Appendix for Online Publication

Labor Supply Responses and Adjustment Frictions: A Tax-Free Year in Iceland

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A Overview of the Icelandic Income Tax System

Up until and through 1987, income taxes in Iceland were collected with a one year lag. That is, the tax payments made throughout every year were based on the income earned in the year before. In practice, early each year an income tax return was filed for the income earned the previous year, including other components such as deductions to be made, assets and liabilities for the calculation of wealth taxes etc. The outstanding tax liability was then computed based on this information. Throughout the year, taxes were then paid in 10 equal payments – on the first day of each month of the calendar year, except January and July. At the beginning of the year, before taxes had been computed, taxpayers paid a fixed share (decided by the Directorate of Internal Revenue, DIR) of their payments in the preceding year. Once the tax returns had been compiled and the correct tax payment had been computed, the difference between the outstanding tax liability and the tax installment payments already made was divided equally between the remaining months of the year to find the monthly payment. After the reform, taxes on income earned in year t were collected during year t through "withholding at source". That is, employers deducted taxes from their employers' paycheck and remitted them to the government.

Although this system had some advantages, such as easing the work of the tax authorities that had to take into account a range of tax deductions and allowances to arrive at the correct tax liability, it had obvious drawbacks, both for the taxpayers and the collectors of tax revenue. Taxpayers with variable or cyclical income, such as those employed in the fishing sector or in agriculture, faced a countercyclical variation in their tax burden relative to their current income. From the perspective of the government and the municipalities, this system could be a handicap, as their revenues were misaligned with e.g. the price level of their current expenses.

Income taxes in Iceland are levied at two levels: a national tax and a local level municipal tax. As described in Section 2, during 1987 all taxes on labor income at both levels were set to zero. The tax schedule prior to the reform consisted of three national level brackets and a municipal tax. In addition, there were a few small and lump-sum income taxes, such as health insurance contribution, cemetery charge, church tax and contribution to the construction fund for the elderly. All taxable income – both labor and capital income – was taxed equally and in the same way at the national and municipal levels.[61] Before arriving at the tax-base, multiple deductions could be made. As these deductions differed substantially between the national and municipal level, the tax base for the two

[61] A separate taxation of labor and capital income was introduced in 1997.

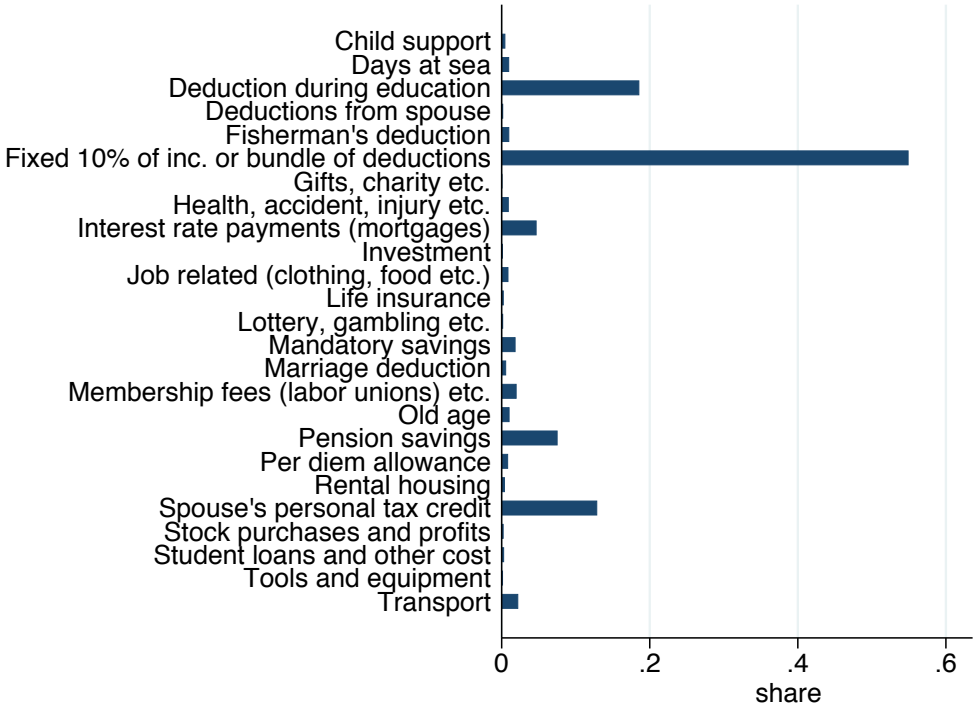


Figure A.1: Tax Deductions

Notes: The figure plots tax deductions in 1986 by category as shares of total deductions.

levels was different. The components that were deductible at both levels included fringe benefits, travel allowances, purchases of tools, machines and instruments, mandatory savings, child support and education related costs. At the national-level there were various other deductions such as a special fisherman's deduction, deductions for each day spent at sea, special deductions for costs for starting a family ('wedding deduction'), interest expenses, pension savings, union membership fees, charitable gifts etc. Moreover, in exchange for a subset of these options for deduction, the tax law offered tax payers the option to instead deduct a fixed 10% from the national-level tax base – an option which many exploited. Figure A.1 documents the share of the categories of tax deductions of total deductions in 1986. While including both labor and capital income as the national-level tax-base, pension and social security benefits were not part of the municipal tax base but were included in the national-level tax base. To summarize, the tax-base at the municipal level tended to be higher than at the national level. As a result of those features, the progressive income tax schedule consisted of four brackets, consisting of three national level brackets and a municipal tax. In addition, each worker had a personal tax allowance – both at the municipal and national level, which was deduced from his computed tax payments. At the national level this amount was fixed and the same for everyone, but the municipal allowance depended on marital status and the number of children. The allowance at both levels was deducted from the outstanding tax liability.

Since 1978, Iceland has had an individual tax system, such that married and cohabiting individuals have been taxed as single units but not jointly. Therefore, each spouse files his/her own tax return, has a separate tax allowance and deductions. However, the tax system has some joint aspects that

were incorporated into the tax system with the aim of lowering the tax burden of two-adult households with a single earner and households with low-income secondary earners. First, married and cohabiting individuals were allowed to transfer to their spouses both their personal tax allowance and tax deductions that remained unaccounted for after their own income taxes had been paid in full.[62] Second, married or cohabiting workers whose spouses were out of the labor force or with a very low income could increase the amount which was taxed in the first bracket by up to half of what remained after their spouses' income was fully accounted for.

The tax rates were frequently reviewed in relation to the government's budget. Although national-level tax rates had been on a slight decreasing trend throughout the 1980s, as documented in Figure 5a, the difference across brackets had remained stable. Moreover, the tax-bracket thresholds, which were set in nominal values and reviewed and updated yearly to account for changes in prices and wages, represent roughly the same income percentile over time, as shown in Figure 5b in the main text. The figure also documents that the bottom-bracket threshold, below which individuals do not pay the national-level income tax, corresponds to roughly the 40th percentile of income throughout the pre-reform period. However, since the tax-base for the municipal tax was different and generally higher than the national-level tax-base, a share of workers that fall below the bottom-bracket threshold pay the municipal tax.

Due to the reform, many of the deductions that were an integral part of the old tax system were abolished. These included a deduction for newly married couples, mandatory pension savings, union membership fees, interest payments on loans and mortgages, various work-related deductions and a 10% fixed deduction. Deductions from the municipal tax were abolished, but the tax rates were lowered such that the municipal tax revenue was almost unaffected. As a result, the tax base at the national and municipal level became one and the same after the reform. In addition, other adjustments were made to the tax system, such as replacing the interest payment deduction with an interest allowance and a housing allowance for first housing purchases, paying out child benefits directly instead being integrated into the tax system, and incorporating minor fees such as to the church and cemeteries into the main income tax, all of which simplified the tax system and made it easier to manage for the authorities. In exchange for the deductions in the old system, the personal tax allowance was increased by half and now served as a single source of tax deduction, with the aim of keeping the tax burden the same in the new and simplified system.[63]

B The Tax Reform and the Time-line of Events

On January 1, 1988, Iceland took up a withholding-based pay-as-you-earn income tax system. Prior to the reform, income taxes were collected with a one year lag. That is, as depicted in Figure 1, the tax liability and tax payments due every month in year t were computed based on income in year $t-1$. This system was similar to that in place in most Western countries prior to adopting the modern

[62] Following the reform, however, the share of the personal tax allowance that was transferable between spouses was reduced from 100% to 80%.

[63] In 1988, the personal tax allowance equalled 22.6% of the average income compared to 12.7% in 1986.

pay-as-you-earn tax systems.[64] When the tax reform was announced on December 6, 1986, it was also announced that during the transition year of 1987, labor income would not be taxed. As Figure 1 depicts, this implies that while people were paying taxes every year, including in 1987 when they paid taxes based on their income earned the year before, all income earned in 1987 was tax free. Therefore, the reform did not influence the government's budget, as the tax revenue flows were uninterrupted, nor did it generate a cash-flow effect on workers.[65] However, since all marginal income earned in 1987 was tax free, the reform generated a strong incentive for intertemporal substitution: Work more during the tax-free year and less in other years.

On December 6, 1986, the Finance Minister announced a tax reform to take place in January 1988 when a system where taxes were collected with a one year lag would be replaced with a pay-as-you-earn withholding tax system. An important part in understanding the implications of the tax-free year is understanding how and when the Icelandic population learned about it. As evidence on when the population learned about the reform, Figure 4 plots the monthly count of the number of newspapers mentioning a withholding-based or pay-as-you-earn tax system between January 1980 and December 1988, i.e. almost seven years before the announcement.

When the reform was announced, and for a long time before that, there was a broad political consensus that a tax reform was needed. The first records of a pay-as-you-earn system being discussed in the Icelandic parliament date back to the mid 1960s (Olgeirsson, 2013). Neighboring countries, such as Norway, Sweden, the US, the UK and Ireland, had already introduced such a system in the 40s and 50s. Icelandic politicians, as well as the labor unions, publicly highlighted the defects of the existing system and the benefits of introducing a withholding-based system. However, discussions and attempts in 1978 and 1981 were unsuccessful, mainly because adopting a withholding-based tax system using the existing tax code was technically complicated or infeasible due to the structure of the tax system, which had a range of deductions and transfers that would complicate the calculations and likely lead to large differences between the income tax withheld during the year and the tax payable at the end of the year (Olgeirsson, 2013).

In the fall of 1986, the Ministry of Finance began preparing a tax reform. In November, the finance minister commenced a committee to work on a proposal revising the income tax system. Around the same time, in late November and early December 1986, national level union bargaining on general employee rights and minimum wages was in progress. Traditionally, the bargaining often effectively takes a form of tripartite negotiations, with the government often having an input at later stages to close the contracts.

On December 6, 1986, new collective agreements were signed and the finance minister announced the tax reform, which was the government's input to a settlement. The pay-as-you-earn tax system

[64]The US transitioned to a withholding-based PAYE system in 1943, when the Current Tax Payment Act was passed, and the UK reformed its system in 1944 after trials in 1940-1941. Sweden passed a law establishing a PAYE system in 1945 that took place two years later. Similarly, Norway passed a law in 1952 but the reform took place in 1957 and Ireland passed a law in 1959 with a reform the following year. More recently, Switzerland transitioned to a PAYE system in 1999-2003. France is the last holdout of the Western countries, but a reform is currently underway.

[65]The modern income-tax system was established in 1877. The tax laws, specifying progressive taxes collected with a lag, were passed four years after Iceland got a constitution and was granted home-rule, after having been part of Denmark until 1874. When giving a tax-free year in 1987, the government was essentially giving up one year's tax revenue, which will be evident that it has been lost when examining the Treasury's position on "Judgment Day".

was scheduled to be implemented on January 1, 1988. The finance minister ordered the aforementioned tax-reform committee to prioritize proposing simplifying changes to the income tax system that would be necessary for an implementation of a withholding-based tax system. In order to avoid a heavy tax burden and "double taxation" during the transition to the new system, i.e. that workers would pay taxes on both income earned in 1986 and 1987 using their 1987 income, it was decided that all labor income earned in 1987 would be exempt from taxes.[66] Naturally, the reform received much media attention in the following days and weeks. Newspapers printed headlines such as "*A Tax-Free Year*" and "*Pay-as-you-earn tax system in 1988 – all income in 1987 tax-free*". In an interview, a chairman of one of the largest labor unions was quoted saying "*Now it is time for everyone outside the labor market to enter, and for all workers to earn tax-free income. There exists work for everyone that wants to work.*"[67]

Based on the proposals set forth by the tax-reform committee, four parliamentary bills were prepared in the first weeks of 1987. These served the purpose of paving the way and preparing the transition to a pay-as-you-earn tax system, either directly or indirectly by simplifying parts of the tax system necessary for the transition. A specific law was passed specifying that labor income earned in 1987 should not be taxed, and a law on the timing of the transition taking place on the 1st of January 1988, as had been scheduled when the reform was first announced. On March 16-18, 1987 all bills necessary for the new tax system were passed by the parliament and signed into law.

In practice, workers and firms were to collect information as usual and file taxes at the beginning of 1988 as in earlier years. The tax authorities sent out advertisements emphasizing that the requirement for enjoying a tax-free year was to file taxes as usual and flyers explaining the new tax system and that income earned in 1987 was tax free (see Appendix Figures A.11 and A.12). For those that would not file their taxes, their income would be approximated based on their income in the year before and they would be taxed as in a normal year. Reporting information as usual was also important because other taxes, such as on capital income and wealth, and benefits were unchanged in 1987; the only change in that year was that income taxes were set to zero.[68]

While the general rule was that all labor income in 1987 should be exempt from taxes, some attempts were made in order to prevent an abuse of the reform. The documents and explanations associated with the law explicitly expressed a very positive view and encouragement of the legislature towards workers exploiting the opportunity that the reform provided to increase their disposable income in 1987 by increasing their labor supply by all means. However, a clear aim was that any abuse of the reform by entrepreneurs or firm owners should be prevented. The law therefore specified two exceptions to the general rule. First, increased earnings in 1987 that were not due to more work or changes in employment arrangements, such as promotion, but rather reflecting transfers of

[66] Although policy makers are likely to want to make some adjustments to tax payments during the transition, a tax-free year is not the only option. There are two options for such adjustments: forgive outstanding (or some) tax liabilities in the transition period, or collect no (or lower) taxes on income earned during the transition period. When the US established a withholding based tax system in 1943, the adjustment took the form of forgiveness of most of the outstanding tax liabilities. According to the Current Tax Payment Act of 1943, 75 percent of the 1942 tax liability was cancelled with the remainder being due in two equal payments on March 15, 1944 and March 15, 1945 (Paul, 1954).

[67] See *Morgunblaðið*, December 7, 1986.

[68] After the tax returns had been processed, the tax office computed how much of the income taxes due should be waived based on reported labor and capital income. For workers with no taxable capital income, this share would be 100%.

income from other years should be taxed as usual. Second, inflation-adjusted increases in earnings of self-employed workers and business owners exceeding 25% should be taxed as usual. Studying the records, however, I find that these measures seem to have played a limited role de facto.[69]

C Data and Measurement

The following appendices provide a further description of the data and measures than provided in the main text.

C.1 Tax Calculator

Marginal tax rates are not directly observed in individuals' tax returns. Marginal tax rates and in which tax bracket individuals' next krona of income falls are crucial for my analysis. As there exists no tax simulation model for Iceland, such as the NBER TAXSIM model that computes marginal tax rates in the United States, I have constructed a tax calculator for the Icelandic tax system. The calculator uses details of the Icelandic tax system in each year, taking into account all tax deductions as well as family aspects of the tax system, such as transfers of tax allowance and extensions of tax brackets due to low spousal income.

The total marginal tax rate is calculated as the sum of the municipal income tax rate (*útsvar*) and the national income tax rate. The individual's marginal tax rate is found as follows. The municipal tax is a flat tax rate, which therefore corresponds to a marginal tax rate on the municipal-level tax base after accounting for deductions. At the national level, there are three tax brackets until 1986 and a flat tax rate in 1988 and onwards. In order to compute the marginal tax rate, I first compute the income tax base by summing over all relevant measures of income and withdrawing all relevant deductions. All necessary information is reported separately in tax returns (and the final tax base in 1985 onwards). Then, the income tax in each bracket is calculated based on the individual's tax base. Married and cohabiting individuals whose spouses have a sufficiently low income, or are out of the labor force, can increase the amount taxed in the first tax bracket by up to 50%. The calculation of taxation in each bracket accounts for this. From the total income tax calculated, I withdraw their own tax allowances and, in some cases, transferred allowances between married and cohabiting individuals. This provides the total income tax payable and – depending on in which tax bracket the next krona earned would be taxed – the marginal tax rate.

Empirically, the tax calculator is accurate and in the years prior to the 1987 reform, it predicts actual liabilities within 10 ISK ($\approx$ \$0.25) for 97.5% of the tax filers. The discrepancy is, to a large extent, due to inaccurate information related to moving, either within our outside Iceland, since the accuracy increases to 99.5% when I the restrict attention to national-level taxes only.

[69] Based on administrative tax records, there were only 255 cases where individuals had excess income taxed on these grounds. One potential implication of these clauses, as well as an interpretation of the fact of so few cases of income being taxed as transferred income, is that self-employed workers and business owners bunch at their permitted income growth of 25%. When studying this possibility, I find limited evidence of bunching, indicating that these conditions were in most cases not strictly binding.

Table A.1: Summary Statistics for the Icelandic Working-Age Population and Subsamples

	Population (1)	Working population (2)	Self employed (3)
Demographics			
Age	37.67	36.97	42.80
Female (%)	46.33	47.31	15.18
Married (%)	57.45	57.51	70.70
Number of Children	0.76	0.78	1.01
Capital Area (%)	56.45	55.50	43.94
Junior College (%)	35.86	36.94	42.23
University degree (%)	9.71	9.79	13.34
Income and Working Time			
Wage Earnings ($)	10,807	11,728	13,888
Capital Income ($)	91	86	121
Other Income ($)	477	357	341
Weeks Worked (all jobs)	37.96	41.20	58.43
Tax Rates and Brackets			
Marginal Tax Rate (in %)	17.82	19.00	23.34
Average Tax Rate (in %)	10.21	10.89	13.84
Municipal Tax Rate (in %)	10.27	10.27	10.26
Number of individuals	162,804	150,013	18,220

Notes: Table entries are means for the group defined in the column header in 1986. Column 1 includes the population of all tax filers of age 16-70. Column 2 includes individuals with non-zero labor earnings. Column 3 includes the subpopulation working in self-employment, either as the primary or secondary job. The number of children is children of age 0-18. Capital area is the share living in Reykjavik and the surrounding area. Monetary values are in real 1981 US dollars. Capital income is taxable capital income.

To calculate the average tax rate, I divide the national and municipal income tax payable by the respective tax base (accounting for differences in deductions at the national and municipal level). The total average tax rate for an individual is then the sum of the two.

C.2 Summary Statistics

Table A.1 presents summary statistics in 1986 for the population of 16-70 year olds as a whole, for all wage earners and for self-employed individuals. The average age in the population is 38 years and 45% of the population are women. About 36% have a junior-college degree (post compulsory schooling) and 10% have a university degree. Among those with non-zero labor earnings, the average weeks worked are 41. The average marginal tax rate was 19% and the average tax rate – computed as the average tax payments divided by the tax base – was roughly 11%.

C.3 Occupation and Sector Classification

Payslips include information about occupation according to a two-digit classification. There are 74 separate occupation classes recorded. The occupation classification is based on the International Labor Organization's (ILO) International Standard Classification of Occupations (ISCO), version ISCO-88. More details on the classification are provided in documentation on ILO's website. Table A.2 documents the structure of the classification and lists the broader occupation groups.

The payslips also record the sector for each firm. In total there are 189 separate sector classes

Table A.2: Occupation Classification

Group	Occupation Category	Nr. of sub-categories
1	Legislators, senior officials and managers	17
2.	Professionals	5
3.	Technicians and associate professionals	8
4.	Clerks	7
5.	Service workers and shop and market sales workers	9
6.	Plant and machine operators and assemblers	1
7.	Skilled agriculture and fishery workers	7
8.	Craft and related trades workers	11
9.	Elementary occupations	9
0.	Armed Forces	0
		74

Notes: The occupation classification is based on the International Labor Organization's (ILO) International Standard Classification of Occupations (ISCO), version ISCO-88. For a detailed description of the classification, see documentation on ILO's website.

Table A.3: Sector Classification

Group	Sector Category	Nr. of sub-categories
1	Activities of extraterritorial organizations and bodies	2
2	Agriculture and Forestry	10
3	Fishing	6
4	Manufacturing	64
5	Mining and quarrying	2
6	Construction	16
7	Other service activities	6
8	Electricity, gas, steam, and air conditioning supply	2
9	Water supply; sewage, waste management and remediation activities	2
10	Wholesale and retail trade; repairs of motor vehicles and motorcycles	19
11	Financial and insurance activities	5
12	Real estate activities	2
13	Rental and leasing activities	2
14	Transportation and storage	10
15	Public administration and defense; compulsory social security	6
16	Education	4
17	Human health and social work activities	11
18	Arts, entertainment and recreation	8
19	Professional, scientific and technical activities	9
20	Activities of households as employers	1
21	Accommodation and food service activities	2
		189

Notes: The sector classification is based on United Nations' International Standard Industrial Classification of All Economic Activities (ISIC). For a detailed description of the classification, see documentation on UN's website.

Table A.4: Education Classification According to Statistics Iceland's Education Register

Level	Description	Broad Category	Nr. of sub-categories
0	Less than primary education		1
1	Primary education	Compulsory education	1
2	Lower secondary education	Compulsory education	8
3	Upper secondary education	Junior college	8
4	Post-secondary non-tertiary education	Junior college	5
5	Short-cycle tertiary education	University education	2
6	Bachelor's or equivalent level	University education	3
7	Master's or equivalent level	University education	2
8	Doctoral or equivalent level	University education	1
			31

recorded. The sector classification is based on the United Nations' International Standard Industrial Classification of All Economic Activities (ISIC). Details about the classification are provided in documentation on UN's website. Table A.3 documents the structure of the sector classification.

C.4 Education Classification

In my analysis, I use data on educational attainment from Statistics Iceland's Education Register. This source contains yearly data on the highest level of education completed in that year. The data set is categories of education attained according to the Icelandic national standard for the classification of educational attainment, *ÍSMENNT2011*, which builds on the international standard classification of education, *ISCED 2011*, but taking into account education attained by Icelandic students from the early 20th century. This classification, as the ISCED, divides education attained into nine categories, out of which six are further subdivided leading to a complete set of 31 educational classes.

D Tax-Bracket DD: Bracket Persistence and Mean Reversion

There is an extensive literature estimating the elasticity of taxable income (see e.g. Saez et al., 2012, for a recent survey.). In particular, dating back to the seminal study of Feldstein (1995), much work has been carried out studying tax reforms in the United States in the 1980s and 1990s. A particular feature of these reforms is that they generated decreases in tax rates at the top of the income distribution. The fact that much of the variation exploited is centered at the top of the income distribution has spurred much discussion on possible consequences for the estimated elasticities (Saez et al., 2012). Three problems have been highlighted. First, as highlighted in Gruber and Saez (2002), if the income distribution is continually widening, e.g. due to factors such as skill-biased technical change and globalization, it may be hard to disentangle long-term effects of tax changes – in particular at the top of the income distribution – from such trends. Second, since income is often the main driver of marginal tax rates, and income has both a permanent and a transitory component, a positive transitory income shock in the pre-reform year will tend to result in a lower income in the years after, therefore biasing elasticity estimates downward. Third, studies using tax return data, in particular from the US, often have little information about tax payers other than their income and taxes, which makes it difficult to control for differences in the characteristics of tax payers at the top vs. at lower

levels in the income distribution.

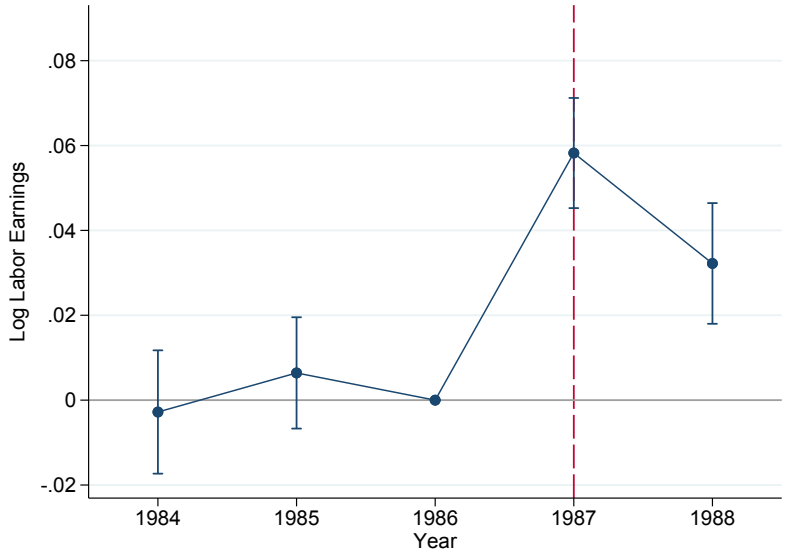
Compared to this literature, the natural experiment provided by the tax-free year has several advantages that allow me to overcome the biases discussed above. First, the tax-free year affected taxes across the whole income distribution. Furthermore, most of my analysis is concerned with short-term responses to a temporary tax cut. Therefore, this alleviates the concerns related to long-term trends such as the evolution of inequality. Second, the variation generated by the tax-free year is not as closely linked to levels of labor earnings as the variation exploited in the aforementioned studies. Due to multiple tax deductions and tax credits, there was a substantial overlap in the earnings distributions across tax brackets. Third, my data have very detailed information about the tax payers' characteristics, as well as their earnings, deductions and tax payments, allowing me to control for a rich set of covariates in my regressions.

Even for these advantages, a potential bias might arise due temporary mean reverting income shocks. For example, some people that are in a high tax bracket in the previous year are there because of an income shock that reverts to the mean in the current year, generating a downward bias in the earnings elasticity. Although I find that individuals' tax-brackets positions tend to be persistent, as documented in Figure A.13, and my analysis of pre-reform years finds no evidence of false positives, as documented in Figure 6, I have performed additional analysis along several dimensions to assess the robustness of my results to these concerns.

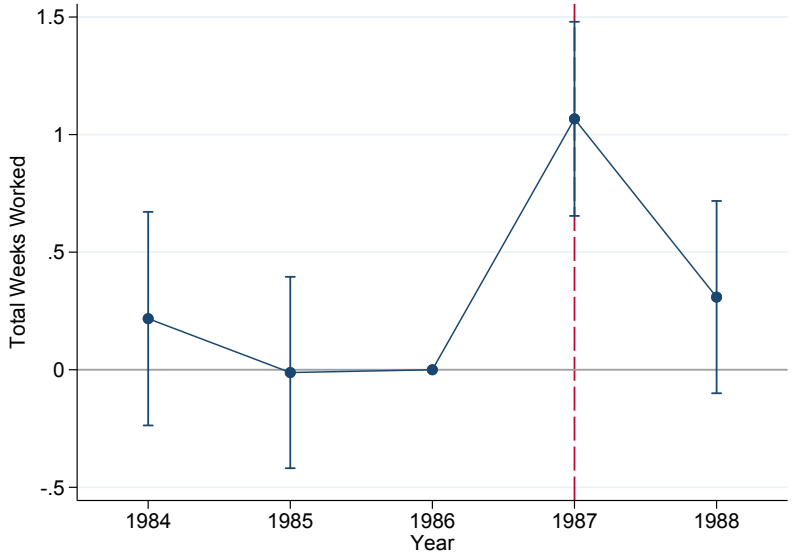
I document results from two informative exercises. First, I perform a prediction exercise, where I predict workers' tax bracket (treatment status) using a rich set of individual characteristics, with the aim of constructing more stable treatment and control groups. For each year, the prediction is based on an estimation of a multinomial logit model where the outcome variable is a categorical variable for the tax brackets. I perform an out-of-sample prediction, in the sense that outcomes for the year predicted are excluded but information from all other pre-reform years is included. The set of right-hand-side predictors includes indicator variables for tax brackets in the past three years and individual characteristics including dummies for age, gender, marital status and the number of children, and a dummy for living in the capital area, which are also included in interaction with tax brackets. The model also includes a full set of dummies for the previous year's percentile in the income distribution. As documented in Figure 5b, tax bracket thresholds correspond to roughly similar quantiles of the income distribution over time. Including dummies for the previous year's percentile in the income distribution in the model proxies for, e.g., distance from the tax bracket thresholds, across which temporary shocks might push individual workers. In every year, I assign workers to tax brackets based on the predicted probabilities from this estimation, provided that the bracket position is predicted with at least 50% probability.[70] The pseudo R^2 from the multinomial model estimates are in the range of 0.40-0.45, depending on year, compared to about 0.30-0.35 when only the previous year's tax bracket is included. Second, I have also performed an estimation where I define workers' treatment status based only on those that stay in the same bracket for the three consecutive years prior to 1987, while excluding others.

Figure A.2 plots coefficient estimates from a dynamic reduced-form estimation where the treat-

[70] The results are robust to requiring higher levels of prediction accuracy.



(a) Reduced Form: Log Labor Earnings



(b) Reduced Form: Total Weeks Worked

Figure A.2: Predicted Tax Brackets: Dynamic Difference-in-Difference

Notes: The figures present estimates from a dynamic DD version of equation (1), estimated in the following regression

$$y_{it} = bracket_{i,t-1} + \delta_t + \eta_t \cdot B_{i,t-1} \times \delta_t + \boldsymbol{X}'_{it}\gamma + \mu_{it},$$

where the outcome variable in panel (a) is log labor earnings and in panel (b) total weeks worked. They plot the coefficients η_t, where $B_{i,t-1} \times \delta_{t=1986}$ is normalized to zero, and tax-bracket position is predicted using 3 lags of tax-bracket position as well as other characteristics, as described in the text. Standard errors are clustered at the individual level and the vertical bars plot the 95%-confidence intervals.

ment status is based on the predicted tax-bracket. Similar to my main specification (Figure 6), the pre-reform coefficients are not statistically significant, implying parallel trends. Table A.11 presents estimates of the elasticity of labor earnings, where the treatment status is assigned using the same procedure. The elasticity estimates, as well as the reduced form estimates, are roughly similar to

those estimated under my main specification and, if anything, only marginally larger. Similarly, the estimates of the elasticity of weeks worked, reported in Table A.12, are very similar to those under my main specification. These results are also robust to using more or fewer lags of tax-bracket position in the prediction exercise. Tables A.13 and A.14 report the effects on labor earnings and weeks worked, respectively, using a specification where treatment status based only on those that stay in the same bracket for the three consecutive years prior to 1987. The results are broadly similar to may main specification.

E Permanent Tax Changes, Expectations and Long-Term Effects

The tax-free year generated a temporary incentive to exchange leisure time for working time in 1987, possibly at the expense of less work in the years that followed. This large reform which, as documented in the current paper, induced strong labor supply responses may also have had some positive effects on labor supply extending beyond 1987, such as through forces of habits and learning. However, the tax system also saw several permanent changes in 1988, which themselves may have generated effects on labor supply. During the first months of 1987, when technical and legal aspects of the new withholding-based tax system were being worked out by the government and the tax authorities, the aim was to simplify the tax system in order to ease the transition (Olgeirsson, 2013). As a result, a lot of the pre-existing tax deductions were abolished and the progressive tax schedule was replaced with a flat tax rate, corresponding to the rate in the upper-middle tax bracket. While fewer tax deductions were compensated for by substantially increasing the personal tax allowance, the reform had permanent effects on average and marginal tax rates.

An important question to ask is whether the permanent reform in 1988 affects my estimates of the responses to the tax-free year in 1987? If workers were responding to a tax reform in 1987 which they perceived to be permanent rather than temporary, my estimates of the Frisch elasticity will be attenuated as they incorporate an income effect arising from the permanent change in taxes, which is likely to be non-negligible. There are two arguments for why there may be limited effects of the permanent reform spilling over to my estimates. First, while the tax-free year was announced in December 1986, which resulted from a change in tax collection, no announcement was made on changes to the tax schedule under the new tax-collection system. As described in Section 2, that process went on during the first months of 1987 and the bill spelling out the new tax law was passed by Parliament in late March 1987. By then, workers had been aware of the much advertised tax-free year for several months. Second, relative to the simple and salient nature of the tax-free year, many of the implications of the new tax code for marginal tax rates were much less clear. In particular, an important part of the tax reform was the removal of tax deductions which affected the tax base and therefore the marginal tax rates. For most tax payers, assessing how changes in tax deductions and allowances would affect their marginal tax rates is likely to have been a complicated task.

In order to statistically evaluate this question, I perform several robustness tests. First, I evaluate the sensitivity of my estimates to controlling for the difference in tax rates between 1986 and 1988. If individuals are sophisticated and well informed about how their tax-rates would be influenced by

the permanent reform, those with larger permanent changes are likely to respond less to the 1987 tax-free year. As Tables A.19 and A.20 document, my estimates of the elasticity of earnings and weeks worked are very robust to these controls, both if controlling for changes in marginal and average tax rates. Next, I restrict the focus to the upper-middle and lower-middle brackets. Since workers in these brackets saw limited changes in their marginal tax rates between 1986 and 1988, with the 1986 upper-middle bracket tax rate corresponding to the flat rate in 1988, they should be minimally influenced by the permanent reform. As reported in Table A.21, this yields an earnings elasticity estimate of between 0.325 and 0.386, which is similar to what is reported for the upper-middle bracket in Table A.15, as well as being broadly consistent with my main estimates. In Section 5, I develop a new research design where, as to be described in more detail, one of the advantages is that the control group experiences neither the treatment nor the possible anticipation of a permanent reform. In addition, I can only apply this research design to the two brackets for which marginal tax rates were similar between 1986 and 1988. The results, reported in Tables A.22 and A.23, are consistent with my main estimates and the results presented in Section 5.

In ongoing work, I study the long-term effects of the tax-free year and the permanent tax changes. However, for completeness, I report a small set of informative results in the Appendix. Permanent effects are obtained by estimating equation (2) for the outcome period 1988-1990, but excluding 1987 from the sample. The results in Table A.24 indicate large permanent effects, both in terms of earnings and income. In order to understand these relatively large permanent effects, studying the responses of men and women separately provides an important insight. Tables A.25 and A.26 report estimates for men and women, respectively. While the earnings elasticity is economically very small and statistically indistinguishable from zero, it is large for women and highly significant. A plausible reason for these gender differences is (i) more persistent effects of strong responses of women in 1987, or (ii) responses to the changes in the transferability of tax deductions and allowances between spouses in 1988, which may have influenced the marginal tax rates for women more than for men.

F Is the Order of Magnitude of the Elasticity Estimates Reasonable?

As discussed in Section 6, reliable earlier estimates of the intensive margin Frisch elasticity are few and the evidence is mixed. As a result, a comparison of my elasticity estimates to the previous literature may not be very informative for inferring whether the size of my elasticity estimates is reasonable. An alternative approach to such evaluation is to compare Frisch elasticity estimates to estimates of other parameters that are related to the Frisch elasticity according to economic theory, such as Marshallian and Hicksian labor supply elasticities to permanent wage changes, and where empirical estimates are more abundant.[71]

In standard models of life-cycle labor supply, the Frisch elasticity is related to the Hicksian and Marshallian labor supply elasticities through the income effect and the elasticity of intertemporal sub-

[71] For estimates of Hicksian and Marshallian elasticities, see e.g. the following studies. US: Feldstein (1995), Auten and Carroll (1999), Goolsbee (2000), Gruber and Saez (2002), Kopczuk (2005) and Giertz (2007); UK: Brewer et al. (2010); Canada: Sillamaa and Veall (2001), Saez and Veall (2005); Denmark: Kleven and Schultz (2014), Chetty et al. (2011); Norway: Aarbu and Thoresen (2001); Sweden: Hansson (2007), Blomquist and Selin (2010), Gelber (2014); Poland: Kopczuk (2012).

stitution in consumption (EIS). A model with time-separable utility in consumption and leisure gives the following relationship between the intensive-margin Frisch elasticity and other key parameters of the model (Ziliak and Kniesner, 1999; Browning, 2005):

$$\varepsilon_{\text{Frisch}} = \varepsilon_{\text{Hicks}} + \rho \cdot mpe^2 \frac{A}{wh} \tag{10}$$

where ρ is the EIS, mpe is the marginal propensity to earn (MPE) out of unearned income, i.e. the income effect, and $\frac{A}{wh}$ is the ratio of wealth to labor income.[72] Therefore, my estimates can be related to the existing empirical evidence on these parameters. The most prominent estimates of the MPE are based on estimates of the effect of winning a lottery, e.g. Imbens, Rubin, and Sacerdote (2001) and Cesarini et al. (2017) and receiving an inheritance (Nekoei and Seim, 2018). In my calculations, I use an MPE of 0.11 implied by the estimates in Imbens, Rubin, and Sacerdote (2001).[73]. Then, I use data from individual tax returns to calculate a median $\frac{A}{wh}$ ratio of 2.59.

Figure A.3 maps my Frisch elasticity estimate of 0.374 into Marshallian and Hicksian elasticities on the y-axis and the IES on the x-axis. The two vertical lines in Figure A.3 mark existing estimates of IES, first an average IES of 0.5 across 169 studies surveyed in Havránek (2015), and an average IES of 0.9 across 33 studies published in the top 5 general interest journals. As the figure shows, these estimates are consistent with Hicksian elasticity between 0.34 and 0.36. This is broadly consistent with previous evidence, as Chetty (2012) reports in a recent meta-analysis an average Hicksian elasticity of 0.33. In line with existing evidence on the income effect, it is reassuring to find that the difference as compared to my Frisch elasticity is small.

G Model of Intertemporal Labor Supply

For the purpose of discussing the effect of wage changes, either parametric or evolutionary, over the life-cycle, this section describes a model following MaCurdy (1981).

G.1 Model

In this model, individual i's lives for $T+1$ periods, where in each period he has a time endowment of $\bar{L}$, he faces no restriction of borrowing at the rate r_t, and his rate of time preference is denoted by ρ. Then his optimization problem can be stated as follows:

$$\max_{\{C_{it}, L_{it}\}} \sum_{t=1}^{T} \frac{1}{(1+\rho)^{t-1}} U_{it}(C_{it}, L_{it}), \quad N_{it} = \bar{L} - L_{it} \tag{12}$$

[72] Similarly, via the Slutsky equation, the model gives a relation between the Frisch and the Marshallian elasticities:

$$\varepsilon_{\text{Frisch}} = \varepsilon_{\text{Marshallian}} - mpe + \rho \cdot mpe^2 \cdot \frac{A}{wh} \tag{11}$$

[73] While MPE cannot be separately estimated from the marginal propensity to save (MPS), Imbens, Rubin, and Sacerdote (2001) study a setting where lottery winnings are paid out as installments over 20 years, enabling them to argue for MPS close to 1 (they use 0.9). Studies of MPE out of inherited wealth report larger estimates than what are found for lottery winners. For a further discussion of this literature and a meta-analysis of the estimates, see Nekoei and Seim (2018)

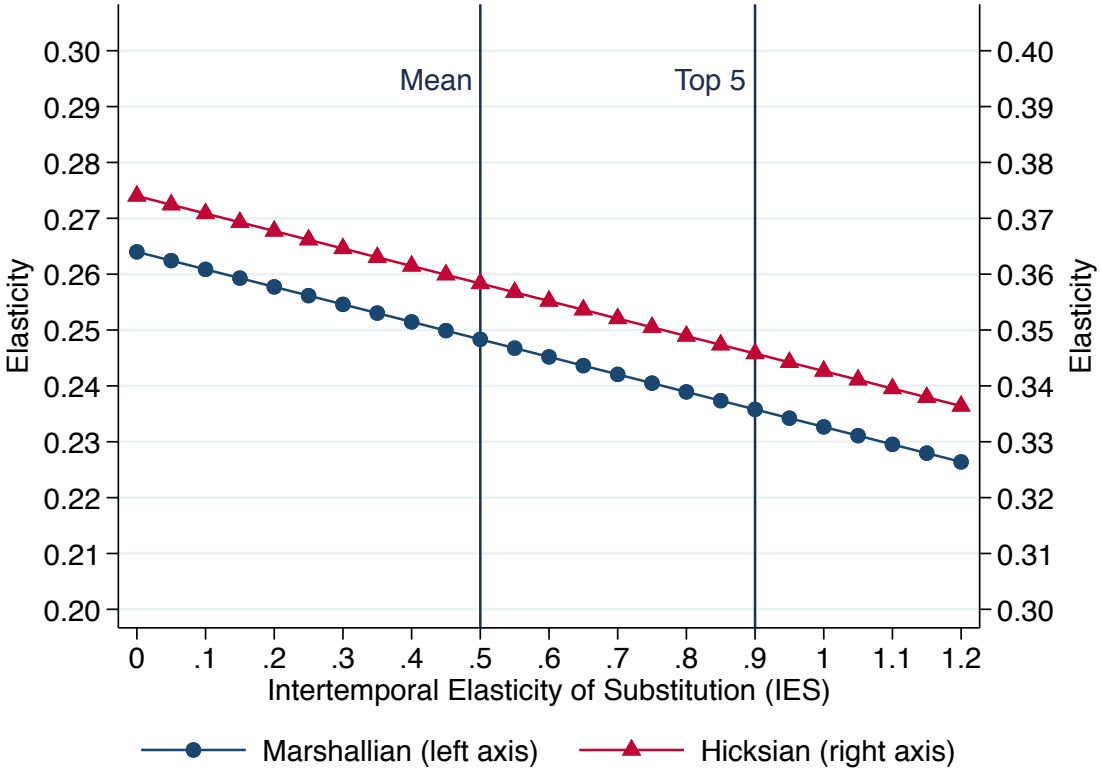


Figure A.3: Implied Hicksian-, Marshallian- and Intertemporal Substitution Elasticity (IES)

Notes: The figure reports values of the Hicksian elasticity, Marshallian elasticity and Intertemporal Elasticity of Substitution consistent with my estimate of intensive-margin Frisch elasticity of 0.374, based on equations (10) and (11). The calculations assume the marginal propensity to earn (MPE) out of wealth, ε_{A}, to be 0.11, which is based on estimates from Imbens et al. (2001) for lottery winners (see the main text for discussion). The ratio of wealth to labor income, $\frac{A}{wh}$, of 2.59 is the median ratio in 1986, calculated based on individual tax records. The vertical line "*Mean*" marks the average estimate of 2,735 estimates of the EIS reported in 169 empirical studies summarized in a meta-analysis in Havránek (2015). Vertical line "*Top 5*" marks the average estimate across 33 studies published in the top five general interest journals.

subject to

$$A_{it} = (1 + r_t)A_{it-1} + w_{it}N_{it} - C_{it} \tag{13}$$

where A_{it} is net wealth in each period. Assume that individual i's within-period utility can be described with the following additively separable function:

$$U_{it}(C_{it}, L_{it}) = \gamma_{C_{it}} C_{it}^{\alpha_C} - \gamma_{N_{it}} N_{it}^{\alpha_N}, \quad N_{it} = \bar{L} - L_{it} \tag{14}$$

Note that α_C and α_N are constant and common across all workers, while $\gamma_{C_{it}}$ and $\gamma_{N_{it}}$ are individual- and age-specific parameters describing tastes for consumption and leisure. It is assumed that (the log of) taste for leisure is

$$\log \gamma_{N_{it}} = \sigma_i + \mu_{it} \tag{15}$$

where μ_{it} is a random error term (i.i.d., mean zero). The Frisch labor supply equation can then be

written as

$$\log N_{it} = \frac{1}{\alpha_N - 1} \left(\log \lambda_{it} - \log \alpha_N + \log w_{it} - \sigma_i + \mu_{it} \right) \tag{16}$$

The Frisch consumption demand function can be written in a similar fashion. In (16), λ_{it} is the Lagrange multiplier on wealth. From the envelope theorem, we have that

$$\lambda_{it} = \frac{1 + r_{t+1}}{1 + \rho} \lambda_{it+1} \tag{17}$$

Taking logs and using the approximation around zero that $\log(1 + x) \approx x$, we have

$$\log \lambda_{it} \approx r_{t+1} - \rho + \lambda_{it+1} \tag{18}$$

Using the above approximation, the labor supply equation (16) can be written as follows

$$\log N_{it} = F_i + bt - \varepsilon R_t + \varepsilon \log w_{it} + u_{it} \tag{19}$$

where

$$F_i = \frac{1}{\alpha_N - 1} \left(\log \lambda_i - \sigma_i - \log \alpha_N \right), \quad \varepsilon = \frac{1}{\alpha_N - 1}, \quad b = \sigma\rho, \quad u_{it} = -\sigma\mu_{it}$$

As in MaCurdy (1981), let us assume a linear approximation of F_i, such that

$$F_i = Z_i\theta + \sum_{t=1}^{T} \gamma_t \log w_{it} + A_{i0}\theta + \alpha_i \tag{20}$$

where Z_i is a vector of individual characteristics and α_i is a residual. Moreover, let us assume that wages follow a quadratic life-time path:

$$w_{it} = \pi_{0i} + \pi_{1i}t + \pi_{2i}t^2 + \nu_{it} \tag{21}$$

where $\pi_{0i}, \pi_{1i}, \pi_{2i}$ are linear functions of the form

$$\pi_{ji} = M_i g_j, \quad j = 0, 1, 2,$$

with M_i being a vector of determinants of wages that are exogenous and constant over the lifetime, such as education, g_j are vectors of parameters, and ν_{it} is an error term. Substituting (21) into (22) yields

$$F_i = Z_i\theta + \pi_{0i}\bar{\gamma_0} + \pi_{1i}\bar{\gamma_1} + \pi_{2i}\bar{\gamma_2} + A_{i0}\theta + \xi_i \tag{22}$$

$$\bar{\gamma_j} = \sum_{t=1}^{T} \gamma_t t^j, \quad j = 0, 1, 2.$$

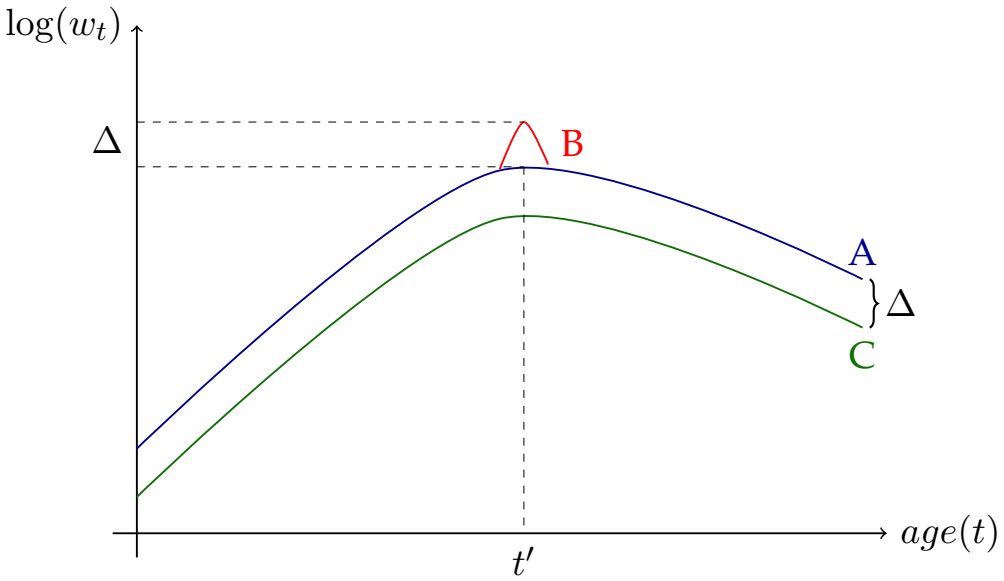


Figure A.4: Life-Cycle Paths of Wages

G.2 Labor Supply Responses to Wage Changes

I now study labor supply responses to wage changes. In such an analysis, it is important to distinguish between wage changes that are anticipated – known as *evolutionary* wage changes – and those that are unanticipated – so-called *parametric* wage changes. As we will see, this is a useful distinction since anticipated changes only generate substitution effects while the latter generate both substitution and income/wealth effects. This analysis is therefore helpful in understanding which parameters can be estimated using natural experiments such as tax reforms to generate a variation in after-tax wages.

Figure A.4 plots wage paths over the life-cycle, according to the process in (21). Consider an individual whose wage path can be described by Path A. As he gets older, individual A's wages increase, to which he responds by adjusting his hours. Such evolutionary wage changes are known to the individual – since he knows his wage path – and therefore generate a substitution effect and no wealth effect. The parameter governing these responses is ε, which is the intertemporal (λ-constant, or Frisch) elasticity of substitution. While this is an elasticity that determines responses to an evolutionary change in wages, it can also be interpreted as determining responses to a particular type of parametric change, i.e. one associated with a wage increase at time t' but holding the marginal utility of wealth constant.

First, let us compare two individuals, for whom the evolution of wages can be described by Paths A and B in Figure A.4, where the latter equals the former at all time periods t except at t' when they differ by Δ. This is a parametric change in wages, as this is a shift in the (known) life-cycle path A. This has two effects on his labor supply. First, this generates an intertemporal substitution effect: labor supply in period t' will exceed that in all other periods $t \neq t'$ by $\Delta\varepsilon$. Second, there is a wealth effect: the individual will set a value of F_B which is lower than that of F_A by $\gamma_{t'}\Delta$. As a result, the labor supply of an individual facing path B compared to path A will be lower in all periods $t \neq t'$ by

a constant. In total, the effect on labor supply at time t' is $(\varepsilon + \gamma_{t'})\Delta$, which is ambiguously signed as the substitution effect and the wealth effect are of opposite signs.

Now let us compare individuals with paths A and C in Figure A.4. Moving from path C to A equals increasing the intercept π_0 of path A by, say, Δ. As before, there are two effects, a substitution effect of $\Delta\varepsilon$ for every period, and a wealth effect of $\sum_{t=1}^{T} \gamma_t \Delta = \bar{\gamma}\Delta$.

Note that any temporary variation in wages which is not perfectly predictable does not allow us to identify the Frisch elasticity; such changes always involve a wealth effect as well. Therefore, the observed labor supply elasticity is $(\varepsilon + \gamma_{t'}) \leqslant \varepsilon$, where equality only holds when utility is linear in consumption, implying no wealth effect. However, comparing the two 'experiments' considered, the temporary one-period increase in wages only has a small wealth effect (e.g. the tax-free year) compared to that generated by a permanent shift in the wage profile (e.g. a permanent change in taxes).

H Collective Labor Supply Model with Home Production

Consider a family consisting of a married couple, where m indexes the husband and f indexes the wife, and their children if they have any. Adults allocate their working time between two activities. First, they can sell their labor on the market and earn a fixed wage, w. Labor income is then used to buy a market consumption good, c. Second, they allocate time to producing goods and services at home, such as taking care of their children or making food, which are only consumed by the family. The latter incorporates the insight from Becker (1965) that a significant proportion of the time spent away from work is home production.

The preferences of each spouse $i \in \{m, f\}$ are described with a quasi-linear utility function in consumption and working time:

$$u_i = c_i + y_i - \frac{\eta}{1+\eta}(n_i + h_i)^{\frac{1+\eta}{\eta}} \tag{23}$$

where c_i is spouse i's consumption of the market good, y_i is spouse i's consumption of the home-produced good, n_i is spouse i's market hours, and h_i are hours allocated to home duties. The parameter η governs the curvature of the disutility of work.

Spouse i's budget constraint is:

$$c_i \leqslant (1 - \tau_i) w_i n_i + z_i + s_i \tag{24}$$

where τ_i is spouse i's marginal tax rate, z_i is spouse i's unearned income, and s_i are the net-transfers received by spouse i.

The couple engages collectively in home production, where home-produced goods and services are assumed to be a public good within the household. The domestic good is produced according to a Cobb-Douglas production technology

$$Y(h_m, h_f) = (\kappa_m h_m)^{\alpha_m} (\kappa_f h_f)^{\alpha_f}, \qquad \alpha_m + \alpha_f \leqslant 1 \tag{25}$$

where $\kappa_i h_i$ is the effective labor input of each spouse. I assume that the home produced good is a public good within the household. Therefore:

$$y_m = y_f = Y(h_m, h_f) \tag{26}$$

Following the literature on collective labor supply (see, e.g. Chiappori, 1988; Apps and Rees, 1988), I assume that family decisions lead to Pareto optimal allocations. Each spouse has his/her individual preferences and maximization problem, but the couples agree to maximize a collective family utility function, which is the weighted sum of individual utility functions.[74] Furthermore, I assume full commitment, so that married couples stay married, and the weighting parameter μ in the family welfare function is exogenous and constant. The family's decision problem is to maximize the following collective family utility function:

$$u(c_m, c_f, y_m, y_f, n_m, n_f, h_m, h_f) = \mu u_m(c_m, y_m, n_m, h_m) + (1-\mu) u_f(c_f, y_f, n_f, h_f) \tag{27}$$

subject to (25), (26) and the family's budget constraint.

The solution to the model provides a labor supply function for husbands and wives:

$$n_i = ((1-\tau_i)w_i)^{\eta} - \frac{\kappa_i h_i}{\kappa_j} \left(\frac{\alpha}{\mu(1-\tau_i)w_i} \right)^{\frac{1}{1-\alpha}}, \quad i, j \in \{m, f\}, j \neq i \tag{28}$$

H.1 Own-wage and Cross-wage labor supply elasticities

Using this simple framework, I ask two questions and get predictions from the model which I then explore in the data. First, how do husbands and wives respond to changes in their wage rate or, equivalently, their marginal tax rate? Computing own-wage elasticity of labor supply, $\varepsilon_{n_i,w_i} = \frac{\partial n_i}{\partial w_i} \frac{w_i}{n_i}$, yields

$$\varepsilon_{n_i,w_i} = \eta + \left(\eta + \frac{1}{1-\alpha_i} \right) \frac{h_i}{n_i} \tag{29}$$

The elasticity consists of two components. First, in an individualistic model without home production, the labor supply elasticity corresponds to the constant preference parameter η. Second, due to home production, labor supply elasticity has a second component. Since an increase in the market wage – or a decrease in taxes – increases the opportunity cost of home production, workers will substitute hours from home production to market work. Equation (29) gives the first prediction of the model: Within couples engaging in home production, individuals' own-wage elasticity is stronger the more important is their labor input for home-production and the more specialized they are in home production. This explains why labor supply elasticities may differ across couples. If women engage in relatively more home production, e.g. due to a comparative advantage or bargaining power in the

[74] This simple framework only illustrates the spousal cross-response arising from substitutability in home production, but not from complementarities in leisure time. Allowing for such complementarities would generate an opposing force, and the overall cross-response would be the combination of the two. Since my results imply negative cross-elasticities in most cases, the results can be interpreted as the force of substitutability in home production dominating the complementarity of leisure.

household, they will have a larger labor supply elasticity due to substitutability between time spent on home production and market work.

The second question I ask is how do husbands and wives respond to changes in their spouse's wage, or the marginal tax rate. Computing the cross-wage elasticity of labor supply, $\varepsilon_{n_i,w_{-i}} = \frac{\partial n_i}{\partial w_{-i}} \frac{w_{-i}}{n_i}$, yields

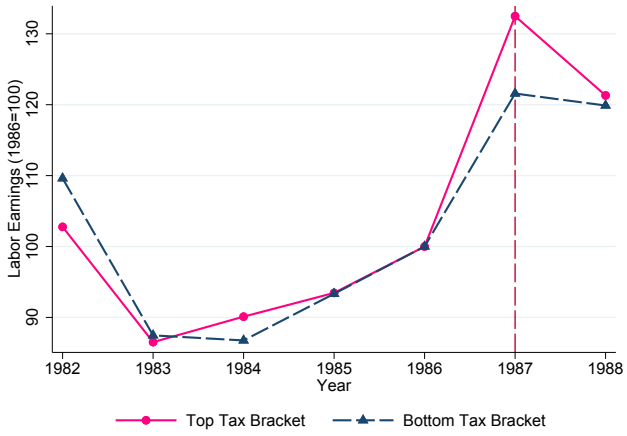
$$\varepsilon_{n_i,w_{-i}} = -\frac{1}{\alpha_i} \frac{h_i}{n_i} \tag{30}$$

The cross-elasticity is negative and depends on relative hours allocated to home vs. market work and the output elasticity in home production. From the perspective of the individual, if his spouse's wage increases, the spouse's opportunity cost of time allocated to home production, relative to market work, increases. As the members of the couple are perfect substitutes in home production, a change in the spouse's wage induces a change in the couple's relative opportunity costs of market work. Therefore, in response to an increase in their spouse's wage, individuals will allocate more time to home production and less to market work. Equation (29) gives the second prediction of the model: Within couples engaging in home production, the cross-wage elasticity is larger (in absolute value) the more time is spent on home production but the lower is the elasticity of their input in home production.

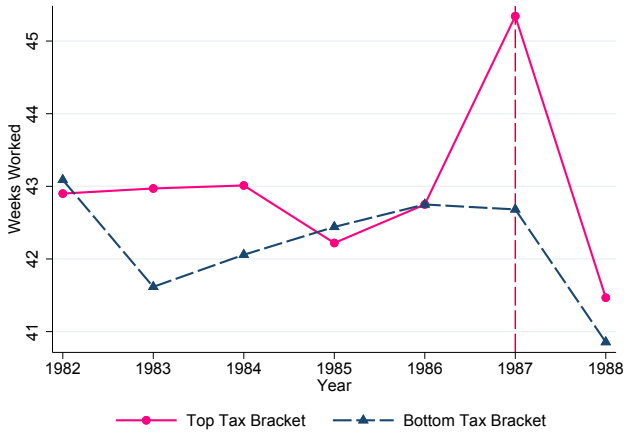
Evidence based on time-use surveys indicates that women allocate more time than men to chores within the household (Aguiar et al., 2013). It is also reasonable to assume, at least in households with small children, that females' output elasticity in home production is larger than that for men.[75] Based on that, the model implies that households with more children, where both spouses take part in home production but women play the leading role, married women will have a larger own-wage elasticity than their husbands. However, the cross-elasticity may be stronger (more negative) for married men than for married women if relatively more time input is needed from them to substitute for their wives' time.

[75] Bredemeier and Juessen (2013) construct a model of family labor supply with a Cobb-Douglas home production function. When calibrating their model, they set the female output elasticity in home production to 0.7 and the elasticity for men to 0.3.

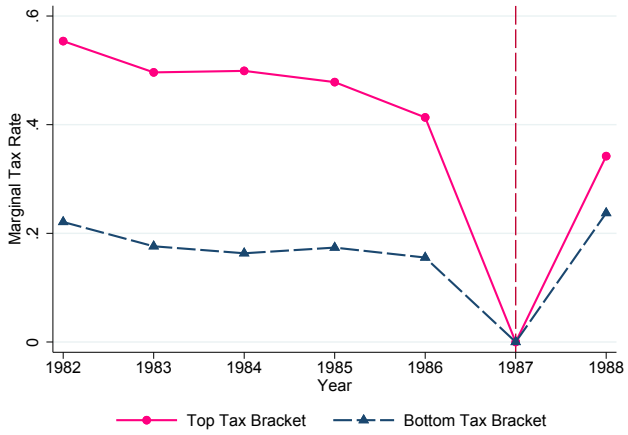
I Supplementary Figures



(a) Reduced Form: Labor Earnings



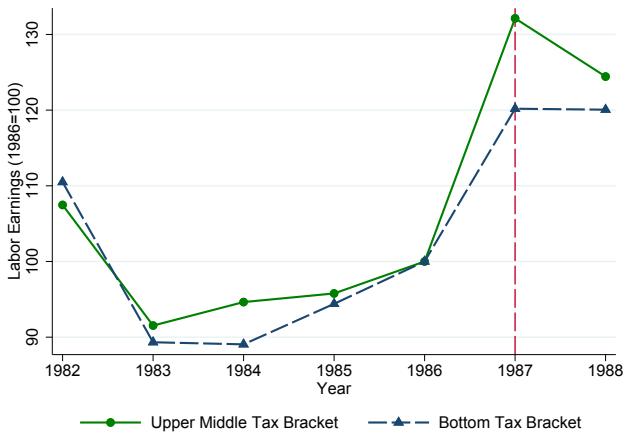
(b) Reduced Form: Total Weeks Worked



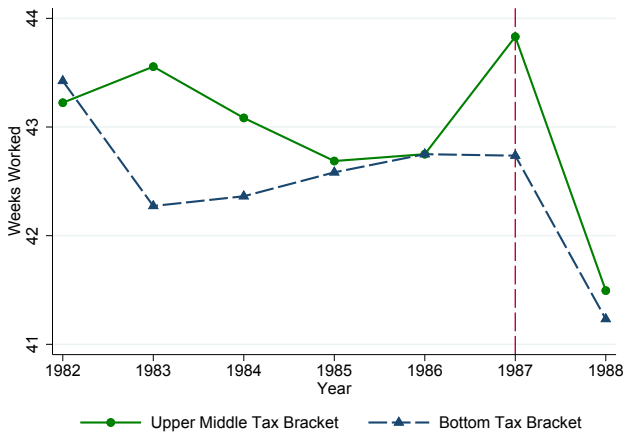
(c) First Stage: Marginal Tax Rates

Figure A.5: Graphical Evidence: Top Tax Bracket

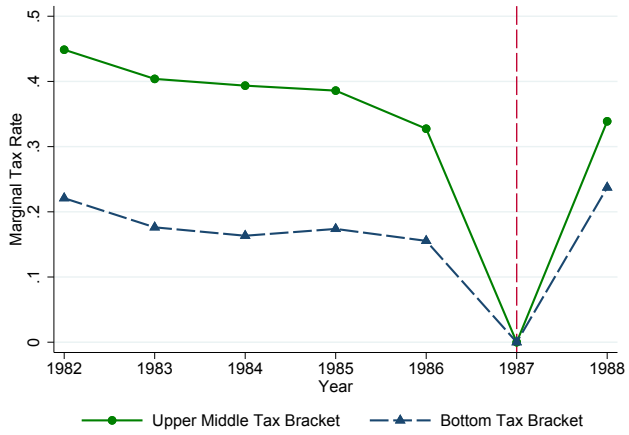
Notes: The figure shows the evolution of average (a) labor earnings, (b) weeks worked and (c) marginal tax rates by tax bracket, where the tax-bracket status in year t is defined according to the tax bracket in $t-1$. Labor earnings are in real terms, normalized to 100 in 1986. Weeks worked are averages of total weeks worked by individual, i.e. in all jobs, normalized to the bottom-bracket average in 1986. In each graph, using the method of DiNardo et al. (1996), I non-parametrically reweigh the distribution of age (partitioned into 10-year bins) and pre-treatment characteristics (marital status, number of children, 3-level education) of individuals in the bottom tax bracket group to match the distribution of individuals in the top tax bracket. In each panel, the difference between the slopes of the two series in 1987 gives a difference-in-differences estimate, while a comparison in other years provides placebo tests of the natural experiment. The graphs for labor earnings and weeks worked imply the reduced-form effects of the tax-free year on these measures of labor supply. Correspondingly, the difference in series of marginal tax rates provides an estimate of the first-stage.



(a) Reduced Form: Labor Earnings



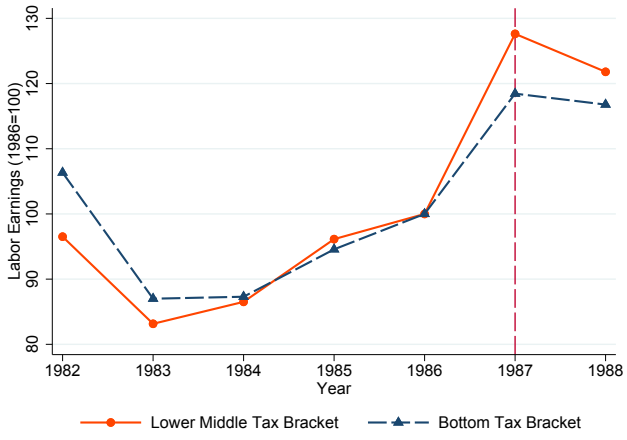
(b) Reduced Form: Total Weeks Worked



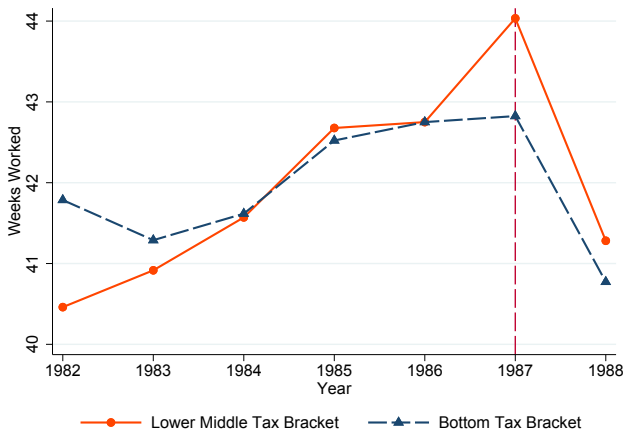
(c) First Stage: Marginal Tax Rates

Figure A.6: Graphical Evidence: Upper-Middle Tax Bracket

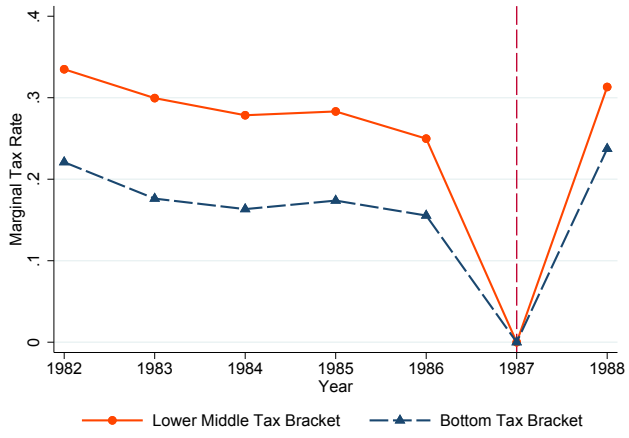
Notes: The figure shows the evolution of average (a) labor earnings, (b) weeks worked and (c) marginal tax rates by tax bracket, where the tax-bracket status in year t is defined according to the tax bracket in $t-1$. Labor earnings are in real terms, normalized to 100 in 1986. Weeks worked are averages of total weeks worked by individual, i.e. in all jobs, normalized to the bottom-bracket average in 1986. In each graph, using the method of DiNardo et al. (1996), I non-parametrically reweigh the distribution of age (partitioned into 10-year bins) and pre-treatment characteristics (marital status, number of children, 3-level education) of individuals in the bottom tax bracket group to match the distribution of individuals in the upper-middle tax bracket. In each panel, the difference between the slopes of the two series in 1987 gives a difference-in-differences estimate, while a comparison in other years provides placebo tests of the natural experiment. The graphs for labor earnings and weeks worked imply the reduced-form effects of the tax-free year on these measures of labor supply. Correspondingly, the difference in series of marginal tax rates provides an estimate of the first-stage.



(a) Reduced Form: Labor Earnings



(b) Reduced Form: Total Weeks Worked



(c) First Stage: Marginal Tax Rates

Figure A.7: Graphical Evidence: Lower-Middle Tax Bracket

Notes: The figure shows the evolution of average (a) labor earnings, (b) weeks worked and (c) marginal tax rates by tax bracket, where the tax-bracket status in year t is defined according to the tax bracket in $t-1$. Labor earnings are in real terms, normalized to 100 in 1986. Weeks worked are averages of total weeks worked by individual, i.e. in all jobs, normalized to the bottom-bracket average in 1986. In each graph, using the method of DiNardo et al. (1996), I non-parametrically reweigh the distribution of age (partitioned into 10-year bins) and pre-treatment characteristics (marital status, number of children, 3-level education) of individuals in the bottom tax bracket group to match the distribution of individuals in the lower-middle tax bracket. In each panel, the difference between the slopes of the two series in 1987 gives a difference-in-differences estimate, while the comparison in other years provides placebo tests of the natural experiment. The graphs for labor earnings and weeks worked imply the reduced-form effects of the tax-free year on these measures of labor supply. Correspondingly, the difference in series of marginal tax rates provides an estimate of the first-stage.

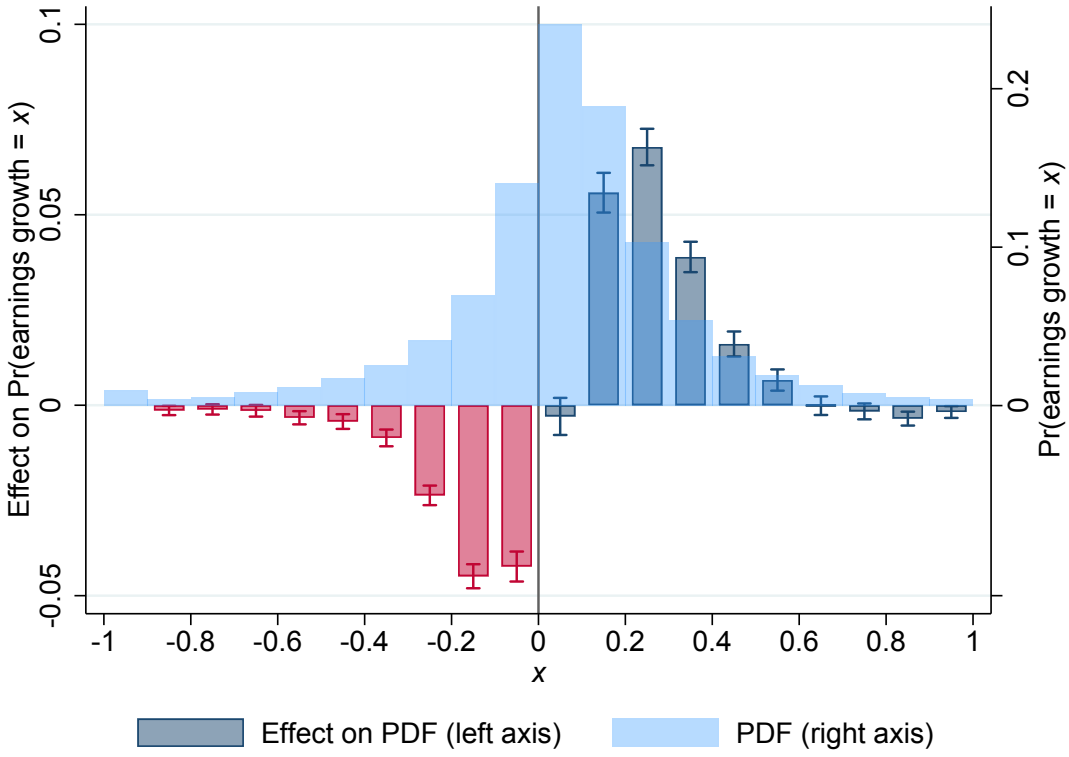
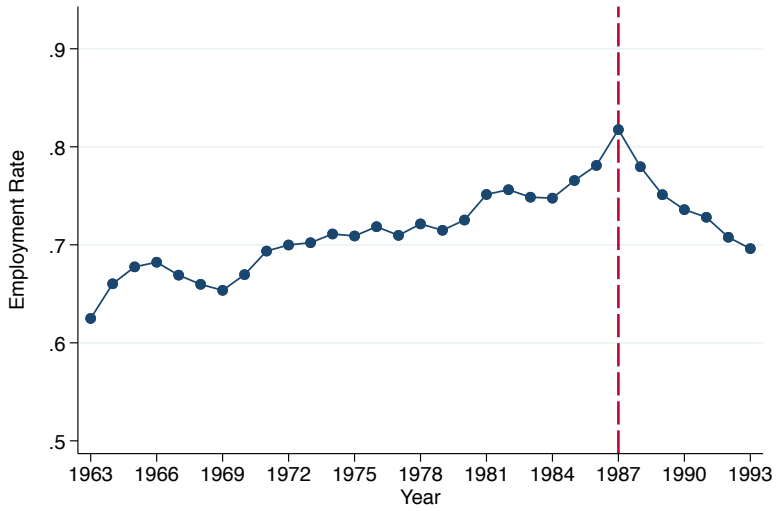
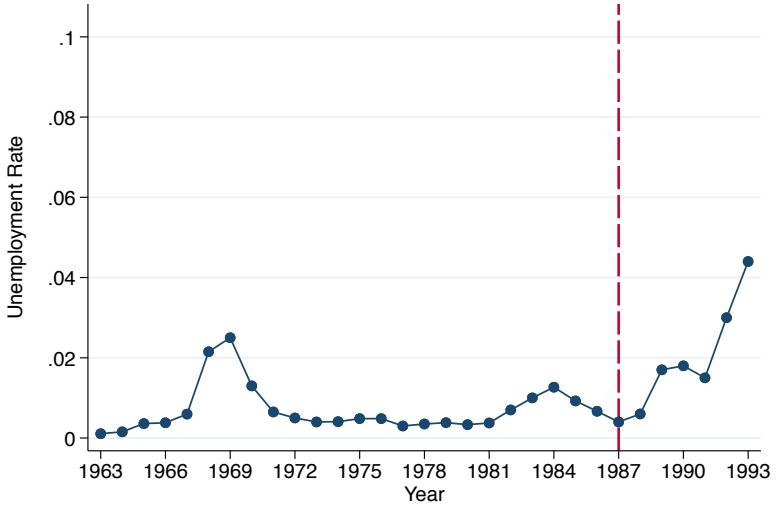


Figure A.8: Earnings effects across the earnings growth distribution

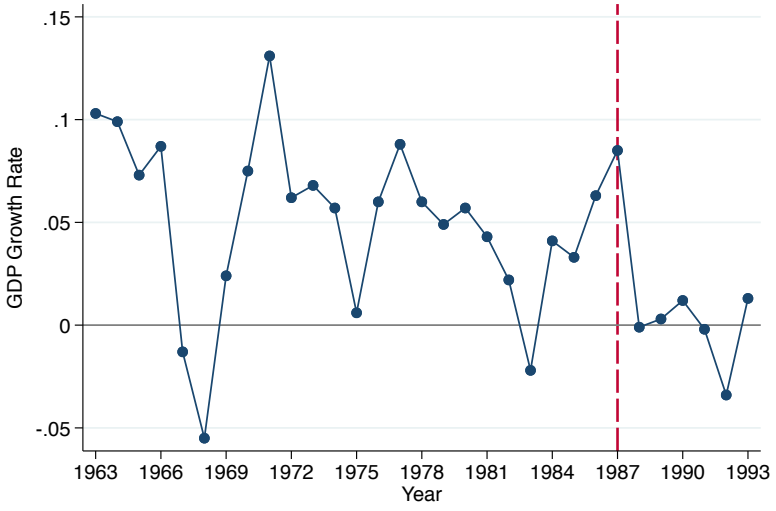
Notes: The figure investigates the effect of the tax-free year on the earnings growth distribution, asking whether the responses reflect a uniform increase in earnings or strong responses in particular parts of the distribution. It plots the coefficient estimates from equation (1), where the dependent variable is an indicator for a year-on-year growth of labor earnings being within a certain range, e.g. between 0% and 10%. The figure then plots the effect on the probability of experiencing an earnings growth in a certain interval (PDF). Coefficients on negative labor earnings growth are colored in red and positive growth in blue. Standard errors are clustered at the individual level and the vertical bars plot the 95%-confidence intervals. The figure documents that the average elasticity reflects more and higher earnings increases but also less earnings decreases. For example, the graph shows that the tax-free year increased the probability of an earnings increase of 20-30% by about 5 percent, relative to a base of 20 percent.



(a) Employment



(b) Unemployment



(c) GDP growth

Figure A.9: Employment, Unemployment and GDP growth

Notes: Panel (a) plots the employment rate, measured by Statistics Iceland as the ratio of total man-years (full-time equivalent workers) to the working age population. Panel (b) plots the unemployment rate, as registered at the Directorate of Labour. Panel (c) plots the yearly growth rate in real GDP, measured by Statistics Iceland.

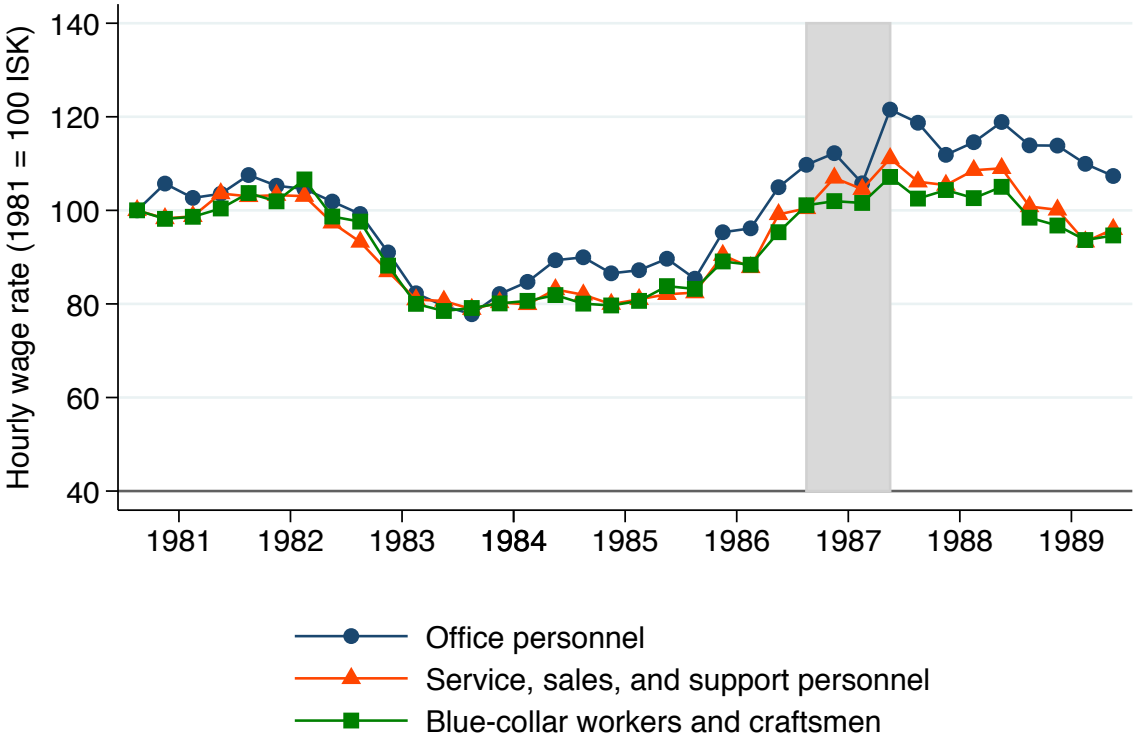


Figure A.10: Hourly Wage Rate

Notes: The figure plots the average hourly wage rate, normalized to 100 Icelandic krona (ISK) in first quarter of 1981, in three broad occupation groups corresponding to office personnel, service- sales-, and support personnel. The shaded area corresponds to the period of first to fourth quarter of 1987. Data on wages are drawn from a survey on paid hourly wage rate collected by the Wage Research Committee (*Kjararannsóknanefnd*) on wages in the private sector.

Figure A.11: Advertisement: "Road to Tax Freedom"

Figure A.12: Explanation of the Withholding Tax System and 1987 Being a Tax-free Year

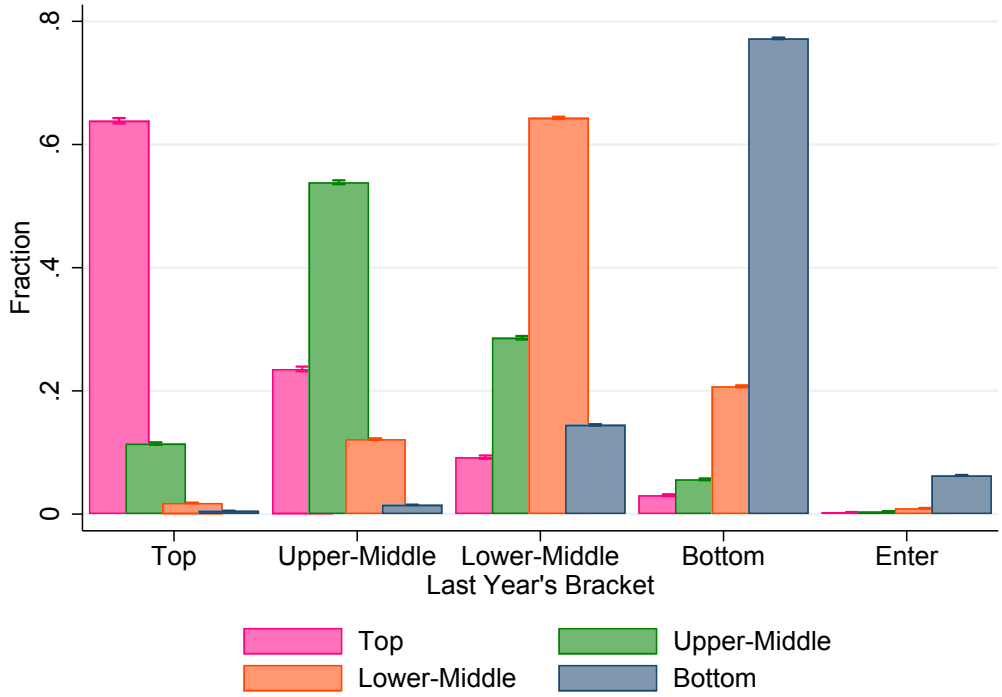


Figure A.13: Transitions between Tax Brackets, 1982-1986

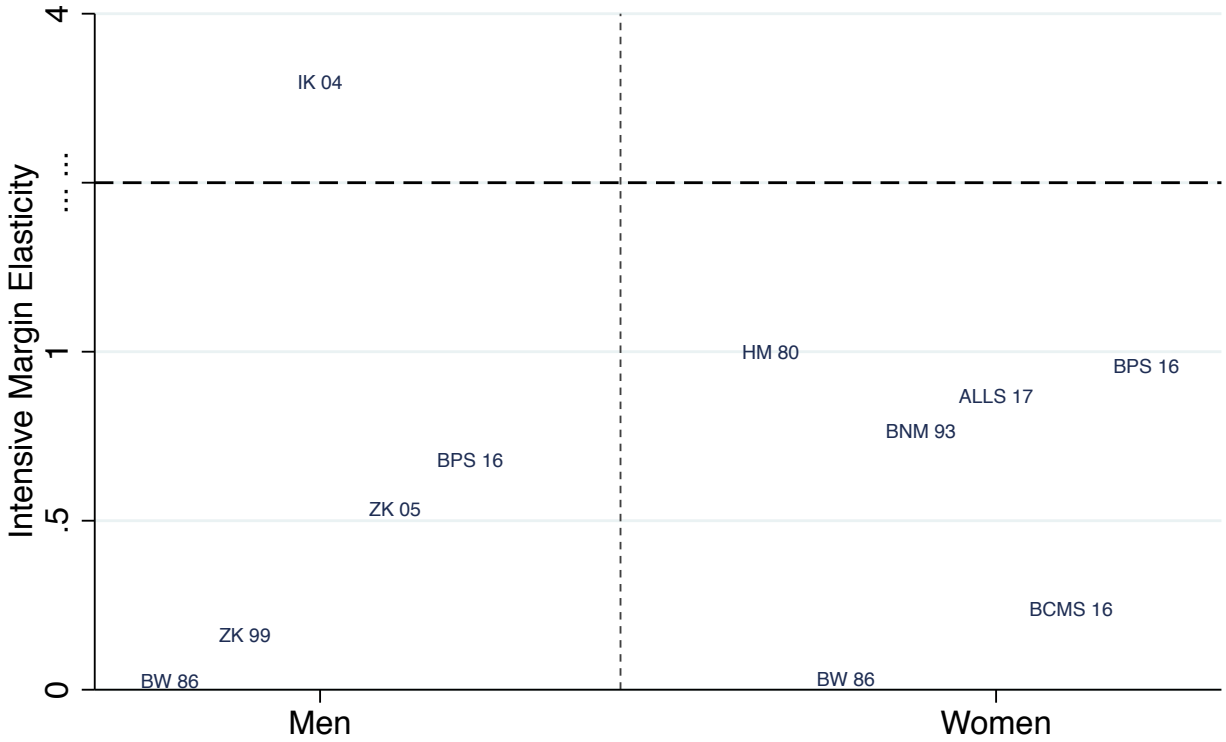
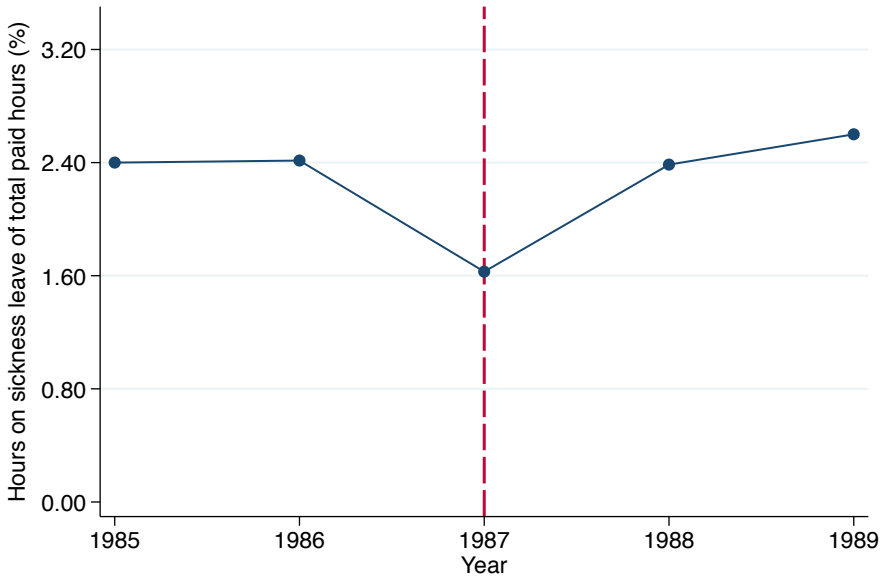
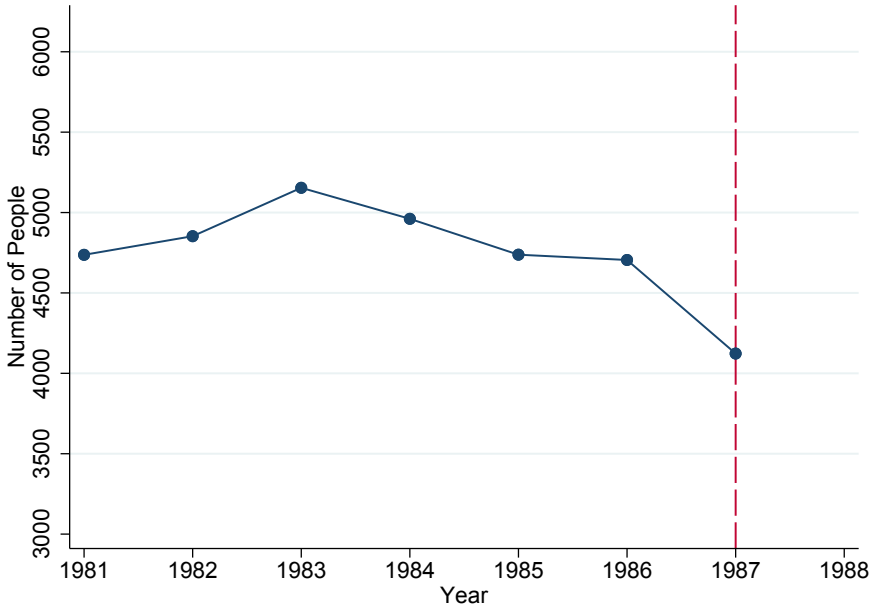


Figure A.14: Summary of Structural Estimates of Intensive Margin Elasticities

Notes: The figure plots parameter estimates of intensive margin Frisch elasticity. As most papers focus on either men or women, or report separate estimates, elasticities are reported by gender. The labels are as follows."BW 86": Blundell and Walker (1986), "ZK 99": Ziliak and Kniesner (1999), "IK 04": Imai and Keane (2004), "ZK 05": Ziliak and Kniesner (2005), "BPS 16": Blundell et al. (2016b), "HM 80": Heckman and MaCurdy (1980), "BNM 93": Blundell et al. (1993), "ALLS 17": Attanasio et al. (2018), "BCMS 16": Blundell et al. (2016a).



(a) Sick leave, in hours of work



(b) Recipients of sickness benefits

Figure A.15: Sick leave from work and recipients of sickness benefits

Notes: Panel (a) plots the number of hours on sickness leave as a share to total paid hours (in %), based on survey data collected by the Wage Research Committee (*Kjararannsóknanefnd*). The numbers are sample averages. Panel (b) plots the number of people (tax filers) who received sickness benefits in the given year. These benefits were reported in tax returns until 1987 and were deductible from taxes. From 1988 onwards, under the withholding tax system, these were no longer reported.

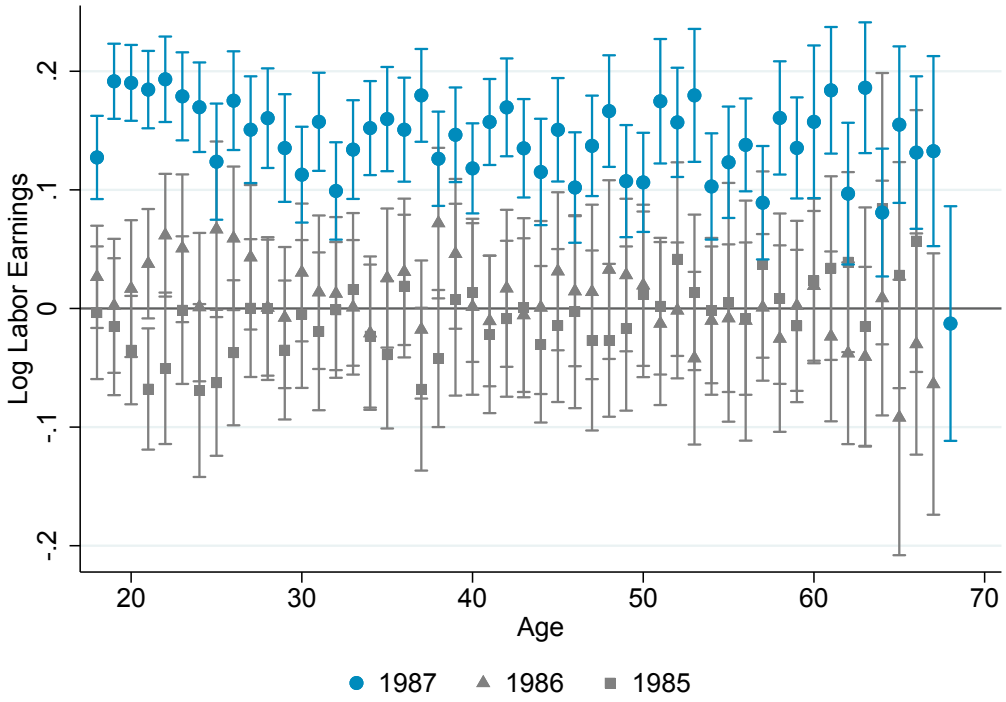


Figure A.16: Placebo Tests and Actual Tax-free Year Reduced Form Estimates

Notes: The figure plots estimates of equation (3), i.e. a reduced form estimate using the life-cycle DD, by cohort. The figure plots estimates for two placebo tax-free years, 1986 and 1985, as well as estimates for the actual tax-free year as a comparison.

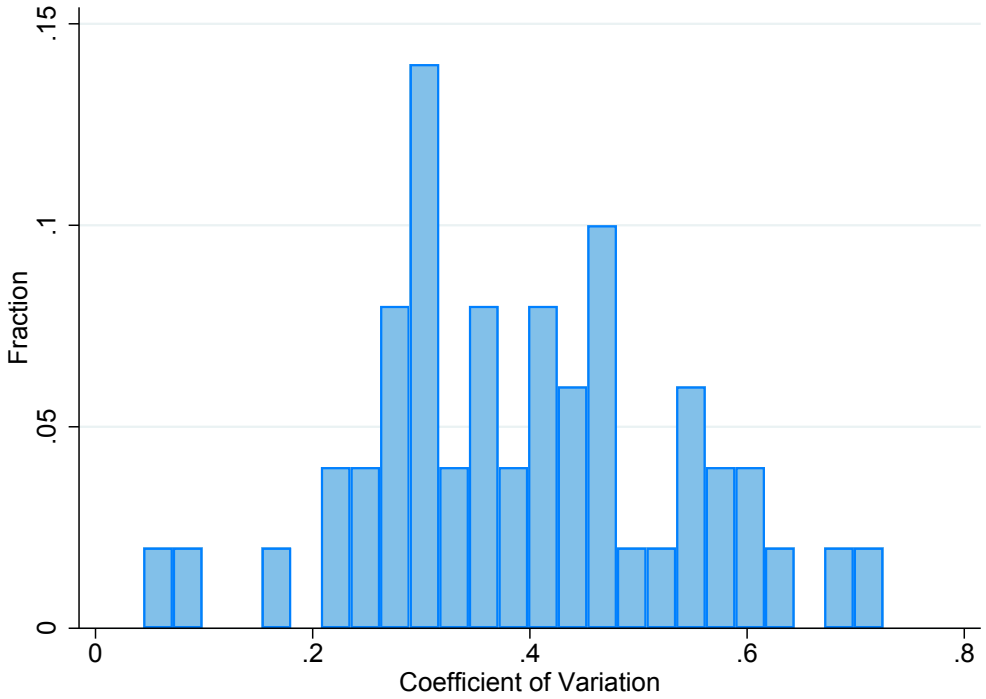


Figure A.17: Relative Variability in Weeks Worked by Occupations

Notes: The figure plots the histogram of the coefficient of variation of weeks worked by occupation, measured with equation (6).

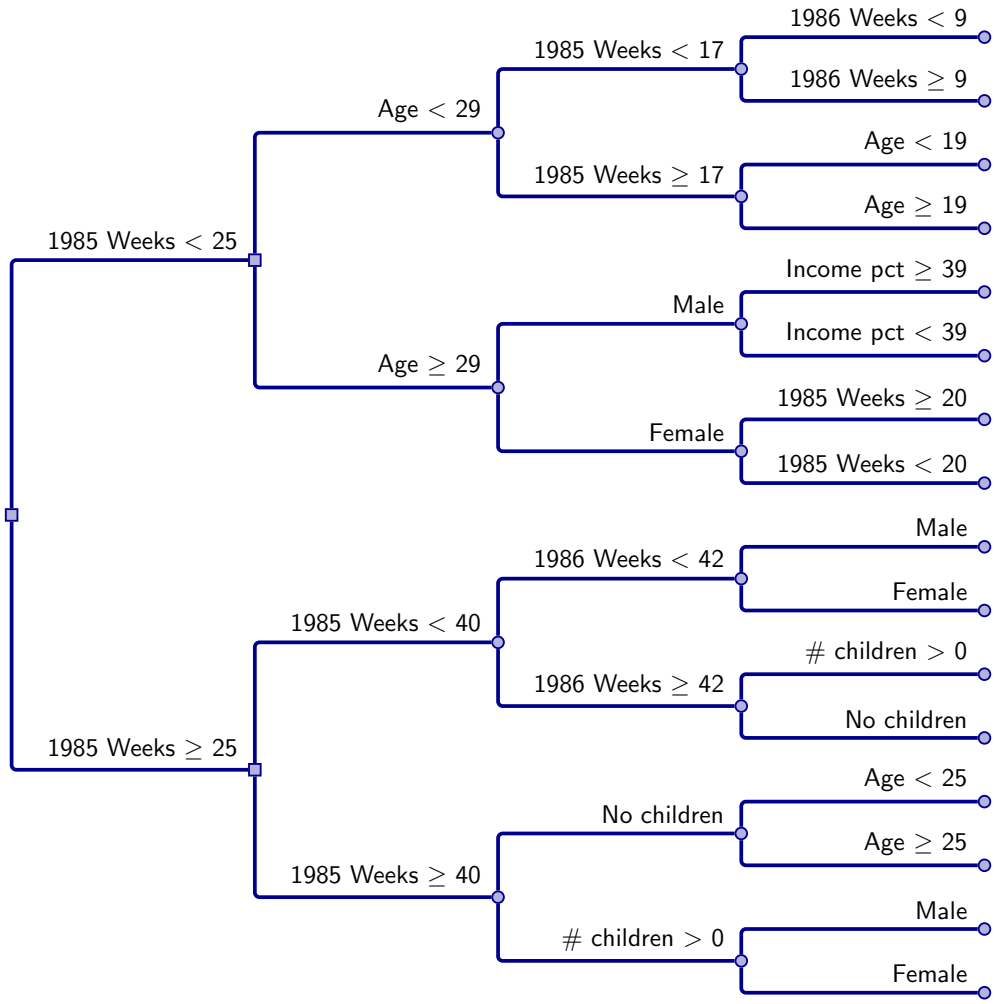


Figure A.18: Prediction tree from random forest estimation

Notes: The figure plots a decision tree from a random forest prediction of labor supply elasticity. This plots the tree of best splits, i.e. a single tree that splits along features that contribute most to the prediction. The purpose of the figure is to document where splits occur within the characteristics of most importance, e.g. weeks worked. Of course, a random forest prediction cannot be represented by a single tree as random forest prediction is based on the combinations of trees.

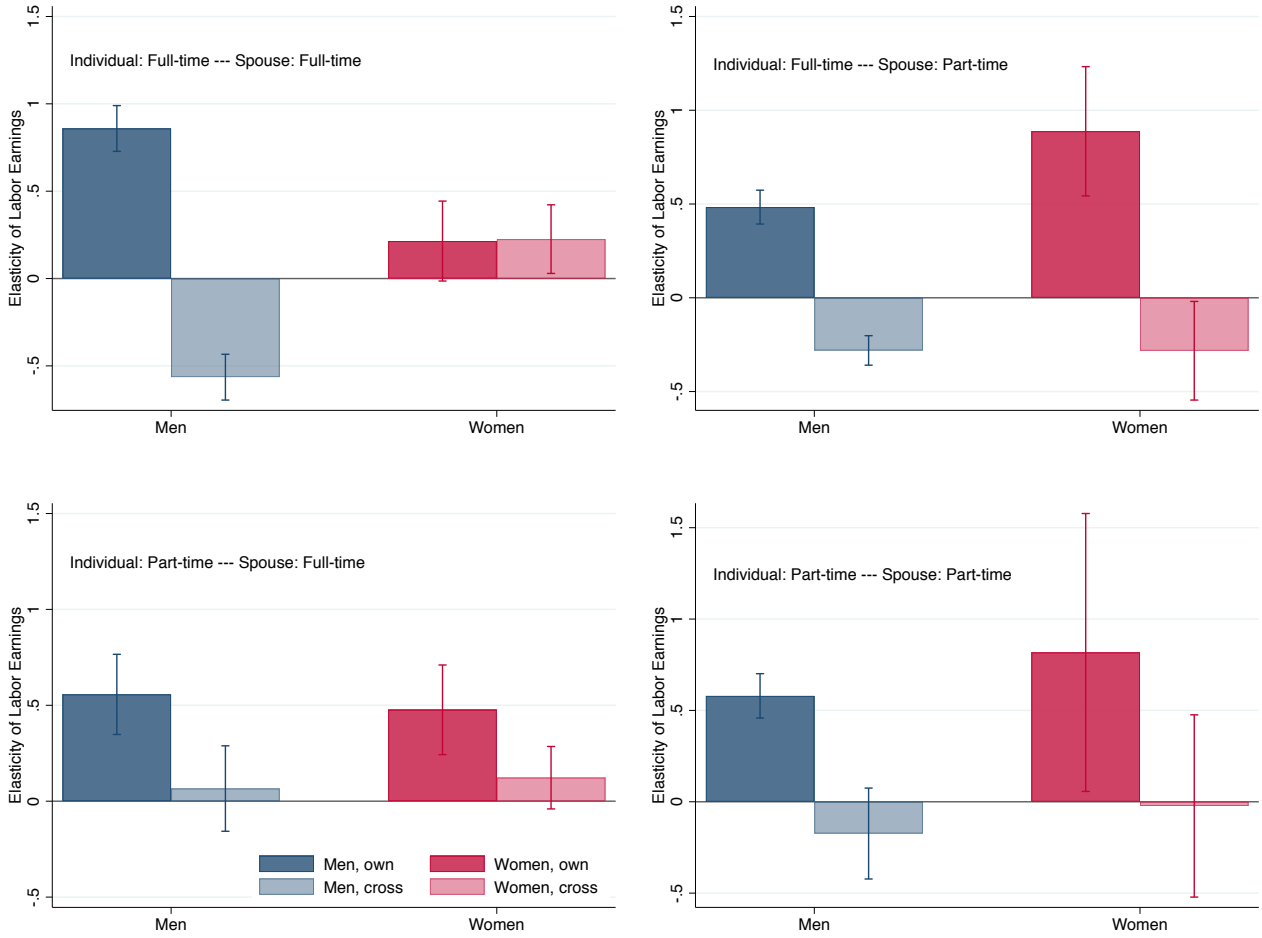


Figure A.19: Own-elasticities and Cross-elasticities of Husbands and Wives by Employment Status

Notes: The figure presents estimates of own-elasticities and cross-elasticities for men and women depending on employment status. *Full-time* is defined as working 46 or more weeks in the previous year. *Part-time* is defined as working less than 46 weeks in the previous year. Elasticities are estimated using a 2SLS estimation of the following modification of equation (2):

$$y_{it} = bracket_{i,t-1} + \delta_t + \varepsilon^{own} \cdot \log(1-\tau_{it}) + bracket_{i,t-1}^{spouse} + \varepsilon^{cross} \cdot \log(1-\tau_{it}^{spouse}) + \boldsymbol{X}_{it}'\gamma + \nu_{it}$$

where the dependent variable is the logarithm of the individual's labor earnings and the two endogenous variables, the individual's log net-of-tax rate and his spouse's log net-of-tax rate, are instrumented with an interaction between indicators of treatment status and tax-free year for the individual and his spouse separately. The coefficient ε^{own} identifies the own-elasticity and ε^{cross} the cross-elasticity. Estimates by subgroups are obtained by interacting group indicators with the log of net-of-tax rate of the individual and his spouse as well as the respective instrumental variables. Regressions control for age, education, whether living in the capital area or not and number of children 0-18. The figure shows 95% confidence intervals based on clustered robust standard errors.

The figure documents two informative patters. First, the figure shows that when both partners are full-time employed, men's cross-elasticity is negative and large, counteracting a large own-elasticity. When both spouses work full-time, there is less room for substitutability. But if full-time employed men contribute less to home production than their full-time employed wives, who now wish to work more hours, they must allocate some time to home production. Second, irrespective of gender, full-time employed individuals with part-time employed spouses have negative cross-elasticities, indicating a substitutability in home production where the spouse specializing in market work allocates more hours to home duties in response to the spouse's tax cut. These findings are consistent with previous evidence finding that as women earn more, they do relatively less housework whereas their husbands do more (Bittman et al., 2003). However, as documented by Bertrand, Kamenica, and Pan (2015), this pattern is more complex, as women's relative housework burden begins to increase with their income when they earn more than their husbands.

J Supplementary Tables

Table A.5: Elasticity of Total Weeks Worked

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	0.093***	0.090***	0.168***
	(0.026)	(0.026)	(0.035)
Reduced form estimate ($d\log y$)	0.019***	0.019***	0.032***
	(0.005)	(0.005)	(0.007)
First stage estimate ($d\log(1-\tau)$)	0.207***	0.208***	0.193***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	515,232	515,232	514,737

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is the logarithm of total number of weeks worked and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the the logarithm of total number of weeks worked. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.6: Effect of Tax-Free Year on Labor Earnings: Employees vs. Self-Employed

	Wage earners			Self-employed		
	(1)	(2)	(3)	(4)	(5)	(6)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	0.373***	0.328***	0.406***	0.484***	0.427***	0.521***
	(0.027)	(0.026)	(0.036)	(0.057)	(0.055)	(0.074)
Reduced form estimate ($d\log y$)	0.076***	0.068***	0.078***	0.103***	0.092***	0.106***
	(0.005)	(0.005)	(0.007)	(0.012)	(0.011)	(0.015)
First stage estimate ($d\log(1-\tau)$)	0.205***	0.206***	0.191***	0.213***	0.214***	0.204***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No	No	Yes	No
Sector Fixed Effects	No	Yes	No	No	Yes	No
Matching	No	No	Yes	No	No	Yes
Observations	448,592	448,592	448,232	78,363	78,363	78,226

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. Columns (1)-(3) report estimates for wage earners and Columns (4)-(6) report estimates for the sample of business owners and workers with income from self-employment. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is the logarithm of labor earnings and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to a weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.7: Effect of Tax-Free Year on Total Weeks Worked: Employees vs. Self-Employed

	Wage earners			Self-employed		
	(1)	(2)	(3)	(4)	(5)	(6)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	2.337***	1.754**	5.563***	10.127***	12.190***	8.700***
	(0.787)	(0.778)	(1.076)	(2.180)	(2.147)	(2.623)
Reduced form estimate (dy)	0.480***	0.362***	1.062***	2.161***	2.614***	1.772***
	(0.161)	(0.160)	(0.204)	(0.464)	(0.458)	(0.532)
First stage estimate ($d\log(1-\tau)$)	0.205***	0.206***	0.191***	0.213***	0.214***	0.204***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Mean of outcome variable	46.62	46.62	46.62	58.61	58.61	58.61
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No	No	Yes	No
Sector Fixed Effects	No	Yes	No	No	Yes	No
Matching	No	No	Yes	No	No	Yes
Observations	441,961	441,961	441,602	78,477	78,477	78,339

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. Columns (1)-(3) report estimates for wage earners and Columns (4)-(6) report estimates for the sample of business owners and workers with income from self-employment. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is the total number of weeks worked and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the total number of weeks worked. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.8: Effect on Earnings and Employment-Related Income

Wages and salaries	93.7%
Fringe benefits, travel allowances etc	2.6%
Drivers payments	0.7%
Gifts from employer	0.1%
Pension payment from employer	0.3%
Bonuses, sales commission etc.	0.7%
Board remuneration	2.0%
Sum	100%

Notes: The table presents results from a 2SLS estimation of equation (2), where the dependent variable is the one stated in each row, in 1981$. Estimates are presented in the fraction of total employment-related income. Each regression controls for gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18.

Table A.9: Effect of Tax-Free Year on Capital Income

	(1)	(2)	(3)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	310***	291***	272**
	(118)	(109)	(131)
Reduced form estimate (dy)	64***	61***	53**
	(24)	(23)	(25)
First stage estimate ($d\log(1-\tau)$)	0.207***	0.208***	0.193***
	(0.001)	(0.001)	(0.001)
Mean of outcome variable	72.34	72.34	72.34
Share of treatment effect on labor earnings	0.021	0.021	0.018
Controls	No	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	530,900	530,900	530,900

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is real taxable capital income in 1981$ and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is real taxable capital income in 1981$. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. "'Share of treatment effect on labor earnings"' refers to the ratio of the top row to a similar estimate of real labor earnings in in 1981$. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.10: Effect of Tax-Free Year on Self-Employment

	(1)	(2)	(3)
2SLS DD estimate ($\frac{dP}{d\log(1-\tau)}$)	0.104***	0.102***	0.155***
	(0.014)	(0.013)	(0.019)
Reduced form estimate (dP)	0.021***	0.021***	0.030***
	(0.003)	(0.002)	(0.003)
First stage estimate ($d\log(1-\tau)$)	0.207***	0.208***	0.193***
	(0.001)	(0.001)	(0.001)
Mean of outcome variable	0.149	0.149	0.149
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	530,900	530,900	530,397

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is an indicator for having income from self-employment and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is an indicator for having income from self-employment. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.11: Effect of Tax-Free Year on Labor Earnings: Predicted Tax Bracket

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	0.397***	0.401***	0.393***
	(0.027)	(0.027)	(0.026)
Reduced form estimate ($d\log y$)	0.081***	0.081***	0.078***
	(0.005)	(0.005)	(0.006)
First stage estimate ($d\log(1-\tau)$)	0.206***	0.205***	0.203***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	311,736	310,982	311,673

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. Treatment status is assigned based on the predicted tax bracket in a given year; see the text for details. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is the logarithm of labor earnings and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.12: Effect of Tax-Free Year on Total Weeks Worked: Predicted Tax Bracket

	(1)	(2)	(3)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	6.710***	6.023***	6.467***
	(0.887)	(0.828)	(1.019)
Reduced form estimate (dy)	1.367***	1.224***	1.292***
	(0.179)	(0.167)	(0.203)
First stage estimate ($d\log(1-\tau)$)	0.206***	0.205***	0.203***
	(0.001)	(0.001)	(0.001)
Mean dependent variable	48.64	48.64	48.64
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	307,108	304,465	307,045

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is total number of weeks worked and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the total number of weeks worked. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.13: Effect of Tax-Free Year on Labor Earnings: Continuous bracket position

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	0.331***	0.273***	0.356***
	(0.025)	(0.025)	(0.029)
Reduced form estimate ($d\log y$)	0.112***	0.093***	0.117***
	(0.008)	(0.008)	(0.009)
First stage estimate ($d\log(1-\tau)$)	0.338***	0.341***	0.329***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	115,997	115,997	115,870

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. Treatment status is assigned to workers that remain in the same tax bracket for the three consecutive years prior to 1987, while excluding others. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is the logarithm of labor earnings and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.14: Effect of Tax-Free Year on Weeks Worked: Continuous bracket position

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	6.370***	5.596***	7.470***
	(0.748)	(0.737)	(0.988)
Reduced form estimate ($d\log y$)	2.161***	1.916***	2.462***
	(0.253)	(0.251)	(0.324)
First stage estimate ($d\log(1-\tau)$)	0.338***	0.341***	0.329***
	(0.001)	(0.001)	(0.001)
Mean dependent variable	49.01	49.01	49.01
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	114,117	114,117	113,990

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. Treatment status is assigned to workers that remain in the same tax bracket for the three consecutive years prior to 1987, while excluding others. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is total number of weeks worked and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.15: Effect of Tax-Free Year on Labor Earnings by Tax-Brackets

	Lower-Middle		Upper-Middle		Top	
	(1)	(2)	(3)	(4)	(5)	(6)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	0.484***	0.539***	0.286***	0.304***	0.236***	0.200***
	(0.037)	(0.042)	(0.020)	(0.029)	(0.016)	(0.033)
Reduced form estimate ($d\log y$)	0.069***	0.072***	0.083***	0.084***	0.111***	0.087***
	(0.005)	(0.005)	(0.006)	(0.008)	(0.007)	(0.014)
First stage estimate ($d\log(1-\tau)$)	0.142***	0.133***	0.293***	0.272***	0.467***	0.434***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Matching	No	Yes	No	Yes	No	Yes
Observations	368,645	368,402	202,600	202,030	146,702	143,676

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is the logarithm of labor earnings and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.16: Effect of Tax-Free Year on Weeks Worked by Tax-Brackets

	Lower-Middle		Upper-Middle		Top	
	(1)	(2)	(3)	(4)	(5)	(6)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	6.973***	9.437***	0.693	1.671	4.932***	5.571***
	(1.208)	(1.678)	(0.720)	(0.886)	(0.644)	(0.725)
Reduced form estimate (dy)	0.987***	1.203***	0.203	0.465	2.301***	2.513***
	(0.170)	(0.213)	(0.211)	(0.247)	(0.300)	(0.326)
First stage estimate ($d\log(1-\tau)$)	0.142***	0.133***	0.293***	0.272***	0.467***	0.434***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Mean dependent variable	45.99	45.99	47.85	47.85	47.09	47.09
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Matching	No	Yes	No	Yes	No	Yes
Observations	363,770	363,542	200,099	199,943	145,205	145,028

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is total number of weeks worked and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.17: Tax-Bracket DD: Labor Earnings – Top and Upper-Middle vs. Lower-Middle Bracket

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	0.232***	0.289***	0.233***
	(0.029)	(0.029)	(0.034)
Reduced form estimate ($d\log y$)	0.037***	0.046***	0.034***
	(0.005)	(0.004)	(0.005)
First stage estimate ($d\log(1-\tau)$)	0.160***	0.158***	0.147***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	431,459	431,459	430,911

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is the logarithm of labor earnings and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.18: Tax-Bracket DD: Weeks Worked, Top and Upper-Middle vs. Lower-Middle Bracket

	(1)	(2)	(3)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	3.100***	4.246***	3.268***
	(1.137)	(1.133)	(1.410)
Reduced form estimate (dy)	0.497***	0.675***	0.482***
	(0.182)	(0.180)	(0.208)
First stage estimate ($d\log(1-\tau)$)	0.160***	0.158***	0.147***
	(0.001)	(0.001)	(0.001)
Mean of outcome variable	49.79	49.79	49.79
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	520,438	520,438	425,579

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is total number of weeks worked and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the total number of weeks worked. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.19: Tax-Bracket DD: Labor Earnings, Controls for 1988 Tax Rates

	(1)	(2)	(3)	(4)
2SLS DD estimate ($\frac{d \log y}{d \log(1-\tau)}$)	0.374***	0.373***	0.307***	0.378***
	(0.024)	(0.022)	(0.023)	(0.022)
$\tau_{1986} - \tau_{1988}$	No	Yes	No	Yes
$\tau_{1986}^{average} - \tau_{1988}^{average}$	No	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	526,955	526,955	526,955	526,955

Notes: The table presents results from a 2SLS estimation of equation (2), where the dependent variable is the logarithm of labor earnings and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The difference between marginal tax rates in 1986 and 1988 is denoted with $\tau_{1986} - \tau_{1988}$. The difference between average tax rates in 1986 and 1988 is denoted with $\tau_{1986}^{average} - \tau_{1988}^{average}$. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.20: Tax-Bracket DD: Weeks Worked, Controls for 1988 Tax Rates

	(1)	(2)	(3)	(4)
2SLS DD estimate ($\frac{dy}{d \log(1-\tau)}$)	4.926***	7.088***	4.470***	7.171***
	(0.784)	(0.719)	(0.749)	(0.719)
$\tau_{1986} - \tau_{1988}$	No	Yes	No	Yes
$\tau_{1986}^{average} - \tau_{1988}^{average}$	No	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Mean of outcome variable	48.43	48.43	48.43	48.43
Observations	520,438	520,438	520,438	520,438

Notes: The table presents results from a 2SLS estimation of equation (2), where the dependent variable is total number of weeks worked and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The difference between marginal tax rates in 1986 and 1988 is denoted with $\tau_{1986} - \tau_{1988}$. The difference between average tax rates in 1986 and 1988 is denoted with $\tau_{1986}^{average} - \tau_{1988}^{average}$. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.21: Tax-Bracket DD: Labor Earnings – Upper-Middle vs. Lower-Middle Bracket

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	0.325***	0.386***	0.337***
	(0.048)	(0.048)	(0.058)
Reduced form estimate ($d\log y$)	0.036***	0.042***	0.033***
	(0.005)	(0.005)	(0.006)
First stage estimate ($d\log(1-\tau)$)	0.111***	0.110***	0.099***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	380,253	380,253	379,783

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is the logarithm of labor earnings and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. "'Matching" refers to weighted regressions after coarsened exact matching on age and pre-treatment marital status, the number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.22: Life-Cycle-DD: Labor Earnings, Upper-Middle and Lower-Middle Brackets

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d\log y}{d\log(1-\tau)}$)	0.493***	0.490***	0.426***
	(0.001)	(0.001)	(0.001)
Reduced form estimate ($d\log y$)	0.150***	0.149***	0.136***
	(0.003)	(0.003)	(0.003)
First stage estimate ($d\log(1-\tau)$)	0.303***	0.303***	0.317***
	(0.001)	(0.001)	(0.001)
Match-strata Fixed Effects	Yes	Yes	No
Individual Fixed Effects	No	No	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Number of observations	250,762	250,762	232,264

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (4), where the dependent variable is the logarithm of labor earnings and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (3), where the outcome variable is the logarithm of labor earnings. The bottom row presents results from a first-stage DD estimation of equation (3), where the outcome variable is the logarithm of one minus the marginal tax rate. "Match-strata Fixed Effects" refers to group fixed effects, where each group is a cell used in coarsened exact matching on age, gender and pre-treatment marital status, the number of children, education, location indicator and percentile of income. Occupation and sector fixed effects are group dummies for occupation and sector groups. The number of observations corresponds to observations for the treatment group. Robust standard errors clustered at the match-strata level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.23: Life-Cycle-DD: Weeks Worked, Upper-Middle and Lower-Middle Brackets

	(1)	(2)	(3)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	2.210***	2.259***	1.024***
	(0.353)	(0.344)	(0.334)
Reduced form estimate (dy)	0.673***	0.689***	0.326***
	(0.107)	(0.105)	(0.106)
First stage estimate ($d\log(1-\tau)$)	0.303***	0.303***	0.317***
	(0.001)	(0.001)	(0.001)
Mean dependent variable	48.15	48.15	48.15
Match-strata Fixed Effects	Yes	Yes	No
Individual Fixed Effects	No	No	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Number of observations	248,850	248,850	229,894

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (4), where the dependent variable is total weeks worked and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (3), where the outcome variable is total weeks worked. The bottom row presents results from a first-stage DD estimation of equation (3), where the outcome variable is the logarithm of one minus the marginal tax rate. "Match-strata Fixed Effects" refers to group fixed effects, where each group is a cell used in coarsened exact matching on age, gender and pre-treatment marital status, number of children, education, location indicator and percentile of income. Occupation and sector fixed effects are group dummies for occupation and sector groups. The number of observations corresponds to observations for the treatment group. Robust standard errors clustered at the match-strata level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.24: Effect of Permanent Reform

	Earnings (1)	Weeks (2)	Employment (3)
2SLS DD estimate	0.424***	4.681***	0.529***
	(0.050)	(1.349)	(0.114)
Reduced form estimate	0.046***	0.487***	0.015***
	(0.005)	(0.137)	(0.003)
First stage estimate	0.103***	0.103***	0.028***
	(0.001)	(0.001)	(0.001)
Mean dependent variable	—	45.62	0.858
Controls	Yes	Yes	Yes
Observations	675,673	676,253	716,851

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The post-reform period is 1988-1990 and the year 1987 is dropped from the sample. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is defined in the top panel above each column and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the total number of weeks worked. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate, except in the case of employment where it is one minus the average tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.25: Effect of Permanent Reform: Men

	Earnings (1)	Weeks (2)	Employment (3)
2SLS DD estimate	0.038	-2.371*	-0.116
	(0.045)	(1.349)	(0.025)
Reduced form estimate	0.006	-0.345*	-0.005
	(0.007)	(0.137)	(0.004)
First stage estimate	0.145***	0.145***	0.040***
	(0.002)	(0.002)	(0.001)
Mean dependent variable	—	48.17	0.913
Controls	Yes	Yes	Yes
Observations	437,486	436,232	463,817

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The post-reform period is 1988-1990 and the year 1987 is dropped from the sample. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is defined in the top panel above each column and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the total number of weeks worked. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate, except in the case of employment where it is one minus the average tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.26: Effect of Permanent Reform: Women

	Earnings (1)	Weeks (2)	Employment (3)
2SLS DD estimate	0.606***	4.624	0.375
	(0.158)	(4.082)	(0.250)
Reduced form estimate	0.032***	0.233	0.008
	(0.007)	(0.201)	(0.005)
First stage estimate	0.050***	0.050***	0.020***
	(0.002)	(0.002)	(0.001)
Mean dependent variable	—	41.34	0.765
Controls	Yes	Yes	Yes
Observations	238,187	240,021	253,034

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The post-reform period is 1988-1990 and the year 1987 is dropped from the sample. The top row presents results from a 2SLS estimation of equation (2), where the dependent variable is defined in the top panel above each column and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (1), where the outcome variable is the total number of weeks worked. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate, except in the case of employment where it is one minus the average tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.27: Life-Cycle DD: Robustness – Sample Restricted to Taxpayers

	Earnings (1)	Weeks (2)	Employment (3)
2SLS DD estimate	0.529***	3.157***	0.040***
	(0.010)	(0.337)	(0.011)
Reduced form estimate	0.150***	0.896***	0.006***
	(0.003)	(0.095)	(0.002)
First stage estimate	0.282***	0.282***	0.153***
	(0.002)	(0.002)	(0.001)
Mean dependent variable	–	48.97	0.920
Match-strata Fixed Effects	Yes	Yes	Yes
Number of Individuals	356,968	350,681	359,943

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (4), where the dependent variable is noted in the top panel and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (3). The bottom row presents results from a first-stage DD estimation of equation (3), where the outcome variable is the logarithm of one minus the tax rate. "'Match-strata Fixed Effects" refers to group fixed effects, where each group is a cell used in coarsened exact matching on age, gender and pre-treatment marital status, the number of children, education, location indicator and percentile of income. Robust standard errors clustered at the match-strata level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.28: Life-Cycle DD: Robustness – Drop Fishing Sector

	Earnings (1)	Weeks (2)	Employment (3)
2SLS DD estimate	0.687***	3.037***	0.071***
	(0.017)	(0.365)	(0.015)
Reduced form estimate	0.147***	0.655***	0.007***
	(0.003)	(0.079)	(0.002)
First stage estimate	0.202***	0.202***	0.105***
	(0.002)	(0.002)	(0.001)
Mean dependent variable	–	39,34	0.659
Match-strata Fixed Effects	Yes	Yes	Yes
Number of observations	572,213	572,213	572,213
Number of Individuals	144,205	144,205	144,205

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. The top row presents results from a 2SLS estimation of equation (4), where the dependent variable is noted in the top panel and the net-of-tax rate is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DD estimation of equation (3). The bottom row presents results from a first-stage DD estimation of equation (3), where the outcome variable is the logarithm of one minus the tax rate. "Match-strata Fixed Effects" refers to group fixed effects, where each group is a cell used in coarsened exact matching on age, gender and pre-treatment marital status, the number of children, education, location indicator and percentile of income. Robust standard errors clustered at the match-strata level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1