodology specifications and details about the different experiments we plan to carry out. Section 5 will present the results and analyze the implications of our findings. Section 6 concludes.

1.1 Related Literature

Our paper relates to several strands of literature. When it comes to the effect of tax rates on aggregate labor supply, Prescott (2004) investigates the role of wedges in accounting for the differences in hours worked between the US and several Western European countries. He finds that differences in these values can account for a large part of this change over time. Rogerson (2006, 2007) also looks at the role of tax rates in accounting for the difference in labor supply between Europe and the US as well as how the role of government redistribution policy comes into play.

Jones, Manuelli & McGrattan (2003) look at potential explanations for the large increase in married female labor supply in the US over the period 1950-1990. In a general dynamic model, they suggest the most realistic reason is a reduction in discrimination leading to a reduced gender wage gap. This allows married households to endogenously specialize so that the wife allocates more time to market work while the husband decreases his market hours.

Chakraborty, Holt & Stepanchuk (2012) are using an overlapping generations model with heterogeneous agents to account for the difference in aggregate labor supply between the US and a sample of European countries. They impose European features of marriage and divorce probabilities (with the effect of increasing the sense of marriage stability) as well as tax rates together with equal redistribution of labor tax revenue to all households, on the US model economy. These factors jointly manage to explain around 30% of the difference. The contribution of the increased marriage stability is explained by its negative correlation with female labor supply and the fact that differences in the female labor supply, and married female labor supply in particular, accounts for a large part of the observed aggregate difference in hours worked.

Bick & Fuchs-Schundeln (2012) look at differences in hours worked among 18 European countries and the US during the years 2001-2008 for different demographic groups. Using a static model of joint labor supply they find that a decent amount of the variation among wives can be explained by variations in wages and consumption- and labor income taxes. Also, by simulating a switch to strictly separate taxation of earned income they find a significant labor supply increase for married women, particularly in Germany where the degree of jointness and progressivity of the tax structure is high.

Furthermore, Schettkat (1987) investigates the time series of married female LFP in Sweden by using a time trend and a year dummy for 1971. The effect he finds, however, only pertains to the married women aged 35-44 without children, potentially indicating a learning period or a lagging response.

Smith et al. (2003) use representative cross-section samples of the married population in Denmark, East- and West Germany, Ireland and the UK to simulate the effects of changing the tax structure on the participation decision of married females aged 20-55. Simulating the use of a UK system of separate taxation compared to an Irish system of joint taxation, the authors find an increase in both the part-time and full-time participation in all countries of the sample.

Closely related papers in a methodological aspect include Eissa (1995), who uses a difference-in-difference approach and the US Tax Reform Act of 1986 as a natural experiment to estimate its effect on the labor supply of married women. For the treatment group including married women in households from the 90th percentile of the income distribution, she finds an aggregate after-tax wage elasticity of 0.8, where the participation share is at least 0.4. LaLumia (2008) uses the same strategy to estimate the effect of the shift from individual to joint taxation of income in the US in 1948 for married couples. By conducting a natural experiment, she reaches the conclusion that the change in income tax structure is associated with a decline of 0.9 to 1.6 percentage points in the LFP of married women, while finding no statistically significant effect for men.

Guner et al. (2012) develop a life-cycle model with heterogeneous single- and married households to assess the effect of two tax reforms (proportional and separate taxation) on the labor supply decision across two steady states. They put particular focus on the decisions of wives and find that they account for around 50% and 100% respectively of the increase in hours worked, with the conclusion that the behavior of this group is particularly important when assessing the effects of tax reforms.

There have been some previous studies looking particularly at the effect of the 1971 reform on the labor supply decision of different demographic groups in Sweden. These papers include Gustafsson & Jacobsson (1985); Gustafsson (1992); Blomquist & Hansson-Brusewitz (1990) and Selin (2009). Selin (2009), although an empirical study, is conceptually similar to this paper since it explicitly looks at the LFP of married women before and after the tax reform of 1971.

This paper contributes to these strands of previous research by combining the use of an actual exogenous variation in the labor income tax filing structure with the analysis of its effect on the LFP decision of married women depending on the labor income of their husbands. Furthermore, we lay particular focus on the role of the intra-household labor income gap and the impact of progressivity. We have also chosen to look exclusively at the preferences of married women without children. In doing so, we abstract from benefits pertaining specifically to working mothers, benefits that may cloud their incentives to respond rationally to the reform.

2 Background

2.1 Labor Income Taxation in Sweden

Joint taxation of labor income for married couples was introduced in Sweden in 1902. Already early on, the system became criticized since it was considered to

cause disadvantages for women were they to marry. In particular, since this tax structure meant that labor income had to be filed jointly within the household, it was considered to cause disincentives for wives to enter the labor force. The reason for this was that, given a working husband, the wife's earned labor income would face the same marginal tax rate as that of her husband, that is, her participation tax rate would equal the husband's marginal tax rate since their labor income was assessed jointly. This caused controversy, and in the late 1940's, following widespread public debates and an official fiscal investigation (Ministry of Finance 1949) it was decided that joint taxation was to remain, but an earned income tax credit was to be introduced for working married women with children under the age of 16. In 1952, the principle of equal division (in Swedish: "tudelningsprincipen") was introduced. With this measure, married couples' aggregate labor income was divided in two equal parts and taxed separately. This came to be beneficial for marrieds since it meant the two parts of the labor income were taxed at a less progressive rate. It was, however, not to the same extent beneficial for the prospects of married women entering the labor force since they still faced a high marginal tax rate, particularly when married to a high-earning husband.

The strife towards separate taxation for spouses therefore continued and was, according to Elvander (1974), largely spearheaded by feminist movements rather than political parties. Gustafsson (1992) mentions the medium term forecast in 1959 that found married women, and married women with young children in particular, to be the "only important reserve of labor" (p. 64). In 1960, an investigation was put in place to assess the potential effects of a separate taxation scheme, and following the medium forecast survey in 1965, where the argument from the 1959 forecast was reiterated, the Minister of Finance was finally convinced of the advantages a change of the labor income tax structure to separate filing for spouses in married households would bring forth.

Starting in 1966, the option of separate taxation became available to all married households. It was rarely used however, due to complicated rules and certain advantages enjoyed by households in which the labor income distribution was very uneven (these couples could avoid the progressive taxation of the husbands income by filing the income jointly). Also, though not particularly promoting married woman labor, the principle of equal division meant many married couples in which both spouses were working still benefited overall from filing jointly.

In 1970 the government put forth a proposition about separate taxation of labor income for marrieds. The proposition was voted through, and starting in 1971 it became mandatory for married couples to file their labor income separately (capital income for example was still filed jointly). Throughout the rest of the 70's the labor income tax became associated with increased progressivity and increased incidence from the local government labor income tax, both because the average local rates went up (from 21% to around 29%) and because these income taxes were no longer deductible towards the central government taxable income. Although central government labor income tax rates were lowered during the period, the increased local rates countered this effect, and the high inflation pushed the incomes into higher tax brackets, thus keeping a high progressivity. This development was the result of the need to finance the expansion of the public sector, but also to achieve a more equal distribution of earned income. Consequently, the highest income earners were hit hard — by the beginning of the 80's the top income earners faced a marginal

tax rate of 85%.

Nonetheless, the 1971 reform was successful. As an example, in 1980 around 78% of married women aged 16-64 were working either full- or part-time, compared to 49.8% before the reform (1967).

2.2 The LFP of Married Women in Sweden

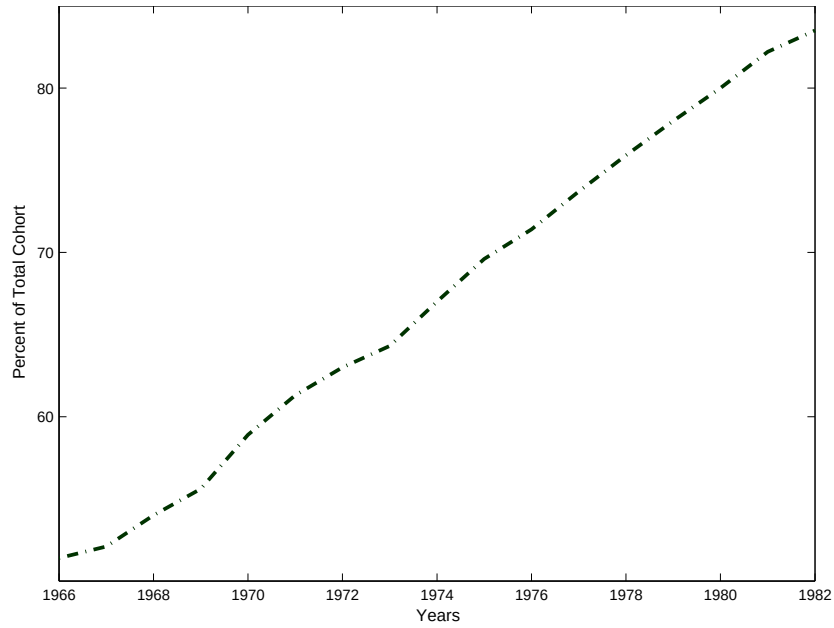
Already before the tax structure reform there was a notable trend in the LFP of married women. Silenstam (1969) looks at the development during the years 1920-1965 and finds an increase for all non-dependent age groups. Causes for this are argued to be a decreasing gender wage gap due to increased demand for female labor and a more favorable public opinion towards women entering the labor force. Also, the decreasing need for work in the home and the increased availability of part-time work opportunities played a role. Another reason for the decrease in gender wage gap is believed to be the increased influence of labor unions. Although the union policies were not explicitly designed to enhance the labor market situation for women, the “solidarity wage policy” meant a great overall reduction in the wage dispersion. Seeing as women typically adhered to the lower part of the income distribution at this point in time, the increased income compression was bound to reduce the male/female income gap. This tendency became all the more apparent following the steady increase in union density from an already high rate in the early 1960’s. Silenstam also mentions two opposing forces during this development, namely the increased marriage rates and the increased LFP of married women (pp. 77-81), which, taken together, stabilized the LFP for married women.

From the mid 1960’s to the mid 1980’s, the LFP of wives has increased significantly. Figure 3 shows the married female LFP numbers taken from Gustafsson & Jacobsson (1985).

Things to notice in this figure is once again the increased availability of part-time work coupled with the generous possibilities for parental leave, which basically meant married women could still be employed while either working less or being at home with a child. There was also a downward trend in the fertility rate following the baby boom of the 1960’s, despite generous child care subsidies that promoted women working in the market, as well as the introduction of paternal leave in 1974.

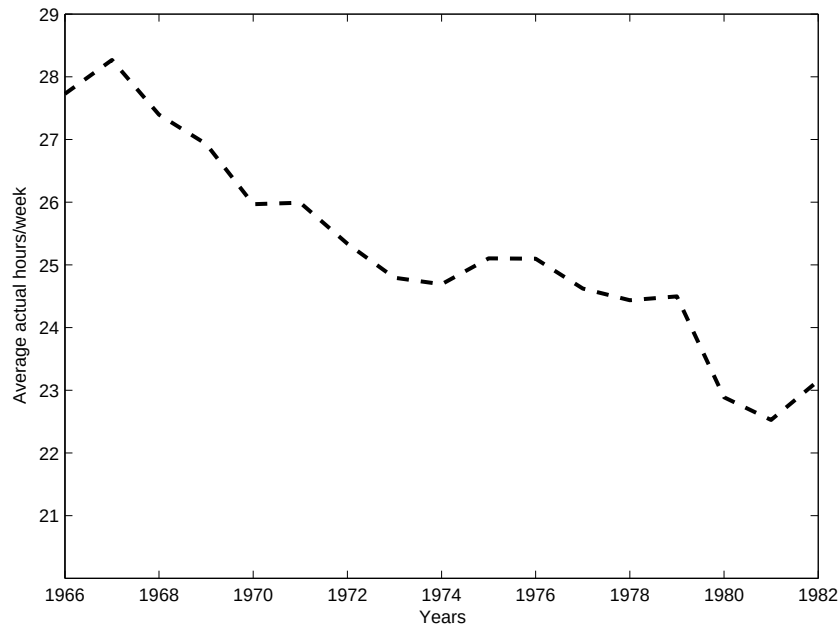
Noticeable during this period is also that the average amount of hours worked per week per married woman in the labor force have remained relatively stable, with a slight downward tendency. This could be partially explained by the parental leave system, since these benefits were dependent on having been employed for a specified amount of time but not on the amount of hours worked during this time. Since paid parental leave time then was freely transferable across parents, this meant that the mothers were more exposed to this tendency since they often spent the most time at home with the child. The development of average hours worked per week for married women is illustrated in Figure 4.

Figure 3: LFP rates for married women in Sweden aged 16-64 (%)



Source: Various editions of the Statistics Sweden Statistical Yearbooks; own calculations

Figure 4: Hours worked for married women in the labor force in Sweden 1966-1982



Source: Various editions of the Statistics Sweden Statistical Yearbooks; own calculations

The above findings suggest that the interesting movement during this period occurred along the extensive margin, that is, the proportion of married women in the labor force, as opposed to the intensive margin that treats the amount of hours worked per week.

3 Data

The data on labor income³ used comes from the Luxembourg Income Study (LIS). It is a database that collects and harmonizes micro-level data from different countries over several decades⁴. For Sweden, information on income and demographic characteristics for individuals and households are collected from register data and the Level of Living Survey (LNU), respectively, for the 1967 compilation. The LNU asks a representative sample of the Swedish adult population about their actual living conditions (examples of topics are family, health, working conditions and education) and was first conducted in 1968. It has been used extensively for political purposes and formed the basis for decisions regarding such areas as labor market policies and adult education programs (Institute for Social Research 1968). Data from after the reform is collected from the 1981 edition of the LIS that uses information from the Swedish Income Distribution Survey (HINK). HINK (now called HEK) has since the early 80's been conducted yearly on samples ranging from around 10000 to 19000 individuals⁵. The aim of the survey is mainly to map out the incomes of Swedish households; how the disposable income varies between different demographic groups as well as how the redistribution of income takes place through taxation and welfare policies (Statistics Sweden 1982). From the variable "labor income" we have excluded entries of self-employed income so that only paid employment income remains. This exclusion of the former is made because special tax rules often apply to this group which might cause bias in the results.

We would now like to partition our sample of households from the LIS into groups based on the husbands' incomes. This distribution is designed to make the groups comparable in 1967 and 1981, so that the first group represents households in which the incomes of the husband is less than three times the overall mean income of all working wives in the given year. The second contains households in which the husband earns three to four times this amount, while in the third group husbands earn more than four times this amount.

Using the data for 1967 and 1981, we obtain Table 1 and Table 2. All the income numbers are expressed in 1967 prices. The column Husin/Fmean shows the husbands' income divided by the mean income of the working wives and therefore serves as the basis for the creation of the three groups. The column LFP represents the labor force participation rates of the wives in each group. The total LFP rates obtained in the table are consistent with our calculations from the Statistical Yearbooks.

As can be seen in the table, the first group comprises a large majority of our sample, particularly in 1981. This is due to several factors, two of them no doubt being the wave of solidaristic wage policy during the late 60's and early 70's and the increased progressivity of the income tax system that increased the compression of the income distribution, particularly in the low- and middle income sectors. Since we are mainly interested in the change in LFP for wives with high-earning husbands in groups two and three, and since the income heterogeneity in group one is limited, this merging of lower- and middle husband income households into one

³henceforth referred to simply as income

⁴For further information, please visit www.lisdatacenter.org

⁵All individuals in a specific household are included in this number; the sample size of actual households is consequently lower.

group constitutes a rather natural simplification.

Table 1: 1967 household income distribution and wives' LFP rates

Group ^a	Husin/ Fmean ^b	Weight	Wives' LFP(%)	Husband Mean Income	Wife Mean Income	Wife/Husband Income Ratio
1	<3	76.4	63.95	21896	10653	0.49
2	3-4	12.3	61.69	35207	11449	0.33
3	>4	11.3	42.57	64282	16464	0.32
Total		100	61.26	26585	11723	0.44

^a This household classification will also be referred to frequently in the paper as "husband income group" or "husband type".

^b Husband income divided by working wives' overall mean income, which was 10205 in 1967.

Table 2: 1981 household income distribution and wives' LFP rates

Group	Husin/ Fmean ^a	Weight	Wives' LFP(%)	Husband Mean Income	Wife Mean Income	Wife/Husband Income Ratio
1	<3	92.3	82.73	27364	17646	0.64.
2	3-4	5.7	76.42	50027	20397	0.41
3	>4	2.3	64.29	80868	20533	0.25
Total		100	81.82	30318	17870	0.59

^a Husband income divided by working wives' overall mean income, which was 14782 in 1981.

Furthermore, the sample only contains households without children under the age of 17 living in the household. This does not mean however that the households in the sample do not have children, only that they are not living at home or that they have reached the age where they are old enough to move out. The reason for excluding these households are the different policy measures that were introduced during the 70's that adversely affected the LFP rates of mothers in a way that lies outside the scope of our model. One of the influences was the design of the parental leave system. First of all, the paid compensation was based on income in previous employment as well as the length of the employment. However, there was no criteria for amount of hours worked, which meant that the wives, traditionally the ones using up the paid leave days (until 1974 they were the only ones that could), often engaged in part-time work both before and after the birth of the child. Additionally, mothers received several social benefits that affected their labor supply decision (increased work deductions, universal child benefits etc).

The wage data used in our model simulation for married women in different husband income groups was derived from the married womens' income⁶. To enable

⁶For a given disutility from working parameter (B), we use matlab to make an initial guess of the series of wages for married females in the three husband income groups respectively. Then we use the function "fmincon" to get the optimal series of wages that will make the gap between the simulated income levels for wives (wh) and the real married female incomes(Ifemale) smallest, that is to minimize: $(w_1h_1 - Ifemale_1)^2 + (w_2h_2 - Ifemale_2)^2 + (w_3h_3 - Ifemale_3)^2$, where h_i is dependent on w_i and exogenous husband income. The B parameter is chosen to match the overall married female working hours in 1967. These parameters and variables will be further explained in Section 4.

a comparison between yearly and weekly data, we assume that one year is made up of: (52 weeks – amount of law-mandated paid vacation weeks – two weeks of public holidays). The amount of law-mandated paid vacation weeks were four in 1967 and five in 1981 (Swedish Agency for Government Employers 2009), giving us 46 working weeks in 1967 and 45 working weeks in 1981.

4 The Economic Environment

4.1 Model and Methodology

Our model environment consists of married households where the husbands work and where there are no children under the age of 17 living in the household. We use a secondary earner model, meaning the husbands' incomes are considered non-labor income and exogenous to the wife's labor supply decision. The validity of the secondary earner framework is confirmed by studies such as Mroz (1987), who finds evidence to support the claim that other family income, such as the income of a husband, is exogenous to the labor supply decision of the wife. We therefore choose to follow this path.⁷ After having observed the husband's income, the wife makes a labor supply decision along both the extensive and the intensive margin, that is, whether she will work or not and for how many hours.

Husbands are partitioned into three groups in 1967 and 1981 depending on their yearly income during the corresponding year (see previous Section). Since the system of filing differs between 1967 and 1981, we specify separately the problems of the wives in one-earner households, where only the husband works, and two-earner households, where both spouses work. Note that the model only considers the utility of the wife, there is consequently no joint maximization of household utility and no bargaining in this framework. The following inputs will be used in the continuation of the model framework:

- I_m : husband's income, which the wife regards as exogenous
- w : hourly wage of the wife
- h : hours worked for the wife
- q : utility cost of joint work
- B : wives' disutility from working
- i : the index for the three different husband income groups, $i=1, 2, 3$
- σ : the disutility curvature parameter

⁷One advantage from this is that we avoid the influence of cross-wage substitution effects that arises in joint household utility maximization decisions, that is, how a change in one spouse's net-of-tax wage affects the other spouse's labor supply decision, in turn depending on how the consumption of leisure is valued within the household (as a complement or as a substitute). Evidence on the sign of this effect is not conclusive, for example Horney & McElroy (1980) finds a negative effect (leisure treated as a substitute good between spouses) while Heckman (1971, cited in Eissa 1995, p. 11) finds a positive effect. This effect would in turn complicate the analysis further since the direction of the bias this would bring to the labor supply decision of the married woman becomes uncertain.

- $\tau_b(.) \backslash \tau_a(.)$: the tax rate function for before and after the reform, respectively
- $T_b(.) \backslash T_a(.)$: the tax function for before and after the reform, respectively. For instance, $T_b(I_m) = \tau_b(I_m) * I_m$.

In the following paragraphs we will elaborate further on the characteristics and functions of some of the model inputs above.

The utility cost parameter for joint work (q):

The utility cost parameter is incurred when both spouses work, and is meant to capture a residual heterogeneity among couples in order to explain differences in labor supply behavior in general, and the participation decision of wives in particular. Drawing on Cho & Rogerson (1988), this parameter mainly represents three kinds of additional costs. These three are consumption costs, in the form of extra services required; time costs, through transportation arrangements; and utility costs by having less time to spend with children, in addition to the inconvenience of searching for jobs and rescheduling activities. All three costs are argued to produce similar aggregate responses, and a common parameter therefore does not present an oversimplification. Further work from Cogan (1981) shows that the inclusion of such a parameter has important implications for the labor supply decision of married women. He estimates that the fixed costs of work for the average married woman in his sample amounts to 28% of her annual income.

We assume that each married household is endowed with a value of $q \in Q$, where Q is a finite set of positive real numbers. The value q is assumed to follow a gamma distribution:

$$q \sim F \equiv q^{\alpha-1} \frac{e^{-q/\beta}}{\Gamma(q)\beta^\alpha}$$

where $\sum_{q \in Q} F(q) = 1$ and $\Gamma(.)$ is the gamma function. The parameters α and β will be calibrated so as to match the LFP data of the wives in the different husband income groups.

The disutility from working parameter (B):

This parameter is calibrated so that the maximized amount of hours worked for the wives in the different husband income groups will be consistent with the overall weekly average amount of hours worked for wives that we have calculated from the statistical yearbooks for 1967.

The disutility curvature parameter (σ):

We also need to determine a value for our smoothness parameter σ and the corresponding estimate of the uncompensated wage rate elasticity of labor supply ($1/\sigma$). The following section will provide a discussion about the meaning and importance of this estimate, as well as a justification for the value we choose for it.

The smoothness parameter σ in the model guards how costly it is for the married woman to adjust the amount of hours spent on working/leisure in a given week. Thus, increasing this parameter will mean she would increasingly prefer a set work-week and that a change in labor supply is more likely to occur along the extensive (LFP) margin. For the overall effect of a tax reform, the value of this parameter will therefore not be of much importance since the change in aggregate hours will

remain more or less constant (for further illustration see for example Rogerson & Wallenius 2009). However, since this paper puts an extra focus on the movement along the extensive margin for wives, the choice of this estimate still holds some importance. As mentioned, $1/\sigma$ will be the estimate of the uncompensated labor supply elasticity, that is, the percentage change in quantity supplied of labor divided by the percentage change in the wage rate. There are a number of papers that have attempted to estimate this value for Swedish women. Jäntti, Pirttilä & Selin (2013) use the LIS database to estimate an uncompensated net wage elasticity of 0.462 for (all) Swedish working women, although the number is not statistically significant and the years considered are more recent than those of this paper. Selin (2009) however, using register data from the LINDA database, reports an identical value when empirically estimating the LFP decision of married women before and after the tax reform. His results, using a fixed effects estimation, are significant at the one percent level and would therefore serve as a feasible indication of an appropriate value. As a final example, Blomquist & Hansson-Brusewitz (1990) use data from the LNU of 1981 to estimate labor supply functions of married men and women. They also use a method to calculate predicted wages for women not actually in the labor force in order to avoid biased estimates. Depending on the estimation technique they obtain values for the uncompensated wage rate elasticity for the full sample of married women ranging from around 0.4 to 0.8. Following these observations we decide to set the value of $1/\sigma$ to 0.47.

The tax rate function:

The tax rate function estimates the average income tax rates faced by the unit of taxation in 1967 and 1981 for different multiples of the mean household income. Below we will briefly present some features incorporated in this function.

The methodology used for calculating income taxes paid differs slightly between 1967 and 1981. In 1967 we start with the declared paid employment income of the household from the LIS data and first deduct the double local government standard deduction⁸. The resulting value is taxed at the average local government tax rate for 1967. The local taxes paid the previous year were then deductible against the central government taxable income, thus reducing the central government taxable income base. Following Söderberg (1996) we have for simplicity chosen to deduct the local taxes paid in 1967, i.e the same year. After deducting the local taxes, the remaining income is subject to the central government standard deduction. Any income left thereafter is finally taxed according to the central government tax rate schedule. Total amount of taxes paid is calculated as the sum of local and central government taxes.

In 1981, the focus turns to individual incomes of the husband and wife. At this point, local taxes were no longer deductible against the central government taxable income, which, since the local and central government deductions this year were the same, meant that the same income base was used for both local government and central government taxation. Similar to before, the total amount of taxes paid for each individual was the sum of local and central government taxes.

It should be noted that we have made some abstractions in these calculations. These include for example deductions for traveling to and from work; deductions

⁸The standard deductions are the parts of the income that are exempt from income taxes. These are universal and do not only pertain to a specific group of workers like many other deductions.

for interest payments and insurance premiums; public pension fees (1967 only); the spousal tax reduction (1981 only) and the married woman work deduction. More on these factors can be found in Söderberg (1996), however we do not feel that the inclusion of them would severely alter our results. Furthermore, many of them only apply for a given year and to specific demographic groups (the married woman work deduction for instance, though having some effect on the LFP decision, was in 1981 only applicable for households with children. Seeing as we are excluding this group from our sample, its relevance severely decreases). The average local government tax rates and the central government tax schedules for 1967 and 1981 can be found in Appendix A.

Having clarified the meaning of these model inputs, we will now continue with the utility function specifications.

I. Before the Reform (joint filing)

In 1967, when the system of joint filing was in place, wives in one- and two-earner households solve the following problems, respectively:

1. One-earner Household: $U_{1bi} = \log(c_{1bi}) = \log(I_{mi} - T_b(I_{mi}))$
2. Two-earner Household: $U_{2bi} = \max_h \{ \log(c_{2bi}) - B \frac{h_i^{1+\sigma}}{1+\sigma} - q_{bi} \} = \max_h \{ \log(I_{mi} + wh_i - T_b(I_{mi} + wh_i)) - B \frac{h_i^{1+\sigma}}{1+\sigma} - q_{bi} \}$

where the index “b” stands for “before the reform”. As can be seen, the utility functions are rather standard in the labor supply literature: the married woman derives utility from (the log of) shared consumption and disutility from working.

Let h_i^* be the optimal hours decision of the wife given that she works. Thus, her utilities in a one- and two-earner household are given by:

$$\begin{aligned} V_{1bi} &= \log(I_{mi} - T_b(I_{mi})) \\ V_{2bi} - q_{bi} &= \log(I_{mi} + wh_i^* - T_b(I_{mi} + wh_i^*)) - B \frac{h_i^{*1+\sigma}}{1+\sigma} - q_{bi} \end{aligned}$$

A wife is indifferent between working or not (having two earners or one earner in the household) for a sufficiently high value of the utility cost. Considering the threshold utility cost value $q_{bi}^* = V_{2bi} - V_{1bi}$, for any household with a utility cost higher than the corresponding threshold, the wife will choose not to enter the labor force. This cost is given by:

$$\begin{aligned} q_{bi}^* &= V_{2bi} - V_{1bi} \\ &= \log(I_{mi} + wh_i^* - T_b(I_{mi} + wh_i^*)) - B \frac{h_i^{*1+\sigma}}{1+\sigma} - \log(I_{mi} - T_b(I_{mi})) \\ &= \log \frac{I_{mi} + wh_i^* - T_b(I_{mi} + wh_i^*)}{I_{mi} - T_b(I_{mi})} - B \frac{h_i^{*1+\sigma}}{1+\sigma} \\ &= \log \frac{I_{mi} - T_b(I_{mi}) + wh_i^* - T_b(I_{mi} + wh_i^*) + T_b(I_{mi})}{I_{mi} - T_b(I_{mi})} - B \frac{h_i^{*1+\sigma}}{1+\sigma} \\ &= \log(1 + \frac{wh_i^* - (T_b(I_{mi} + wh_i^*) - T_b(I_{mi}))}{I_{mi} - T_b(I_{mi})}) - B \frac{h_i^{*1+\sigma}}{1+\sigma} \end{aligned} \tag{1}$$

Recall that the utility cost follows a gamma distribution, so that a relatively lower threshold utility cost will be equivalent to a lower female LFP rate, as the proportion of the households with a utility cost higher than the threshold will choose not to work. Wives maximize their utility by solving the following problem:

$$\max \{ \log(I_{mi} - T_b(I_{mi})), \max_h \{ \log(I_{mi} + wh_i - T_b(I_{mi} + wh_i)) - B \frac{h_i^{1+\sigma}}{1+\sigma} - q_{bi} \} \}$$

II. After the Reform (separate filing)

In 1981, when the system of separate filing was in place, wives in one- and two-earner households solve the following problems, respectively:

1. One-earner Household: $U_{1ai} = \log(c_{1ai}) = \log(I_{mi} - T_a(I_{mi}))$
2. Two-earner Household: $U_{2ai} = \max_h \{ \log(c_{2ai}) - B \frac{h_i^{1+\sigma}}{1+\sigma} - q_{ai} \} = \max_h \{ \log(I_{mi} - T_a(I_{mi}) + wh_i - T_a(wh_i)) - B \frac{h_i^{1+\sigma}}{1+\sigma} - q_{ai} \}$

where the index “a” stands for “after the reform”. Let h_i^* once again be the optimal hour decision of the wife given that she works. Thus, her utility is given by:

$$V_{1ai} = \log(I_{mi} - T_a(I_{mi}))$$

$$V_{2ai} - q_{ai} = \log(I_{mi} - T_a(I_{mi}) + wh_i^* - T_a(wh_i^*)) - B \frac{h_i^{*1+\sigma}}{1+\sigma} - q_{ai}$$

Now the derivation of the threshold utility cost looks slightly different:

$$\begin{aligned} q_{ai}^* &= V_{2ai} - V_{1ai} \\ &= \log(I_{mi} - T_a(I_{mi}) + wh_i^* - T_a(wh_i^*)) - B \frac{h_i^{*1+\sigma}}{1+\sigma} - \log(I_{mi} - T_a(I_{mi})) \\ &= \log \frac{I_{mi} - T_a(I_{mi}) + wh_i^* - T_a(wh_i^*)}{I_{mi} - T_a(I_{mi})} - B \frac{h_i^{*1+\sigma}}{1+\sigma} \\ &= \log(1 + \frac{wh_i^* - T_a(wh_i^*)}{I_{mi} - T_a(I_{mi})}) - B \frac{h_i^{*1+\sigma}}{1+\sigma} \end{aligned} \quad (2)$$

Wives in this economy maximize their utility by solving the following problem:

$$\max \{ \log(I_{mi} - T_a(I_{mi})), \max_h \{ \log(I_{mi} - T_a(I_{mi}) + wh_i - T_a(wh_i)) - B \frac{h_i^{1+\sigma}}{1+\sigma} - q_{ai} \} \}$$

4.2 Taxes and the “Intra-Household Labor Income Gap”

The inputs for the average tax rate functions of 1967 and 1981 are calculated in the following way. We first partition the sample into different income brackets. Then we compute the average tax rate paid on the household (in 1967) or individual (in 1981) income in income bracket j in year $t \in \{1967, 1981\}$ as the average income tax expenses paid in income bracket j in year t divided by the average income in said bracket and year.

The following equation is then fitted to the data, separately for each year:

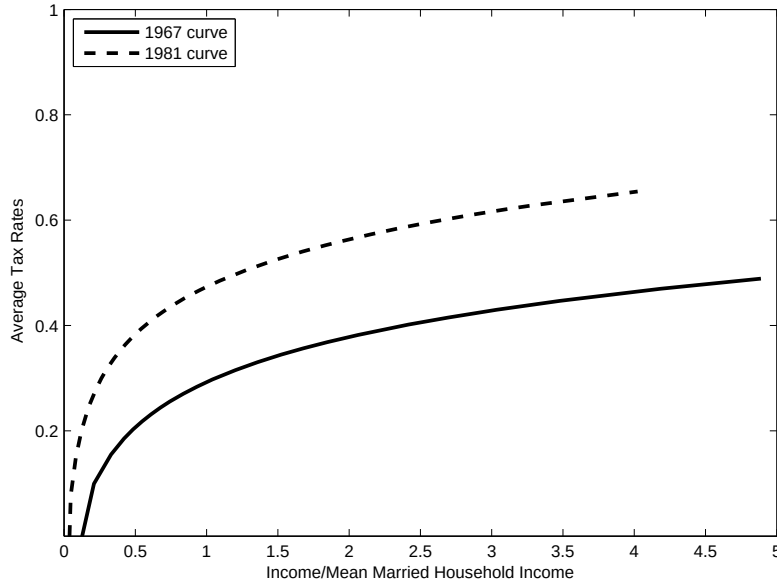
$$\frac{\text{Avg taxes}_{jt}}{\text{Avg income}_{jt}} = \eta_0 + \eta_1 \log\left(\frac{\text{Avg income}_{jt}}{\text{Mean household income}_t}\right) + \varepsilon_{jt} \quad (3)$$

The resulting coefficients are presented in Table 3 and plotted in Figure 5. Notable here is the progressivity inherent in both curves, together with the increased local and government tax rates, causing a high tax burden even for low income households.

Table 3: Coefficients of tax rate functions

Year	η_0	η_1	R^2
1967	0.2924	0.1238	0.94
1981	0.4734	0.1301	0.81

Figure 5: Average tax rate functions in 1967 and 1981

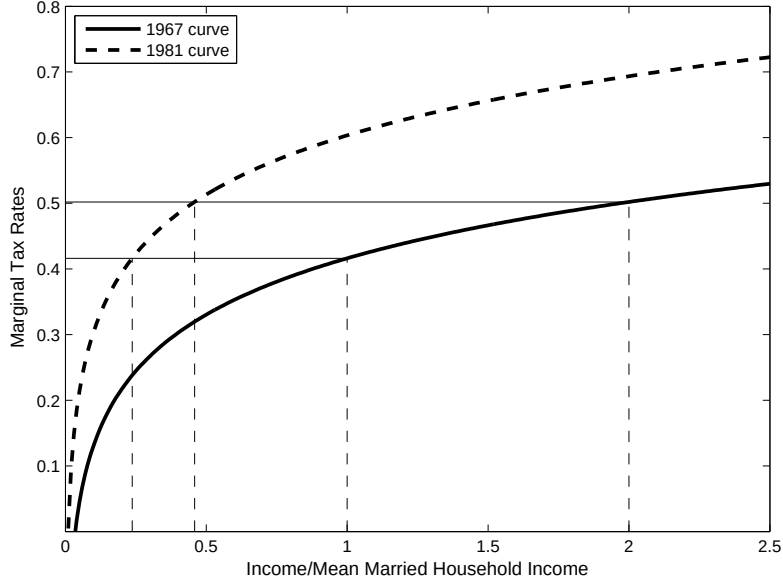


Let us now also distinguish average tax rates from the marginal tax rates. To arrive at the marginal tax rate functions, equation (3) is altered in the following way:

$$\frac{\partial \text{Avg taxes}_{jt}}{\partial \text{Avg income}_{jt}} = (\eta_0 + \eta_1) + \eta_1 \log\left(\frac{\text{Avg income}_{jt}}{\text{Mean household income}_t}\right) \quad (4)$$

The marginal tax rate functions for both years are displayed in Figure 6. The two rightmost vertical dotted lines indicate the marginal tax rates at one and two times the mean household income in 1967. The two leftmost vertical dotted lines show the corresponding marginal tax rate-neutral individual normalized incomes from 1981. The increased progressivity of the tax schedule means the husband of one-earner households would face significant (around 20 percentage points) increases in his marginal tax rates compared to 1967. However, the separation of the taxation scheme had important implications for the participation decision of the wives through several channels, one of them being the individual average tax rates. Since the incomes of husband and wife were bundled in 1967, the effective average tax rate faced by the wife was obtained through $(T_b(I_{mi} + wh_i^*) - T_b(I_{mi}))/wh_i^*$, while in 1981 this rate was simply obtained by $\tau_a(wh_i^*) = T_a(wh_i^*)/wh_i^*$. The average tax rates faced by the husbands in 1967 and 1981 were $\tau_b(I_m)$ and $\tau_a(I_m)$,

Figure 6: Marginal tax rate functions in 1967 and 1981



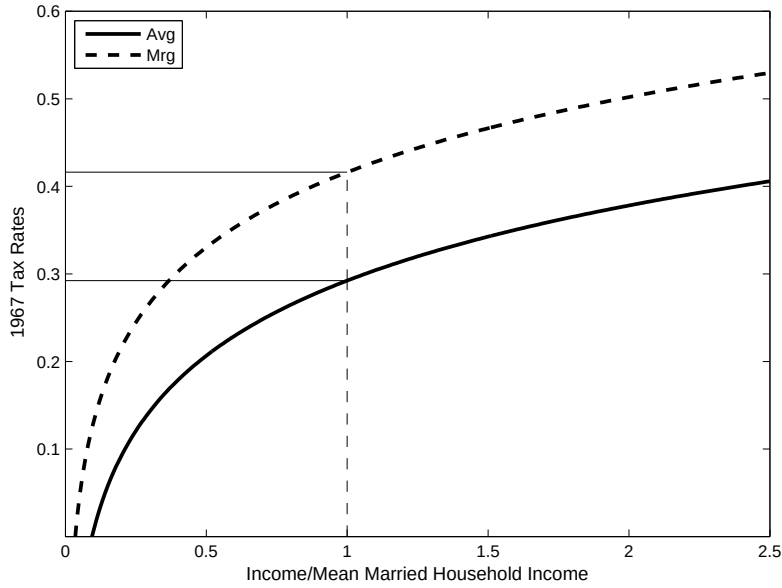
respectively. Given the secondary earner assumption, the first krona earned by wives in 1967 were taxed at the marginal tax rate of their husbands' last krona earned, and therefore wives were exposed to higher average tax rates than their husbands. In 1981 spouses were instead taxed separately, which served to lower the wives' average tax rates considerably. Of particular importance for the extensive margin was the participation tax rate, the tax rate faced upon entering the labor force. Figure 7 compares the average and marginal tax rates faced by households in 1967. Consider a one-earner household with an income level at the mean household income ($x = 1$), facing an average tax rate of just under 30%. In this household, the marginal tax rate, which is the participation tax rate for the wife, would be about 13 percentage points higher (the gap between the two curves at a given value of x), contributing to a high effective average tax rate for the wife. In 1981, this participation tax rate for the wife dropped to zero due to the separate filing.

If we take a deeper look at the wives' effective average tax rate in 1967 and define it as τ_{ewb} , we can derive that:

$$\begin{aligned}
 \tau_{ewb} &= \frac{T_b(I_{mi} + wh_i^*) - T_b(I_{mi})}{wh_i^*} \\
 &= \frac{(I_{mi} + wh_i^*)\tau_b(I_{mi} + wh_i^*) - I_{mi}\tau_b(I_{mi})}{wh_i^*} \\
 &= \frac{I_{mi}(\tau_b(I_{mi} + wh_i^*) - \tau_b(I_{mi})) + wh_i^*\tau_b(I_{mi} + wh_i^*)}{wh_i^*} \\
 &= \tau_b(I_{mi} + wh_i^*) + \frac{I_{mi}}{wh_i^*}(\tau_b(I_{mi} + wh_i^*) - \tau_b(I_{mi})) \\
 &> \tau_b(I_{mi} + wh_i^*) \\
 &> \tau_b(I_{mi})
 \end{aligned} \tag{5}$$

Now that we have grasped the features of the tax schedule in 1967 and 1981, a review of equations (1) and (2) would be fruitful. If we define the ratio wh_i^*/I_{mi} as the “before-tax income ratio”, the different designs of the tax structures in 1967

Figure 7: Average and marginal tax rate functions in 1967



and 1981 altered the ratio in opposite directions. In equation (1) we can see that before the reform, the entry $\frac{wh_i^* - (T_b(I_{mi} + wh_i^*) - T_b(I_{mi}))}{I_{mi} - T_b(I_{mi})}$ was a contracted version of the before-tax intra-household income ratio, since the effective average tax rate faced by the wife was higher than that of the husband, as we derived in equation (5). This results in the widening of the intra-household income gap.

After the reform, the entry $\frac{wh_i^* - T_a(wh_i^*)}{I_{mi} - T_a(I_{mi})}$ in equation (2) instead becomes an enlarged version of the before-tax income ratio, leading to the shrinking of the intra-household income gap. This was because the average tax rates faced by the wives were lower than the rates faced by the husbands as the wives had relatively lower income. A more intuitive illustration of this pattern can be seen in Table 4 and Table 5, portraying the effective average tax rates faced by the husband and the wife in 1967 and 1981, together with the before- and after-tax income ratio.

Table 4: Taxes and the intra-household income gap, 1967

	1967, Joint Filing		
	group 1	group 2	group 3
husband average tax rate	0.25	0.31	0.38
wife average tax rate	0.40	0.45	0.52
wife participation tax rate	0.37	0.43	0.51
wife/husband income ratio, before tax	0.49	0.33	0.26
wife/husband income ratio, after tax	0.39	0.26	0.20

Rather unsurprisingly, the before-tax income gap is smaller for the upper husband income groups in both years. Wives in 1967 were faced with effective average tax rates that were approximately 0.14 higher than their husbands'. This reduced the wife/husband income ratio by 0.1, 0.07 and 0.06 for the three groups, respectively, confirming the aforementioned contraction effect and increasing the net-of-tax intra-household income gap. Under separate filing in 1981, wives were faced

Table 5: Taxes and the intra-household income gap, 1981

	1981, Separate Filing		
	group 1	group 2	group 3
husband average tax rate	0.44	0.52	0.58
wife average tax rate	0.38	0.40	0.40
wife participation tax rate	0.00	0.00	0.00
wife/husband income ratio,before tax	0.64	0.41	0.25
wife/husband income ratio, after tax	0.71	0.51	0.36

with lower average tax rates relative to their husbands, leading to the enlargement of the wife/husband income ratio and thus shrinking the intra-household income gap. This will play a potentially important part in the upcoming simulations.

4.3 The Benchmark Economy

We now proceed to calibrate the model using the features of the 1967 environment to get our benchmark economy. We assume the economy consists of households that belong to one of the three husband income groups we defined earlier. The calibration procedure yielded a value for the disutility parameter B of 17.5 in order to match the average working hours of 28.4 for wives in 1967. The parameters from the gamma distribution ($\alpha=0.8003$; $\beta=0.2838$) yielded Table 6, showing the results of the calibration for the LFP rates of married women in the three different husband income groups. The aggregate LFP rate was 61.26% in the real data and 63.08% in our benchmark economy.

Table 6: The benchmark economy

	1967 Data	Benchmark
Aggregate LFP(%)	61.26	63.08
LFP by husband type(%)		
1	63.95	66.83
2	61.69	54.75
3	42.57	46.82

Table 7 reports the fit of our model to the 1981 economy. We keep the calibrated parameters ($B=17.5$; $\alpha=0.8003$; $\beta=0.2838$) from 1967, while using 1981 data for wages, taxes and household distribution. As can be seen, the numbers fit the data quite well. The model is able to capture the pattern of the participation rates by different husband income groups.

Table 7: Simulation results for the 1981 economy

	1981 Data	1981 Simulation ^a
Aggregate LFP(%)	81.82	83.04
LFP by husband type(%)		
1	82.73	83.97
2	76.42	76.15
3	64.29	66.81

^a 1981 simulation is the one with the parameters of the benchmark economy and the wages, taxes, and household distribution of 1981.

5 Results

5.1 Simulation from 1967 to 1981

In this section we aim to decompose the rise in the married female LFP that the model captures. We consider three potential explanatory factors: a rise in wages and a different household income distribution; a change in the income tax filing system (from joint to separate) and the alteration of tax rates. The results from the simulations are listed in Table 8. The first column contains the benchmark LFP rates, while the second shows the simulated rates for the 1967 economy with the wage rates and the income group distribution from 1981. The third column portrays the benchmark economy but with the separate filing structure. We keep the 1967 married couple tax schedule here to estimate the pure effect arising from the change in filing structure. In the fourth column, we account for the fact that changing the filing structure would mean the individual incomes are now subject to the single filing tax rate schedule, thus we apply the 1967 single tax schedule to fit the reality better. Finally, the fifth column shows the effect of altering the individual tax rates to 1981 values under a separate filing system.

Table 8: Alternative economies

	Benchmark	1981 Wages& Distribution ^a	Joint-to- Separate ^b	Single Tax ^c	1981 Tax ^d
Aggregate LFP (%)	63.08	72.14	75.71	75.83	77.24
LFP by husband type (%)					
1	66.83	73.89	78.20	78.29	79.33
2	54.75	59.08	69.98	70.15	72.21
3	46.82	43.52	65.17	65.43	68.63

^a The benchmark economy with the 1981 wages and distributions.

^b The benchmark economy with separate filing using the 1967 married couple tax schedule.

^c The benchmark economy with separate filing using the 1967 individual tax schedule.

^d The benchmark economy with separate filing using the 1981 tax schedule.

As you can observe in the table all variations serve to increase the overall LFP of wives in the model. Imposing the wage and income distribution of 1981 increases the LFP of wives in the first income group by seven percentage points, but has a

decreasing effect. This is because the impact of the increase in wages is crowded out by the increase in the intra-household income gap, which is captured by the decreasing wife/husband income ratio. This can be seen in Table 1 and Table 2, where the ratio for group one and two increases from 1967 to 1981 (the increase is larger for group one, hence the larger increase in LFP rate from the simulation), while it actually decreases for the third group, explaining the drop in LFP rates.

Turning to the introduction of the separate filing reform in the three alternative economies from the last three columns of Table 8, we see a significant and increasing quantitative effect on the LFP rates for all of them. The three economies all use separate filing systems, while they differ in the coefficients of the tax rate functions. The “Joint-to-Separate” column uses the coefficients from the 1967 married couple tax schedule; the “Single Tax” column uses the coefficients from the 1967 single tax schedule and the “1981 Tax” column uses the coefficients from the 1981 tax schedule⁹. These results would suggest that the tax rate itself is not a very important explanatory factor for the changes along the extensive margin of married female labor supply under separate filing.

Moreover, to focus on the effect on wives’ LFP when going from a joint to a separate filing system, we compare the benchmark economy with the “Joint-to-Separate” economy. It is worth mentioning here that the change in LFP rates are highest for income group two and three. This is because the wives in these households face the largest drop in their participation tax rate. Recall the discussion on the contracted and enlarged spousal income gap from section 4.2, where the contraction in the income gap becomes greater for households in income group two and three under the joint filing system. Changing to a separate filing system would mean these households enjoy a stronger enlargement effect of this income ratio and a shrinking intra-household income gap.

In Table 9, we see a further decomposition of the different effects at work. Overall, wages and distributions explain about 45.39% of the rise in LFP from 1967 to 1981, while going from a joint to a separate filing system explains about 63.28% of the rise. If we take a further look at the different husband income groups, we can see that a change of filing system explains up to 90% of the rising LFP for wives in husband income group three. The increasing explanatory power of the filing system reform in the upper husband income groups is consistent in the three alternative economies with separate filing. This effect, on the one hand, is again due to the enlargement effect of the spousal income ratio, and on the other hand, the result of the relatively low wife/husband income ratio incremental from 1967 to 1981 in income group two and particularly three (in the latter it is even negative).

⁹The coefficients for the 1967 married couple tax schedule and the 1981 tax schedule are reported in Table 3, while the coefficients for the 1967 single tax schedule are: $\eta_0 = 0.3649$, $\eta_1 = 0.1146$.

Table 9: Decomposition of changes in female LFP from 1967 to 1981

	1981 Simulation	1981 Wages& Distribution ^a	Joint-to- Separate ^b	Single Tax ^c	1981 Tax ^d
Aggregate LFP (%)	100	45.39	63.28	63.88	70.94
LFP by husband type (%)					
1	100	41.19	66.34	66.86	72.93
2	100	20.23	71.17	71.96	81.59
3	100	-16.51	91.80	93.10	109.10

^a The benchmark economy with 1981 wages and distribution.

^b The benchmark economy with separate filing using the 1967 married couple tax schedule.

^c The benchmark economy with separate filing using the 1967 individual tax schedule.

^d The benchmark economy with separate filing using the 1981 tax schedule.

5.2 Tax Structure, Progressivity and Married Women LFP

After decomposing the overall effects, we will proceed with a tax revenue-neutral exercise where we account for the increased progressivity in the tax schedule that started during the 1970's. This is carried out both under the joint and the separate filing system.

Although our simulations thus far have incorporated some change in the degree of progressivity, we have not yet assessed its impact while isolating the effect of other factors such as total government labor income tax revenue. Recall equation (3) for the effective average tax rate function from section 4.2. In order to assess the effect of a change in progressivity of the tax schedule on the LFP of wives in the different income groups, we proceed to insert different values for the coefficient η_1 while altering the corresponding coefficient η_0 to keep tax revenue constant, thereby effectively measuring the impact of a change in progressivity. In Table 10 we see the results for three different values of η_1 : 0.1, 0.2 and 0.3, in the 1967 system of joint filing (recall the actual estimated coefficient was 0.1238 in 1967 and 0.1301 in 1981).

Table 10: Tax progressivity scenarios with neutral tax revenue (a)

		1967, Joint Filing		
		$\eta_1 = 0.1$	$\eta_1 = 0.2$	$\eta_1 = 0.3$
	η_0	0.2935	0.2937	0.3079
LFP by husband type (%)				
	1	68.48	61.17	52.68
	2	56.65	47.95	36.90
	3	49.05	37.95	20.46

We see here that increasing the progressivity yields lower LFP rates for wives in all three income groups, with the biggest decrease for income group three. Recalling the earlier mentioned contraction of the after-tax wife/husband income ratio under joint taxation, increasing the progressivity under a joint filing system will further enlarge this contraction since wives, the secondary earners of the household, are

more exposed to the progressivity than their husbands. Overall, increasing the progressivity will serve to further lower the wife/husband income ratio and hence the threshold utility cost of the household.

In Table 11 we carry out the exact same simulation but under the separate filing system. These results instead indicate an increasing LFP trend in the income groups. Recalling the enlargement of the wife/husband income ratio, it follows that increasing the progressivity will contribute to further increasing this ratio and thus the threshold utility cost. This follows from the fact that the husbands are adversely affected by the change since they to a larger extent adhere to the upper parts of the income distribution. The effect will consequently be largest for households in husband income groups where the intra-household income gap is the highest.

Table 11: Tax progressivity scenarios with neutral tax revenue (b)

		1967, Separate Filing		
		$\eta_1 = 0.1$	$\eta_1 = 0.2$	$\eta_1 = 0.3$
LFP by husband type (%)	η_0	0.3242	0.3469	0.3711
	1	77.74	80.18	82.26
	2	69.09	73.92	78.24
	3	63.86	71.44	79.20

The takeaway from this exercise is that the filing system used matters for the impact of the degree of progressivity in the tax schedule. The impact is more severe under the joint filing system and affects the married female LFP negatively, increasingly in the upper husband income groups. Under the separate filing system, the effect is positive but rather weak.

5.3 Assumptions and Limitations

To adequately interpret the impact of these findings, some reservations are in order. First of all, the overall LFP rates and average hours worked were obtained for 1967 through the calibration of the B and q parameters. The 1981 model output was then generated by using the same parameter values. This resulted in a good fit for the LFP rates, while the hours worked on average among wives were overestimated. This could, as mentioned before, be due to the increase in part-time work that the model does not capture fully. In any case, we do not consider this a big setback since our focus from the outset has been on the extensive margin of labor supply and the increase in the participation of wives in the labor market. Furthermore, although the statistical yearbooks overall constitute a reliable source, the estimations of hours worked, particularly in 1967, are probably more prone to measurement errors than are the ones for LFP in the LIS data. Seeing as the information is survey-based, the question of whether or not you are a part of the labor force should yield more accurate responses than the question of exactly how much you have worked. Our focus on the participation decision therefore appears further justified. If one were more interested in addressing the intensive margin of labor supply, there might also be a need for imposing some sort of hours restriction or extra cost of work (in addition to q) to be able to accurately capture the increase in part-time work.

Due mainly to register data access restrictions we have been forced to abstract from life-cycle dynamics in the model. This makes us unable to account explicitly for such things as human capital investment-, savings- as well as retirement decisions. A natural extension of this paper would be to incorporate these features, preferably accompanied by the introduction of a home production sector.

Returning further to the discussion in section 3, we reiterate our choice to exclude households with children under the age of 17 living in the household. The presence of children can have severe implications for the labor supply decision of wives if, for example, there is no option for publicly funded health care, since the opportunity cost of work then increases (under the assumption that the wife typically stays at home with the child). However, there are several papers suggesting the negative effects of having children on the female labor supply is very small in Sweden. Gustafsson & Stafford (1992) study the joint decision of using subsidized day care for a sub-sample of Swedish married households. They show that the high quality of the publicly subsidized day care in Sweden makes entering the labor market a more attractive option (looking particularly at a sub-sample of married households with one pre-school child). This high-quality system, which has been active since the mid 1960's, they claim is even specifically adapted to allow for parent work (by providing lunch for the children, having opening hours until 18 and so on). Due to these beneficial circumstances and the high incidence of part-time work for mothers, their work incentives become affected in a way that our model does not capture. Also, as indicated, the difficulty of establishing the exact age of the child complicates proceedings. For completeness, we have in Appendix B entered the simulation results even for this group. As expected, the change in LFP rates is understated due to the highly flexible working environment. We refer the reader to the appendix for a further discussion on this matter.

Another excluded aspect of the model is payroll taxes. Payroll taxes have, during the period considered, increased significantly in Sweden due to both an increasing number of fees and higher rates for the already existing ones (see for example Söderberg (1996) for detailed bracket information or McDaniel (2007) for the development of average rates). In many countries where these taxes are paid by the worker (Denmark is a modern example), the design of the system can therefore have a potentially large impact on his or her labor supply decision. In Sweden however, these expenses are covered by the employer, whereby the rates will affect the unit labor cost and the demand for labor, but should not directly influence the labor supply decision of the worker. The labor income data for our sample is reported net of payroll expenses, meaning it represents the gross earned income received and declared by the worker. Furthermore, Hansson (2006) mentions that one reason for the increases in the Swedish payroll taxes in the mid 70's, at the expense of the central government income tax rates, could have been that this encountered less opposition from the working population. This was because, along the lines of our previous argument, the employers were the ones paying the cost and the employees were less aware of this "invisible" tax (p. 5). The effect of these taxes on the worker could therefore be described as ambiguous at best, if at all existent. For these reasons our labor supply model does not incorporate a payroll tax function, unlike for example Kaygusuz (2010) who estimates labor supply decisions for married women in the US in an otherwise similar setting.

Furthermore, as stated in section 4, we use a secondary earner assumption and

treat the husband's income as exogenous to the wife. This means that his preferences and optimization problems are not considered in any of our simulations. Again, since we want to focus on the reaction of the wife, her decisions are the important ones to account for, but a complete mapping of the effects of our simulations would benefit from analyzing also the husband's reactions.

Finally, there might be a case for arguing that the historical events that took place in the Swedish society during the 1970's contributed to a shift in both cultural and economic environments. This would complicate the justification of our method of steady state comparison and to use of the 1967 parameters to fit the 1981 data. This view has some merit, but we also believe the adjustment period following the introduction of the tax reform lasted for quite some time. With this in mind, the time scope can instead be considered as a reasonable transition period to a new steady state economy.

5.4 Implications

We have seen that a more individual structure of labor income taxation can provide good incentives for married women to enter the labor force. As mentioned earlier, this could have important implications for countries still using a joint filing system, while at the same time having a large married female labor supply reserve. This is because a majority of married females are found in upper age groups. Facing aging populations, the share of married women in this age group is bound to increase, and these countries will most likely depend on them to help satisfy future demands for labor.

The effect of the scale of progressivity has also shown to bear importance; exactly how will depend on the filing system used. Countries with a high degree of jointness in their filing system will be wise not to use progressive scales if they want to incentivize wives to enter the labor market. This might be of particular importance in countries where the gender income distribution is skewed and the husbands of wives outside the labor force are top earners. One way of identifying countries with these characteristics is to look at assortative matching patterns in income and education. In joint filing countries with a low degree of assortative matching, a low degree of progressivity might be a way of helping wives into the labor force.

The evidence from this paper thus suggests that separate filing reforms can have sizable effects on the LFP decision of wives, especially when combined with a progressive tax schedule. It should be noted though that we have disregarded some influences, one example being the impact of marriage instability. Our model makes the assumption that couples derive utility from a shared consumption bundle. The consequence of this is that the intra-household income ratio plays an important part in the LFP decision (as documented earlier in this paper by the roles of the contraction and enlargement effects). In less stable marriages, this assumption might be less accurate. For instance, one reason for the increased labor supply of married women in the US in recent years is believed to be the increase in divorce rates and the fact that married women have become more career-oriented and attached to the labor market. This has lowered both their own and the cross-wage labor supply elasticity (the latter in this case represents the labor supply response of the wife to variations in the husband's wage), which in turn means this group has become less responsive to alterations like income marginal tax rate cuts (Blau & Khan 2007). It

also suggests that US wives might be less dependent on the husband's income and derive less utility from the shared consumption. A similar tendency in countries like France, Portugal and Luxembourg would hamper the effect of separate tax reform attempts. Recent OECD data¹⁰ shows a decrease for all three countries in crude marriage rates as well as increases in crude divorce rates, suggesting a decrease in marriage stability. They however fare rather well when it comes to measurements of the mean duration of marriage to divorce over time, thus the overall effect on the labor supply responsiveness of married women is ambiguous and could benefit from further research.

This research could also benefit from a further decomposition of husband income groups. In this paper we have merged all households where husbands earn less than three times the average annual wife income into one group. This, we believe, will not present any noteworthy complications since the within group income distribution was rather compressed in both 1967 and 1981, and the tax code treated the majority of this group in a very similar way (since progressivity was concentrated in the upper income brackets). In countries with a more dispersed income distribution and a different progressivity schedule, it could be useful to look at other group compositions for the analysis.

Furthermore, although a separate filing system appears to provide an effective measure towards increasing the LFP of married women, it is also important to overcome cultural hurdles and traditional views about the married woman's role in the labor market. Silenstam (1970) mentions this kind of change of opinion in Sweden during the 60's, while there were strong feminist movements operating in the 70's to lobby against wage discrimination. These kinds of changes could be important complements to structural changes, and would most definitely go a long way in activating the underutilized married female labor supply in countries like Italy and Japan. In Japan, an under-subsidized child care system and reluctance from companies to rehire women who have taken out maternal leave has led to the isolation of many married women willing to work in the market. Increased spending from the government on child care, more flexibility on behalf of the companies and a more modern and accepting attitude towards married women entering the labor market is needed, not the least in order to accommodate the future demand for labor in a rapidly aging economy (Japan Times 2012). Research in this area could investigate the effectiveness of different public child care subsidization systems and tax breaks pertaining specifically to married women.

6 Concluding Remarks

This paper has looked at the evidence of the increase in married female LFP following the separate filing reform of household labor income in Sweden in 1971. Using a secondary earner model to analyze the labor supply decision of Swedish wives, we manage to replicate the change in LFP rates for three different groups, defined according to the difference in income of their corresponding husbands. Decomposing the effects found in our simulation, we find a significant influence from the introduction of the separate filing reform, bringing forth a significant positive change in the participation decision for the wives in all three of our husband income

¹⁰OECD Family Database 2012

groups. The change in wages and income distribution in the benchmark economy to its 1981 equivalents had positive effects on the participation decision in husband income groups one and two but negative for group three. This pattern is explained by the shrinking intra-household income ratio. Complementing the filing reform by also changing the tax rate schedules to the rates for single individuals in 1967 and 1981, respectively, alter the results somewhat but hardly by a large measure. This would suggest that tax rate level does not play an essential role for the wife's participation decision under the separate filing reform. To confirm the impact of the degree of progressivity during the period from 1967 to 1981, we conduct a tax revenue neutral experiment where we vary the progressivity in the 1967 tax system under a joint and separate filing scheme, respectively. The results from this exercise suggest that increasing the progressivity will have sizeable and negative consequences for the participation decision of wives under the joint filing scheme, while the effects are positive but rather weak under the separate filing system.

The driving force behind these findings is the importance of the intra-household income ratio. In a system of joint filing, the participation tax rate for the wife is dependent on her husband's income, which means a higher degree of progressivity will negatively affect the participation decision. This is not the case in a system of separate filing, where the high progressivity adversely affects the husbands, seeing as they to a larger extent adhere to the upper part of the income distribution.

Our findings provide potential policy implications for countries currently using a system of joint filing for labor income, and suggests caution is warranted when choosing the degree of progressivity. Several OECD countries today are struggling with aging populations and will have to count on underutilized parts of the active population to satisfy the future demand for labor. For countries like France, Luxembourg and Portugal, the introduction of a separate filing reform could present married women with better incentives to join the labor market.

7 References

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Appendix A Local- and Central Government Tax Schedules in 1967 and 1981

Table A12: Local Taxes and Standard Deductions

Year	Proportional	Standard Tax Deductions			
	Local Tax	Local,Single	Local,Married	Central,Single	Central,Married
1967	0.1871	2250	4500	2250	4500
1981	0.2955	6000	-	0	-

Table A12 shows the average local government tax rates in 1967 and 1981 together with the local and central government standard deductions for married and single households (in nominal values).

Table A13: 1967 central government tax schedule for married couples

Taxable Income	Marginal Tax Rate (%)
0-12000	10
12000-16000	15
16000-20000	22
20000-24000	27
24000-30000	34
30000-40000	42
40000-60000	48
60000-100000	54
100000-150000	59
>150000	65

Table A14: 1967 central government tax schedule for single individuals

Taxable Income	Marginal Tax Rate (%)
0-6000	10
6000-8000	15
8000-10000	22
10000-15000	27
15000-20000	31
20000-25000	36
25000-30000	40
30000-40000	44
40000-60000	49
60000-100000	54
100000-150000	59
>150000	65

Table A13 and Table A14 report the central government labor income tax brackets for married and single households (nominal values), respectively.

Table A15: 1981 central government tax schedule

Taxable Income	Marginal Tax Rate (%)
0-6400	1
6400-25600	2
25600-32000	4
32000-38400	5
38400-44800	8
44800-51200	11
51200-57600	14
57600-64000	20
64000-70400	22
70400-76800	26
76800-83200	29
83200-89600	33
89600-96000	38
96000-102400	44
102400-108800	45
108800-128000	48
128000-192000	53
>192000	58

Table A15 gives us the central government labor income tax brackets for individuals in 1981 (nominal values).

Appendix B Results for Married Women with Children

Table B16 shows the LFP data for wives in households having children under the age of 17 living in the household. The rightmost column shows the percentage of the change in the data accounted for by our model. As can be seen the explanatory values range from around 26% to 60%, with a worse fit for group two and three. As previously mentioned the model severely understates the change in LFP participation, mainly due to the influence of part-time work. It is not unreasonable to believe that this bias is strongest for income group three, as the wives in these households with higher-earning husbands probably can afford more flexibility in their working arrangements. There is also the case of parental leave that clouds the rational incentives to provide labor. For example, although we cannot separate children by age, wives planning to have children or already having young children might increase their working time in order to become eligible for parental leave compensation. Also, after 1974, when fathers became eligible for parental leave, one possible scenario could have been that wives in households with higher-earning husbands were further encouraged to enter the labor force for part time jobs just

to enable their husbands to use some of the compensated leave. This would have incurred a high marginal utility for the husband from leisure while keeping 90% of his income. Seeing as group two and three account for a rather small part of the overall sample in 1981, this could further explain the downward trend in explanatory value in the table, while being consistent with the fact that the introduction of parental leave in 1974 did not have any significant overall effects on the amount of compensated leave days used by fathers.

Table B16: Results for married women with children (%)

husband type	1967		1981		Change
	Data	Benchmark	Data	Simulation	Accounted for
1	48.64	46.32	77.54	65.18	60.41
2	39.78	35.77	78.60	59.68	55.84
3	33.44	39.74	83.07	50.91	25.77
Total	45.39	43.84	77.85	64.18	59.81