Online Appendix of:

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 throughout 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 ten equal payments on the first day of each month of the calendar year, except January and July. At the beginning of the year, and 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 employees' paycheck and remitted them to the government.

Although this system had some advantages, such as easing the work of the tax authorities in taking into account a range of tax deductions and allowances to arrive at the correct tax liability, it had obvious drawbacks, for both 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 municipal tax. As described in Section I, 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 the 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.[1] Before arriving at the tax base, multiple deductions could be made. As these deductions differed substantially between the national and municipal levels, the tax base for the two 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 fisher's deduction, deductions for each day spent at sea, special deductions for the costs of 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 taxpayers the option to instead deduct a fixed 10% from the national-level tax base, an option many exploited. While including both labor and capital income as the national-level tax base,

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

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 that at the national level. Because 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 levels, deducted from the computed tax payments. At the national level, this amount was fixed and was 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, not jointly. Therefore, each spouse files his/her own tax return, and 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.[2] Second, married or cohabiting workers whose spouses were out of the labor force or with a very low income could increase the amount 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 3a, 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 3b 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, as the tax base for the municipal tax was different and generally higher than the national-level tax base, the share of workers who 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 levels became 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 of being integrated into the tax system, and incorporating minor fees such as fees to the church and cemeteries into the main income tax, all of which simplified the tax system and made

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

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.[3]

B The Tax Reform and the Timeline 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 pay-as-you-earn tax systems.[4] 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, and nor did it generate a cash-flow effect on workers.[5] However, as 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 this change. As evidence on when the population learned about the reform, Figure 2 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, there was a broad political consensus that 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 1940s and 1950s. 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

[3] In 1988, the personal tax allowance equaled 22.6% of the average income compared with 12.7% in 1986.

[4] 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 1940/41. Sweden passed a law establishing a PAYE system in 1945 that was implemented 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.

[5] 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's constitution was proclaimed and the country 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 was lost by examining the Treasury's position on "Judgment Day".

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 formed 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 usually 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 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. 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.[6] 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*". Politicians and union leaders emphasized the opportunity that this reform provided, and in an interview, the chairman of one of the largest labor unions was quoted as saying "*Now it is time for everyone outside the labor market to enter, and for all workers to earn tax-free income. There is work for everyone that wants to work.*"[7]

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 January 1, 1988, as had been scheduled when the reform was first announced. During 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 they produced flyers explaining the new tax system and that income earned in 1987 was tax free (see Appendix Figures A.3 and A.4). For those who 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

[6] Although policy makers are likely to want to make some adjustments to tax payments during a transition, a tax-free year was 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 the forgiveness of most outstanding tax liabilities. According to the Current Tax Payment Act of 1943, 75% of the 1942 tax liability was canceled with the remainder being due in two equal payments on March 15, 1944 and March 15, 1945 (Paul, 1954).

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

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.[8]

While the general rule was that all labor income in 1987 should be exempt from taxes, some attempts were made 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 any or 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 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 only a limited de facto role.[9]

C Data and Measurement

The following appendices provide a further description of the data and measures 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 which computes marginal tax rates in the US, I 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 were 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

[8] 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%.

[9] 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 cluster (or 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.

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 tax filers. The discrepancy is largely because of inaccurate information related to moving, within or outside Iceland, as the accuracy increases to 99.5% when I restrict my attention to national-level taxes only.

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 levels). The total average tax rate for an individual is then the sum of the two.

C.2 Summary Statistics

Table A.10 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 nonzero labor earnings, the average weeks worked is 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

Pay slips 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.11 documents the structure of the classification and lists the broader occupation groups.

The pay slips also record the sector for each firm. In total there are 189 separate sector classes 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.12 documents the structure of the sector classification.

C.4 Education Classification

In the analysis, we 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 onwards. 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 Life-Cycle Labor Supply Model and Identification Strategy

Section IV in the main text develops an identification strategy motivated by the life-cycle labor supply model of MaCurdy (1981). For the purposes of explaining and illustrating the intuition behind this method, this section in the appendix lays out the MaCurdy (1981) model and discusses in turn labor supply responses to evolutionary wage changes, anticipated transitory wage changes, and an unexpected transitory wage change (tax-free year). I then illustrate how the model informs about how labor supply elasticities can be estimated.

D.1 Model

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

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

subject to

$$A_{it} = (1+r_t)A_{it-1} + w_{it}N_{it} - C_{it} \tag{2}$$

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

$$U_{it}(C_{it}, L_{it}) = \gamma_{C_it} C_{it}^{\alpha_C} - \gamma_{N_{it}} N_{it}^{\alpha_N}, \quad N_{it} = \bar{L} - L_{it} \tag{3}$$

Note that α_C and α_N are constant and common across all workers, while γ_{C_it} and γ_{N_it} are individual- and age-specific parameters describing the tastes for consumption and leisure. It is assumed that (the log of) taste for leisure is

$$\log \gamma_{N_{it}} = \sigma_i + \mu_{it} \tag{4}$$

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

$$\log N_{it} = \frac{1}{\alpha_N - 1} \left(\log \lambda_{it} - \log \alpha_N + \log w_{it} - \sigma_i + \mu_{it} \right) \tag{5}$$

The Frisch consumption demand function can be written in a similar fashion. In (5), λ_{it} is the Lagrange multiplier on wealth. From the envelope theorem, we have that

$$\lambda_{it} = \frac{1 + r_{t+1}}{1 + \rho} \lambda_{it+1} \tag{6}$$

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

$$\log \lambda_{it} \approx r_{t+1} - \rho + \lambda_{it+1} \tag{7}$$

Using the above approximation, the labor supply equation (5) can be written as follows

$$\log N_{it} = F_i + bt - \varepsilon R_t + \varepsilon \log w_{it} + u_{it} \tag{8}$$

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

$$F_i = Z_i\theta + \sum_{t=1}^{T} \gamma_t \log w_{it} + A_{i0}\theta + \alpha_i \tag{9}$$

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

$$w_{it} = \pi_{0i} + \pi_{1i}t + \pi_{2i}t^2 + \nu_{it} \tag{10}$$

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 (10) into (11) yields

$$F_i = Z_i\theta + \pi_{0i}\bar{\gamma_0} + \pi_{1i}\bar{\gamma_1} + \pi_{2i}\bar{\gamma_2} + A_{i0}\theta + \xi_i \tag{11}$$

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

D.2 Labor Supply Responses to Evolutionary and Transitory Wage Changes

I now consider the 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 given that anticipated changes only generate substitution effects while the latter generate both substitution and income or wealth effects. This analysis is therefore helpful in understanding which parameters can be estimated using natural experiments such as tax reforms to generate a

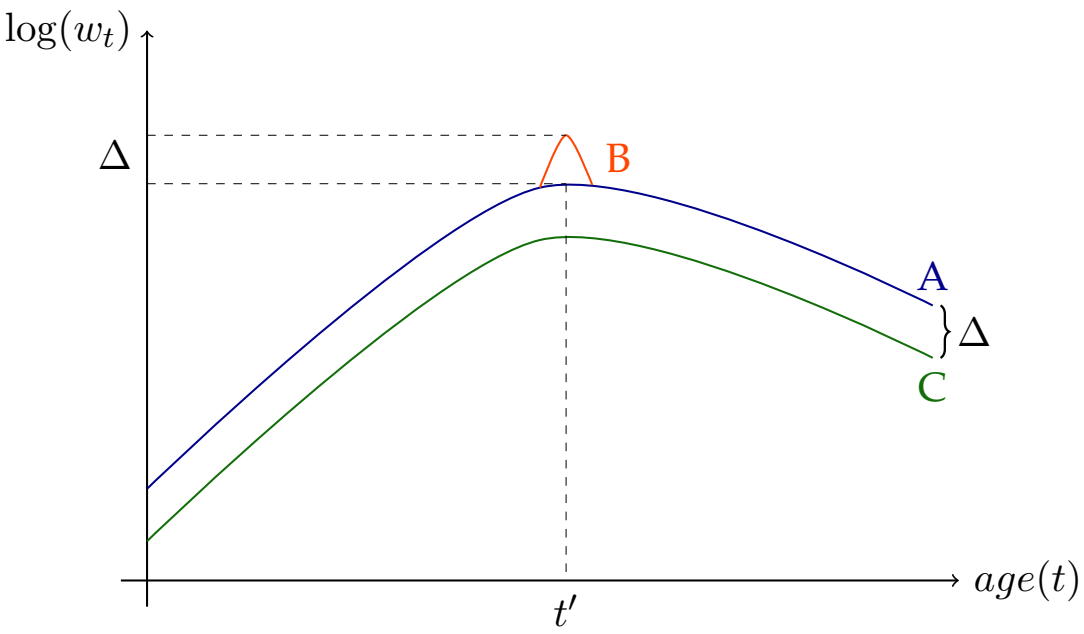


Figure A.1: Evolutionary and transitory wage changes over the life cycle

variation in after-tax wages.

Figure A.1 plots wage paths over the life cycle, according to the process in (10). Consider an individual whose wage path can be described by path A. As he becomes older, individual A's wages increase, to which the individual responds by adjusting hours. Such evolutionary wage changes are known to the individual as the wage path, and therefore generate a substitution effect and no income effect. The parameter governing these responses is ε, which is the intertemporal (λ-constant) *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.

As such perfectly anticipated evolutionary wage changes are difficult to identify and observe, let us consider two scenarios an econometrician might encounter. First, let us compare two individuals, for whom the evolution of wages can be described by paths A and B in Figure A.1, where they are equal at all periods t except at t' when they differ by Δ (e.g. due to a tax-free year). This is a parametric change in wages, as this is a shift in the (known) life-cycle path A. This has two effects on the individual's labor supply. First, it 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 an income effect: the individual will set a value of F_B that is lower than that of F_A by $\gamma_{t'}\Delta$. As a result, the labor supply of an individual facing path B compared with path A will be lower in all periods $t \neq t'$ by some constant. In total, the effect on labor supply at time t' is $(\varepsilon + \gamma_{t'})\Delta$. Given the income effect and substitution effect are of opposite sign, the labor supply response to a one-period wage increase is smaller than that predicted by the Frisch elasticity ε.

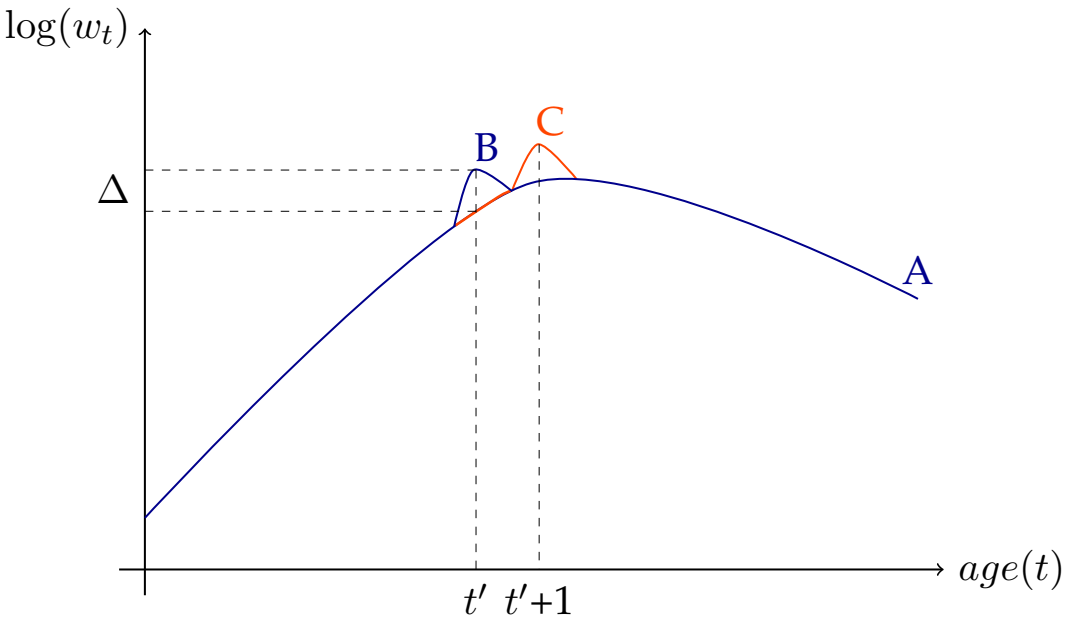


Figure A.2: Tax-free year at different periods over the life cycle

As a second comparison, let us compare individuals with paths A and C in Figure A.1. Moving from path C to A is equivalent to 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 $\sum_{t=1}^{T}\gamma_t\Delta = \bar{\gamma}\Delta$.

Any temporary variation in wages that is not perfectly predictable does not allow us to identify the Frisch elasticity; such changes always generate an income effect. Therefore, the observed labor supply elasticity estimated from a transitory wage change is $(\varepsilon + \gamma_{t'}) \leqslant \varepsilon$, where equality only holds when utility is linear in consumption, implying no income effect. However, comparing the two "experiments" considered above, the temporary one-period increase in wages (e.g. the tax-free year) only generates a very small income effect compared with that generated by a permanent shift in the wage profile (e.g. a permanent change in taxes). Transitory wage increases therefore allow us to measure elasticities close to the Frisch substitution elasticity.

D.3 Labor Supply Responses to a Tax-Free Year

The intuition from the MaCurdy (1981) model can be used to motivate the empirical strategy I develop in Section IV to estimate labor supply responses to the tax-free year. Figure A.2 presents a stylized graphical example to help describing the intuition behind the empirical approach.

The comparison between the life-cycle wage profiles of two individuals, A and B, in Figure A.2 is identical to that in Figure A.1. A comparison of the labor supply of A and B before and during the wage increase faced by B allows for estimating the Frisch elasticity ε, net of an income effect. To be precise, as during the tax-free year income remains unchanged at the same labor supply as the year before, the reform does not generate an income effect in the same way as a one-period wage increase. Therefore, this reform allows for estimating an elasticity closer to the Frisch elasticity ε.

In my empirical setting, there exists no comparison such as that between A and B. However, as individuals experience the tax-free year at different points over their lifetime, my setting allows for an alternative comparison, enabling me to estimate the labor supply elasticities. To illustrate the comparison, Figure A.2 plots a wage profile for individual C, who is identical to B except that the individual experiences the wage increase when one year older, at age t'+1. As documented by the figure, at age t', individual C is the counterfactual for B, as they follow the same life-cycle paths. Therefore, the Frisch elasticity ε can be estimated by relating the wage increase Δ to the difference in labor supply of B and C at age t', when C has not yet received the wage increase.

E Summary of Frisch Elasticity Estimates

To obtain a reference point for evaluating the magnitude of the Frisch elasticity estimates in the current paper, I conduct a meta-analysis of previous estimates, summarizing estimates of both intensive-margin and extensive-margin elasticities.

E.1 Intensive Margin Frisch Elasticity

Figure A.15, panel (a), summarizes past estimates of intensive margin Frisch elasticities.[10] The figure is organized in three sections by the samples studied, from left to right: the population (as either a whole or a representative sample), prime-aged men, and specific occupational groups. For reference, I also plot my estimates for the corresponding sample.

Close studies. My analysis lies closest to two earlier studies. Using a random sample of 9,300 individuals, Bianchi, Gudmundsson, and Zoega (2001) study labor supply during the Icelandic tax-free year and compare it to the year before and the year after. Their paper is an important contribution highlighting the Icelandic tax-free year as a unique natural experiment. To date, it still remains one of the few informative data points on intertemporal labor supply (Chetty et al., 2013). However, owing to limited data availability, their estimates are based on *average* tax rates in 1986 while the relevant measure for calculating the intensive margin elasticity is the *marginal* tax rate. To facilitate comparability of their estimates to this and other studies in the literature, I compute the average marginal tax rates for the groups they study and transform their estimated earnings responses into an intensive margin elasticity of 0.77 (see Appendix F for details).[11] Of most note, this estimate is more than twice as large as what I estimate in Section III. This contrast underlines the importance of separating responses to the tax-free year from the influences of pre-trends, the business cycle, and subsequent changes to the tax system.

[10] See Appendix Table A.14 for details of the studies included in Figure A.15. The figure attempts to provide an informative comparison rather than an exhaustive survey. Earlier surveys include Blundell and MaCurdy (1999), Keane (2011), Chetty (2012) and Chetty et al. (2013).

[11] I follow essentially the same procedure as in Chetty et al. (2013) when calculating the elasticity. The difference is that my calculations are based on individual-level marginal tax rates whereas the calculations in Chetty et al. (2013) are based on the average across the progressive tax bracket schedule, assuming an equal share of taxpayers in each bracket. The fact that there is much more mass of taxpayers at lower brackets than higher tax brackets explains why their calculations yield a much lower intensive margin elasticity (0.37) than what I calculate.

The other close study is where Martinez, Saez, and Siegenthaler (2021) estimate a Frisch elasticity using a tax reform in Switzerland, much like that leading to the tax-free year in Iceland. In the late 1990s and early 2000s, Switzerland changed its base for income taxation from the previous *two* years' income to pay-as-you-earn. As a result, the reform led to a two-year tax holiday, but this took place at different times across geographic regions. Using the staggering of the reform, the authors estimate a small intensive margin elasticity of 0.025 with a small standard error. As I explain below, different populations and differences in the flexibility of the two labor markets likely explain this difference.

In more recent work, Stefánsson (2019) revisits and extends the analysis in Bianchi, Gudmundsson, and Zoega (2001) using population-level income data. Using difference-in-differences across income groups at the upper end of the income distribution, he estimates an earnings elasticity of about 0.07. This is different from my methodology, which exploits differences in marginal tax rates across tax brackets. As explained in Appendix A, marginal tax rates were not only a function of the level of labor income but owing to multiple tax deductions and tax credits there was a substantial overlap in the earnings distributions across tax brackets.

Other earlier work. Most of the existing evidence on Frisch elasticity, including the seminal studies by MaCurdy (1981) and Altonji (1986), draw on regressions of the working hours on wages of prime-age men. As Figure A.15, panel (a), illustrates, the elasticities in these studies are very imprecisely estimated and often statistically insignificant. This may be due to several reasons. First, the instrumental variable approach used in much of this literature is based on individual characteristics, traditionally age and education, as predictors of changes in wages. While this literature brought the insight that these factors can be good predictors of the level of wages, later work has found them to perform poorly in predicting wage changes, leading to weak instruments (Keane, 2011). Second, prior work has emphasized issues concerning the measurement of wages and hours in the Panel Study of Income Dynamics (PSID) used in much of this literature, which may lead to either a positive or a negative bias (Heckman, 1993; French, 2004a).[12]

The empirical challenge of estimating Frisch elasticity and the presence of adjustment frictions has motivated several studies that estimate elasticities for particular occupations, such as bicycle messengers (Fehr and Goette, 2007) and taxi drivers (Farber, 2015), for whom exogenous changes in wages are plausible and who are flexible in choosing their daily labor supply. As summarized in Figure A.15, panel (a), these studies tend to estimate relatively large labor supply elasticities. The size of the elasticities are roughly similar but even larger than what I estimate for the groups with the most temporal flexibility (Figure 9). While these studies provide clear causal estimates in an environment with minimum frictions, it is challenging to generalize their findings to the situation where average workers respond to transitory and business cycle variations in wages.

E.2 Extensive Margin Frisch Elasticity

Figure A.15, panel (b), summarizes the estimates of extensive margin Frisch elasticity. Compared with the intensive margin, the existing studies of these are much fewer. My extensive margin elas-

[12] In addition to the quasi-experimental literature surveyed in this section, extensive literature estimates Frisch elasticity using structural methods. I survey prominent papers in this literature in Appendix Figure A.16.

ticity estimate falls far below the estimate by Carrington (1996), who studied employment in Alaska during an oil pipeline boom in the 1970s.[13] The figure underlines the drivers of my elasticity estimate. Similar to prior evidence, I identify an employment response for those at and around retirement age (age 60 years and older). The strongest employment responses, however, are among the youngest cohorts (below age 25 years), for which no comparable estimates exist. For the prime-aged, which is also the population studied in Martinez, Saez, and Siegenthaler (2021), the extensive margin elasticity is zero.

F Calculation Based on Bianchi, Gudmundsson, and Zoega (2001)

Bianchi, Gudmundsson, and Zoega (2001) study labor supply during the Icelandic tax-free year among a random sample of 9,300 individuals by comparing labor income and weeks worked in the tax-free year to the year before and the year after. Their estimates carry much weight in the literature as estimates of the intensive-margin Frisch elasticity are few. However, their estimates are based on the *average* tax rates in 1986 while the relevant measure for measuring the intensive margin elasticity is the *marginal* tax rate. Therefore, to facilitate a comparison of their elasticity estimates and others in the literature, it is necessary to convert their estimates into an elasticity using marginal tax rates. I proceed by calculating an intensive margin elasticity using the estimates from Bianchi, Gudmundsson, and Zoega (2001) and my individual-level data on marginal tax rates.

I base my calculations on the estimates in Table 6 in Bianchi, Gudmundsson, and Zoega (2001). Since the numbers are for individuals working in 1986, it implies that the resulting elasticity can be interpreted as the intensive margin elasticity. The table reports the percentage change in labor income for men and women in 1987 relative to the average in 1986 and 1988. This therefore gives a reduced-form estimate, or the numerator for the elasticity calculation. To obtain the denominator, I calculate the average marginal tax rate across these two groups—employed men and women—in my data, where, as explained in Appendix C, marginal tax rates are calculated using microdata and a tax calculator. The intensive marginal elasticity can then be calculated as the percentage change in labor income for men and women divided by the corresponding group averages in the logarithm of the net of marginal tax rates. To obtain a population-level estimate, I construct a weighted average across men and women using the sample size numbers in Table 6 in Bianchi, Gudmundsson, and Zoega (2001). The resulting elasticity estimate is 0.77. The standard error for this estimate is computed from the standard errors reported in Bianchi, Gudmundsson, and Zoega (2001) using the Delta method and is 0.12.

The procedure described above is essentially the same as the procedure used in Chetty et al. (2013). They calculate an elasticity of 0.37. The large difference lies in the fact that since they did not have access to individual-level data on tax rates, their calculations are based on the average marginal tax rate across the progressive tax bracket schedule, assuming an equal share of taxpayers in each bracket. Since there is much more mass at lower tax rates, this assumption yields a much larger

[13] It is interesting to note that the median age in the Alaskan population in 1970 was just 22.9 years (Carrington (1996), Table 1). Therefore, the estimate in Carrington (1996) is perhaps more comparable to that for young cohorts in Iceland.

denominator than what I calculate using averages of individual-level marginal tax rates. Therefore, the elasticity that they calculate is substantially smaller than what I calculate.

G Is the Order of Magnitude of the Elasticity Estimate Reasonable?

Reliable and comparable estimates of the intensive margin Frisch elasticity are few and the existing evidence is mixed. As a result, inferring whether the size of my estimates is reasonable through such a comparison may not be conclusive. An alternative approach is to use theory to evaluate whether the estimates are consistent with those of other parameters in the standard dynamic labor supply model.

Using economic theory and prior estimates, I can provide a prediction of the Hicksian elasticity implied by my estimate of the Frisch elasticity.[14] A dynamic labor supply model with time-separable utility in consumption and leisure provides the following relationship between the intensive margin Frisch elasticity and other key parameters in the model (Ziliak and Kniesner, 1999; Browning, 2005):

$$\varepsilon_{\text{Frisch}} = \varepsilon_{\text{Hicks}} + \rho \cdot mpe^2 \frac{A}{wh} \tag{12}$$

where ρ is the intertemporal substitution in consumption (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. Similarly, via the Slutsky equation, the model yields the following relation between the Marshallian and the Frisch elasticities:

$$\varepsilon_{\text{Marshallian}} = \varepsilon_{\text{Frisch}} + \frac{A}{wh} \cdot mpe(1 - \rho \cdot mpe) \tag{13}$$

Figure A.17, maps my Frisch elasticity estimate into the Hicksian and Marshallian elasticities on the y-axis and IES on the x-axis for given values of the other parameters in equations (12) and (13). 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), Cesarini, Lindqvist, Notowidigdo, and Östling (2017), and Golosov, Graber, Mogstad, and Novgorodsky (2023), and receiving an inheritance (Nekoei and Seim, 2021). In my calculations, I use an MPE of 0.11 implied by the estimates in Imbens, Rubin, and Sacerdote (2001).[15] Then, I use data from individual tax returns to calculate a $\frac{A}{wh}$ ratio of 3.01, which is the median ratio for workers aged 25-67 in 1986. A value of the IES then pins down the implied Hicksian in the figure. The figure marks two estimates of IES: first, an average IES of 0.5 across the 169 studies surveyed in Havránek (2015), and second, an average IES of 0.9 across 33 studies published in the top-5 general interest journals. The implied Hicksian elasticity lies between 0.37 and 0.39, which

[14] Standard theory of dynamic labor supply yields an important conclusion about the relationship between the Frisch, Hicks and Marshallian elasticities, namely that the Frisch elasticity is larger than the Hicks elasticity, which is, in turn, larger than the Marshallian elasticity (MaCurdy, 1981). This already implies that obtaining an estimate of the Hicks or Marshallian elasticities yields a lower bound on the Frisch elasticity.

[15] While MPE cannot be separately estimated from the marginal propensity to save (MPS), Imbens, Rubin, and Sacerdote (2001) consider a setting where lottery winnings are paid out as installments over 20 years, enabling them to argue for an MPS close to 1 (they use 0.9). Studies of heirs find larger MPE than found for lottery winners (Nekoei and Seim, 2021).

is close to the Hicksian elasticity of 0.33 calculated in Chetty (2012) when pooling across existing studies. The implied Marshallian elasticity of 0.04-0.06 is also in line with previous estimates, such as by Kleven and Schultz (2014) who estimate an elasticity of 0.05 by pooling over a series of tax reforms in Denmark. The Frisch elasticity estimated in the current paper is therefore consistent in magnitude with other parameter estimates where evidence is more abundant.

H Supplementary Figures

Figure A.3: Advertisement: "Road to Tax Freedom"

Figure A.4: Explanation of the withholding tax system and 1987 being a tax-free year

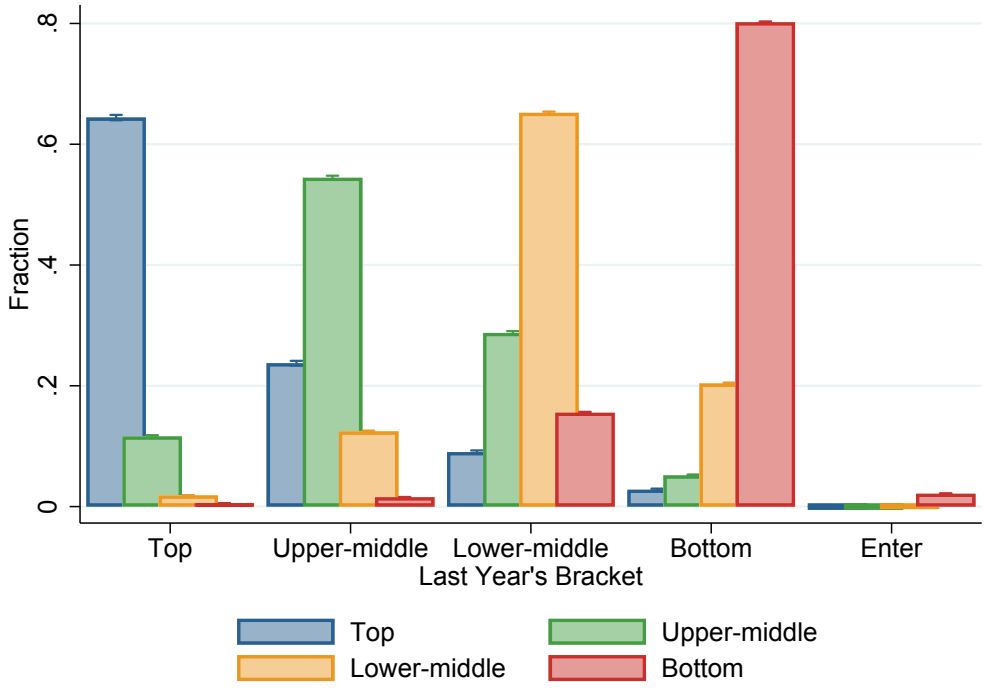


Figure A.5: Transitions between tax brackets, 1982–1986

Notes: The figure plots the average transition rate between tax bracket during the pre-reform period, 1982-1986. That is, every year I compute the rate of transition from a given tax bracket to all other brackets and the rate of stays within the same bracket. I then compute averages of the resulting transition matrix and plot in the figure.

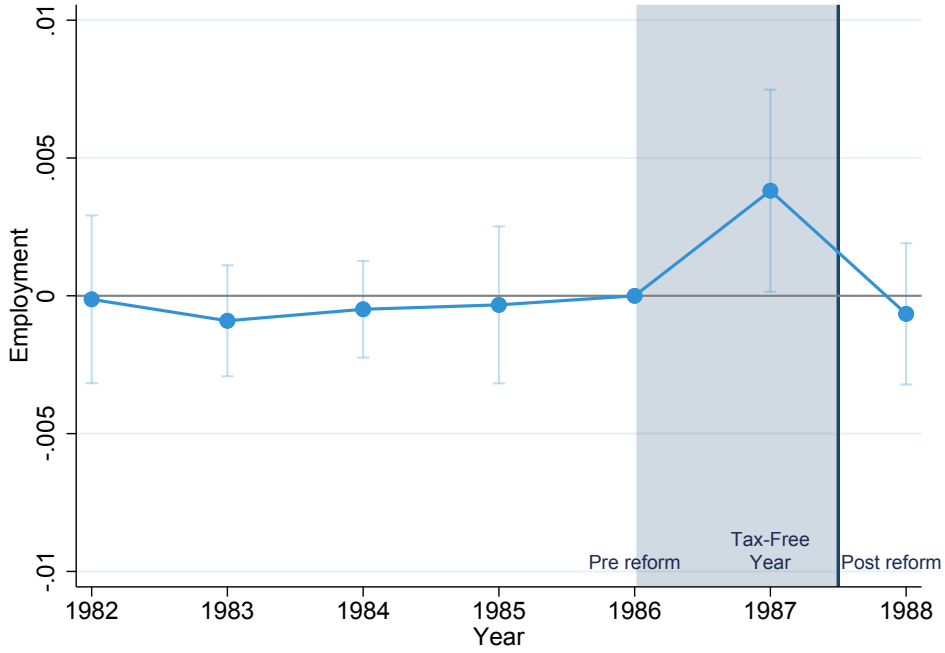
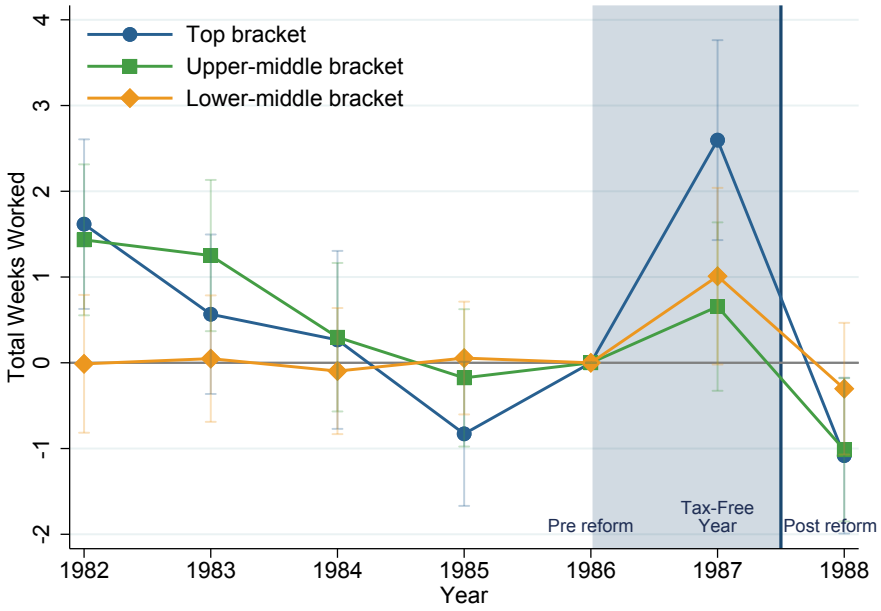
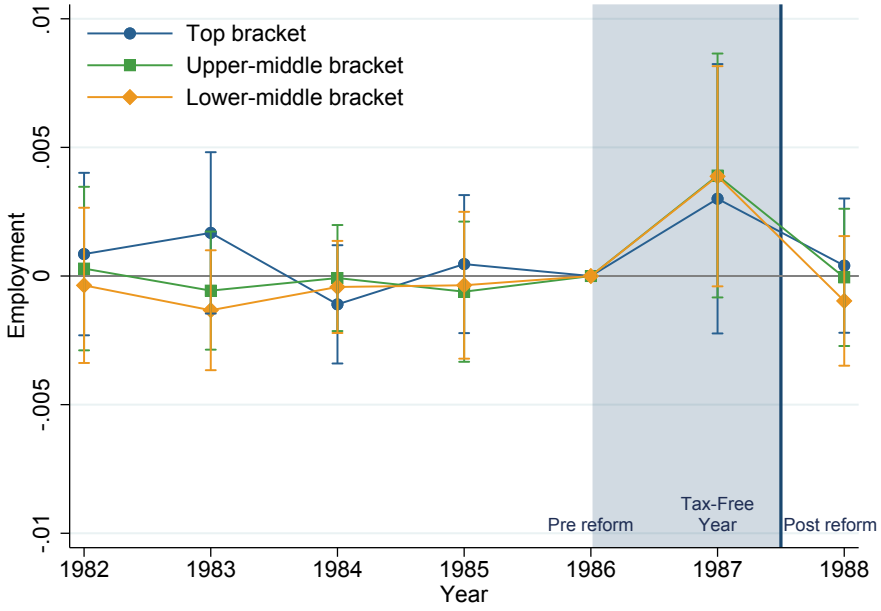


Figure A.6: Employment

Notes: The figure documents the effect of the tax-free year on employment. It plots coefficients from the dynamic version of regression (1) where the outcome variable is employment, defined as earning income above zero in the given year. Details on the regression specification are in the note to Figure 4. The treatment group consists of workers in the three top tax brackets and the control group of those in the bottom bracket. The shaded area marks the period used to estimate the response to the tax-reform—the 1987 tax-free year compared to the pre-reform year 1986—and the labels highlight the pre and post-reform periods. The regressions control for gender, marital status, age, education, number of children, indicator for living in the capital area, and occupation in the previous year. Standard errors are clustered at the tax bracket by municipality level and the vertical bars plot the 95% confidence intervals.



(a) Weeks Worked



(b) Employment

Figure A.7: Weeks Worked and Employment: Tax-Bracket Difference-in-Differences

Notes: The figure plots estimates from a dynamic DID version of equation (1), as explained in the note to Figure 4. The outcome in panel (a) is weeks worked and in panel (b) employment is defined as earning income above zero. Estimates are plotted separately for each of the top three tax brackets where the bottom bracket is the control group. The shaded area marks the period used to estimate the response to the tax-reform—the 1987 tax-free year compared to the pre-reform year 1986—and the labels highlight the pre and post-reform periods. The regressions control for gender, marital status, age, education, number of children, indicator for living in the capital area, and occupation in the previous year. Standard errors are clustered at the tax bracket by municipality level for each year and the vertical bars plot the 95% confidence intervals.

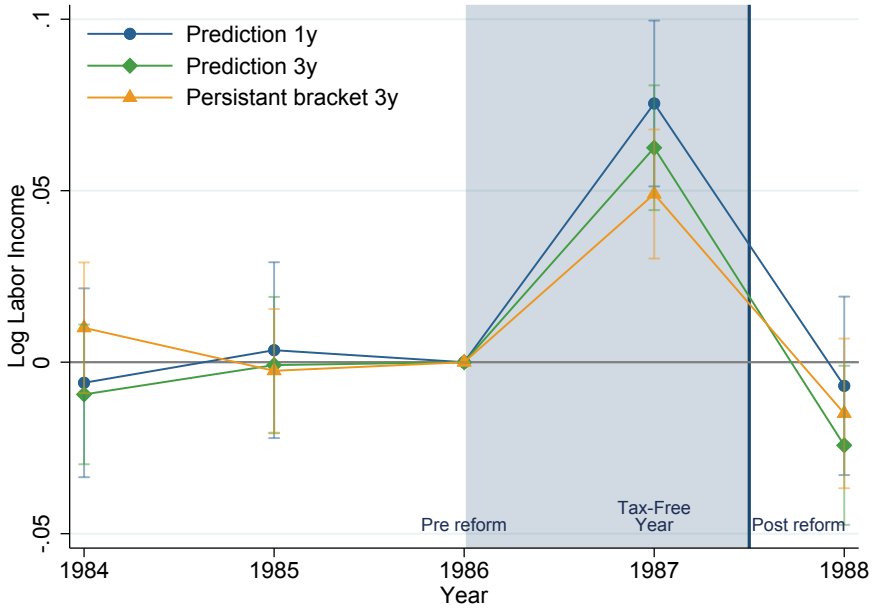
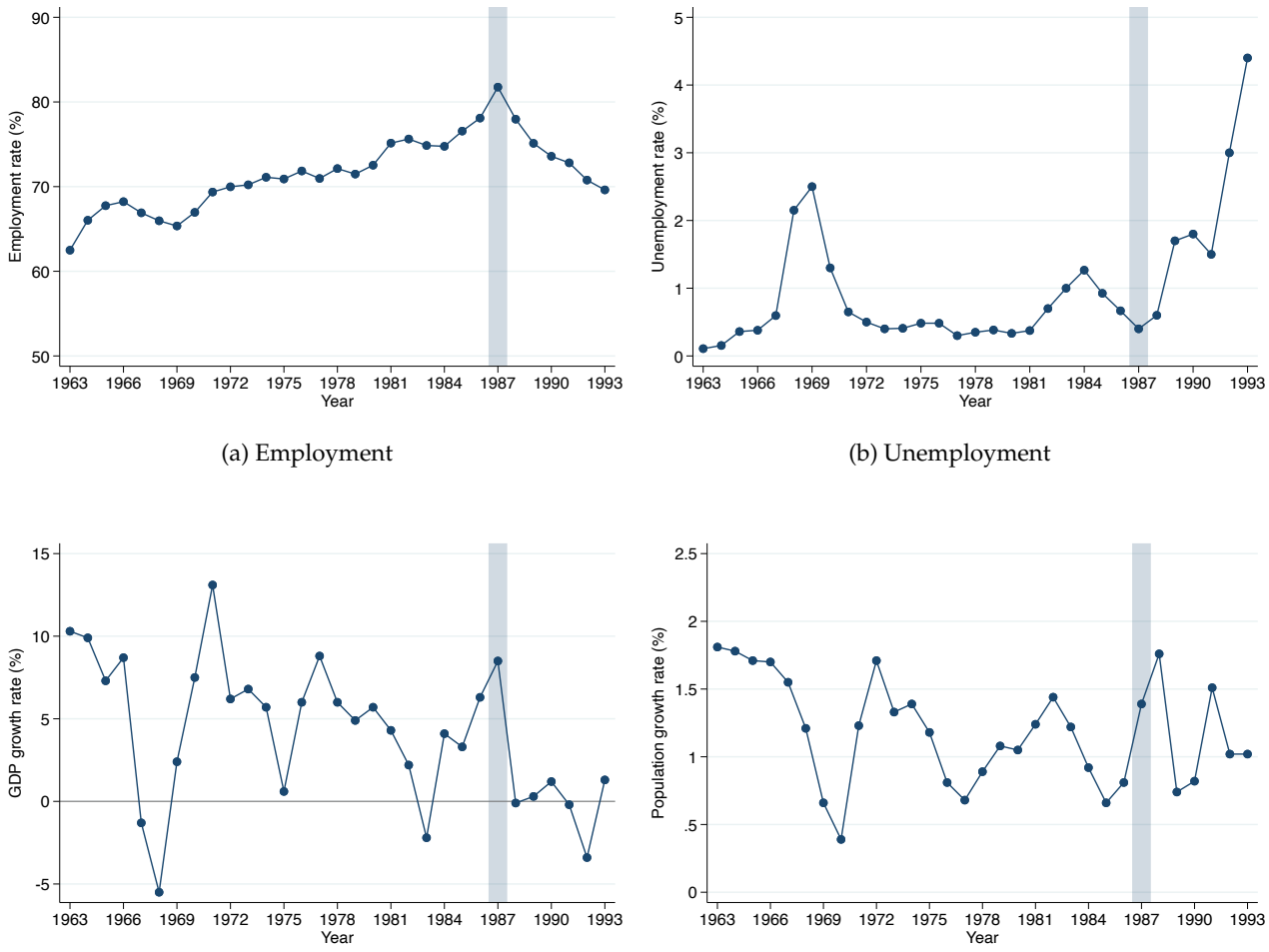


Figure A.8: Sensitivity to Assignment of Treatment Status

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 is log labor income. These plot the coefficients η_t, where $B_{i,t-1} \times \delta_{t=1986}$ is normalized to zero, and the tax bracket position is predicted using three lags of tax-bracket position along with other characteristics, as described in the text. Standard errors are clustered at the individual level and the vertical bars plot the 95% confidence intervals.



(a) Employment

(b) Unemployment

(c) GDP growth

(d) Population growth

Figure A.9: Employment, unemployment, GDP growth, and population growth

Notes: The figure shows the evolution of macroeconomic aggregates for the period 1963-1993. The vertical bar marks the tax-free year of 1987. 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, measured as registered unemployment at the Directorate of Labor. Panel (c) plots the yearly growth rate in real GDP, measured by Statistics Iceland. Panel (d) plots the yearly population growth rate.

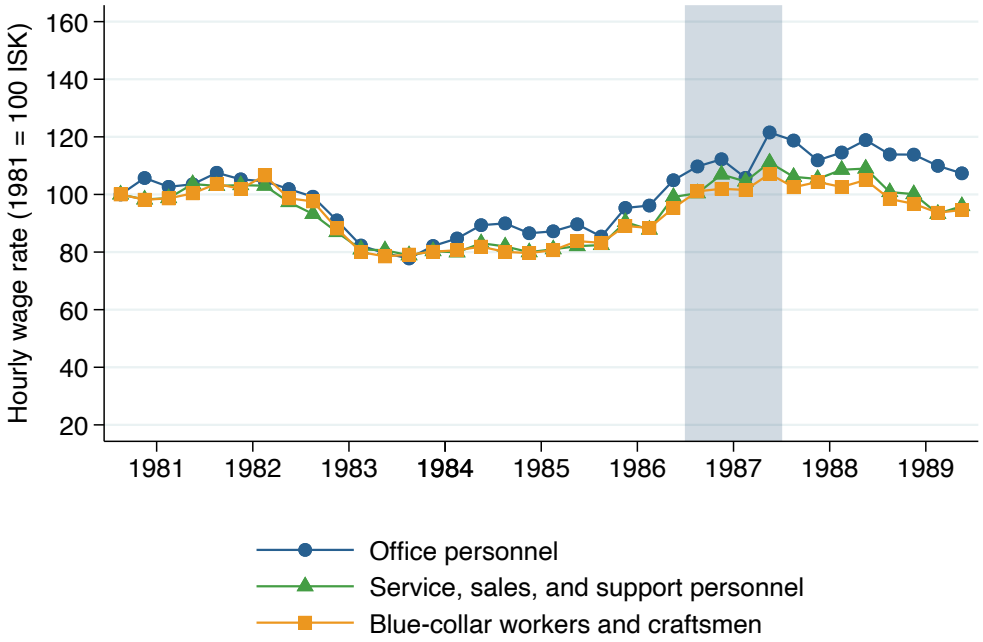


Figure A.10: Hourly wage rates by occupation

Notes: The figure plots the average hourly wage rate, normalized to 100 Icelandic krona (ISK) in the first quarter of 1981, in three broad occupation groups corresponding to office, service and sales, and support personnel. The shaded area corresponds to the period from the first to fourth quarters 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.

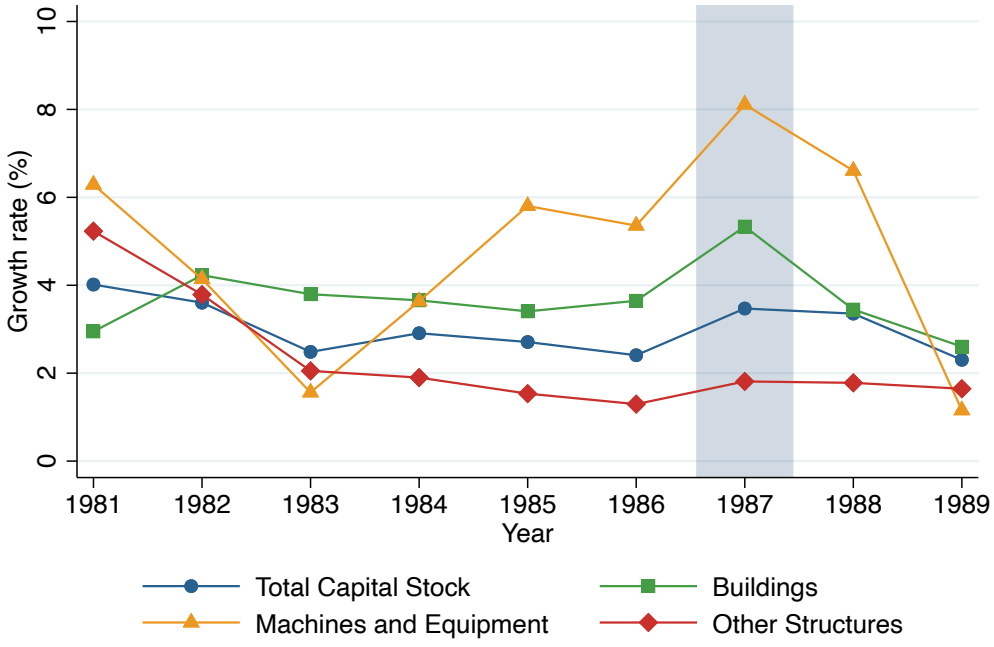
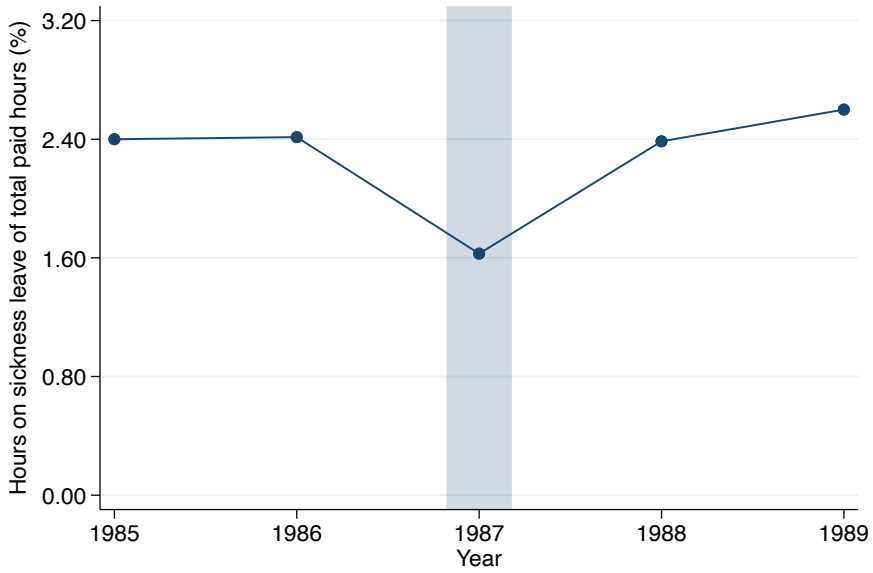
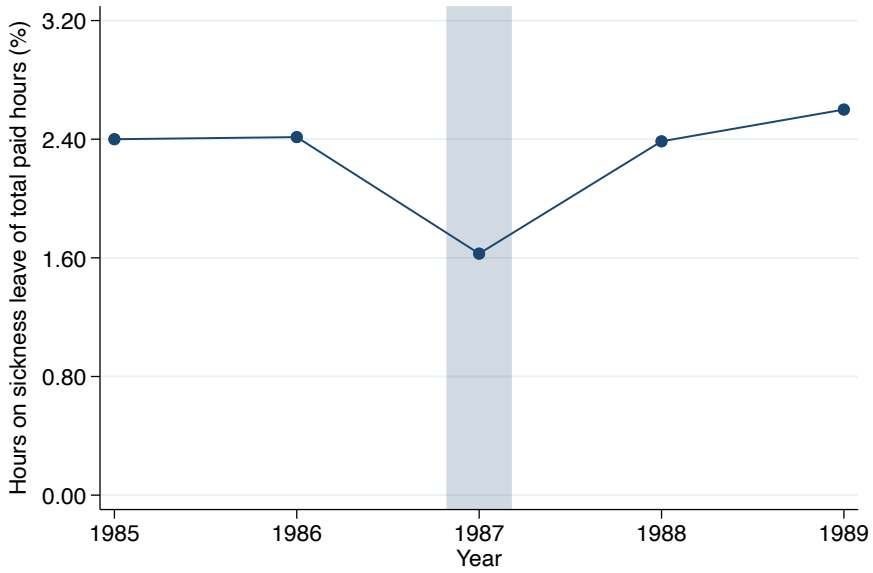


Figure A.11: Growth rate of the capital stock

Notes: The figure plots the yearly growth rate in the capital stock and capital stock subcategories. Data are from Statistics Iceland.



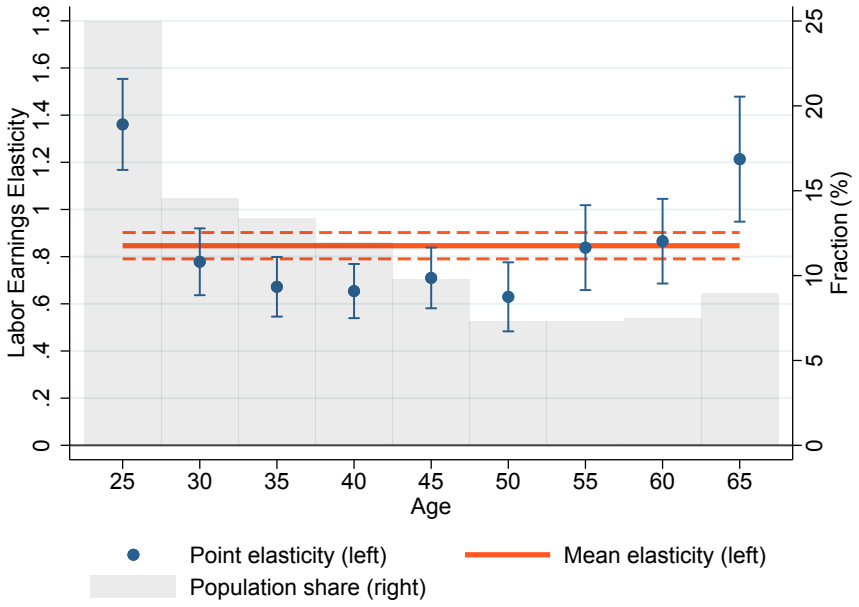
(a) Sick leave, in hours of work



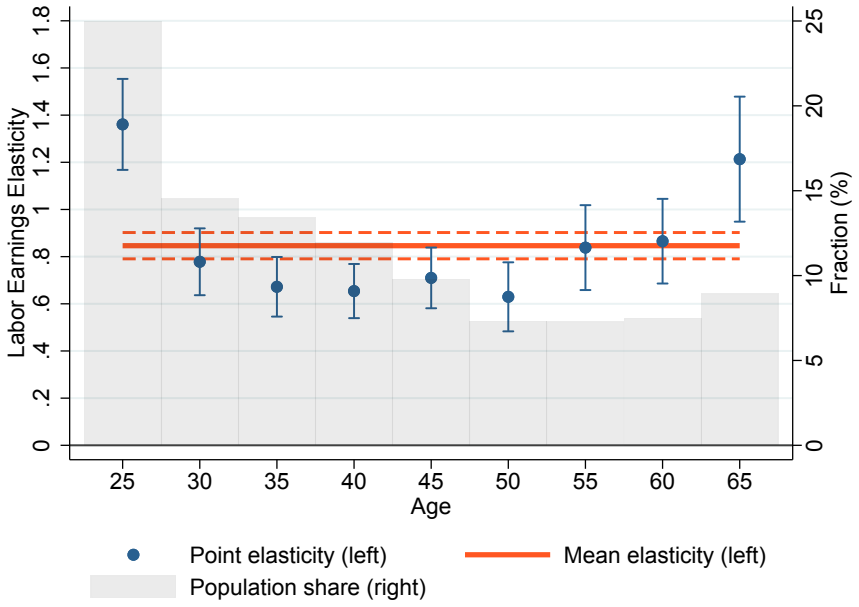
(b) Recipients of sickness benefits

Figure A.12: Sick leave from work and recipients of sickness benefits

Notes: Panel (a) plots the number of hours of sickness leave as a share of 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) receiving 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.



(a) Life-Cycle Differences Estimates



(b) Triple-Differences Estimates

Figure A.13: Elasticity of Labor Earnings by Age

Notes: The figure plots the estimated labor income elasticity by age. The elasticities in panel (a) are estimates using the life-cycle differences, equation (4). The elasticities in panel (b) are estimated using a triple differences design, equation (5). I group cohorts by age in 1987 and present estimates by age group, such that "25" refers to those at age 18-25; "30" to age 26-30; "35" to age 31-35; "40" to age 36-40; "45" to age 41-45; "50" to age 46-50; "55" to age 51-55; "60" to age 56-60; "65" to age 61-67. Standard errors are clustered at the demographic group level, i.e., by gender, age, education, and municipality, and vertical bars plot the 95% confidence intervals. The horizontal line plots the average elasticity for the population, and the dashed line the corresponding 95% confidence intervals. The shaded area (bars) is the population distribution, where each bar corresponds to the share of the working-age population (in %).

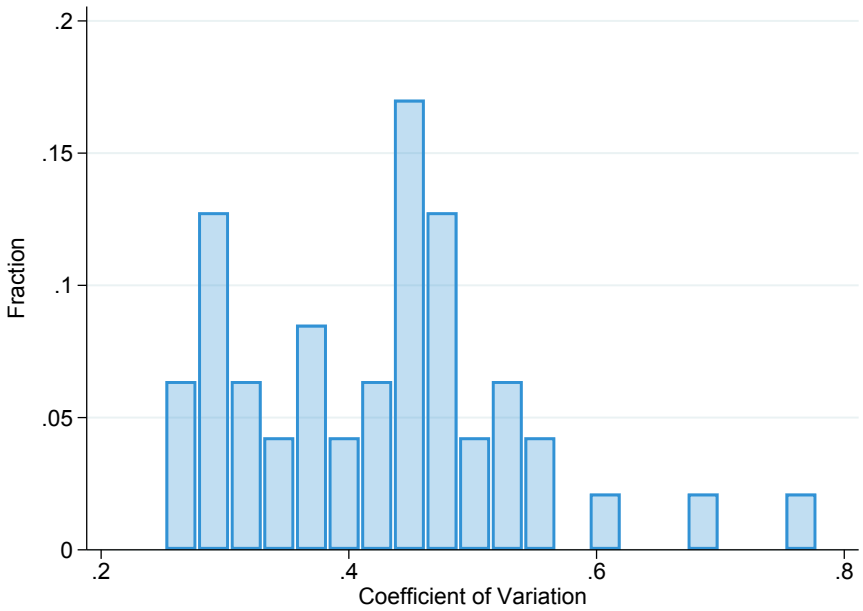
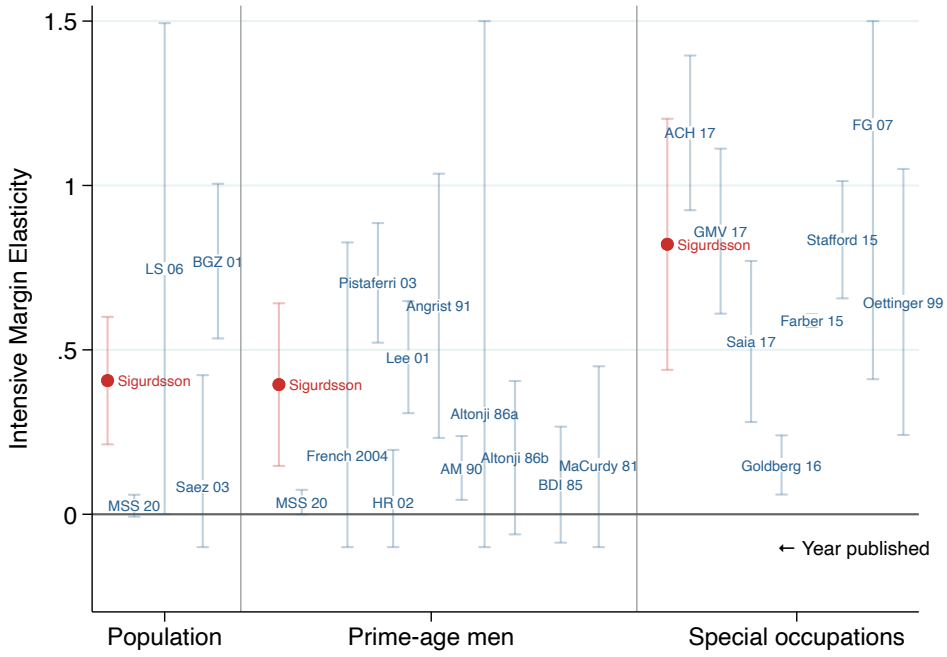
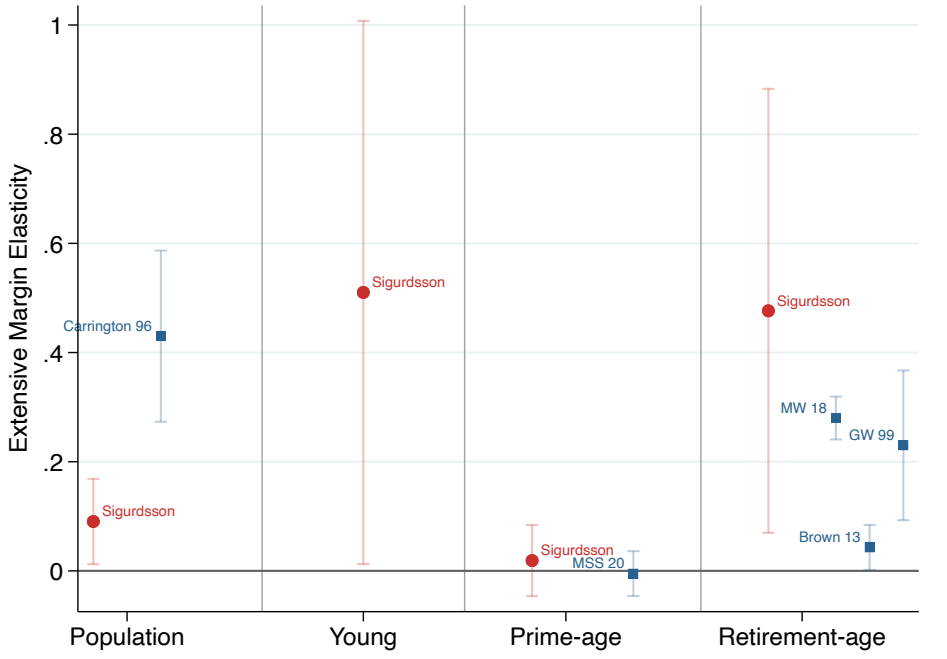


Figure A.14: Relative variability in weeks worked by occupation

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



(a) Intensive margin Frisch elasticity



(b) Extensive margin Frisch elasticity

Figure A.15: Summary of Frisch Elasticity Estimates

Notes: Panel (a) summarizes prior estimates of the intensive margin Frisch elasticity and panel (b) summarizes extensive margin elasticity estimates. My estimates are in red dots. For the subgroup of special occupations, my elasticity estimate refers to the cleaning occupation, which has the highest temporal flexibility (Figure 9). Point estimates refer to the authors' main, representative, or preferred specification. The 95% confidence intervals are either based on reported standard errors or computed using the delta method. For details on the studies, see Appendix Table A.14.

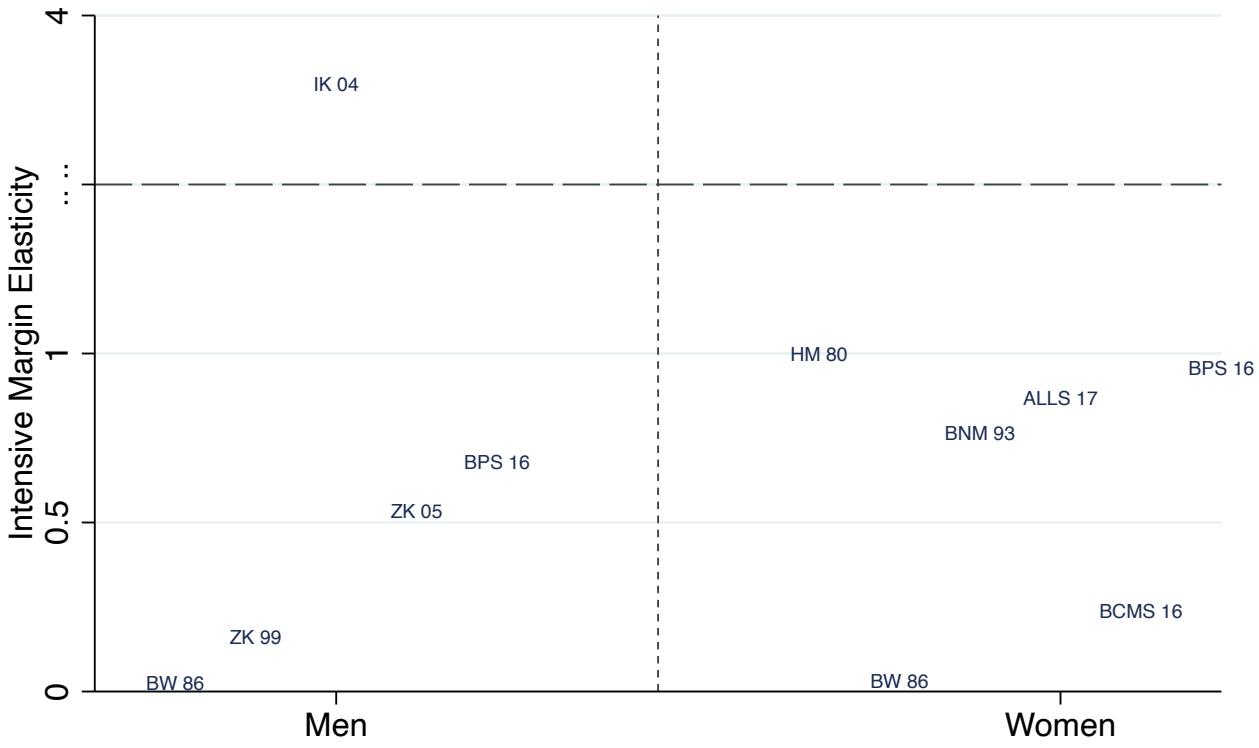


Figure A.16: Summary of structural estimates of intensive margin elasticities

Notes: The figure plots parameter estimates of the intensive margin Frisch elasticity. As most papers focus on either men or women, or report estimates separately, 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).

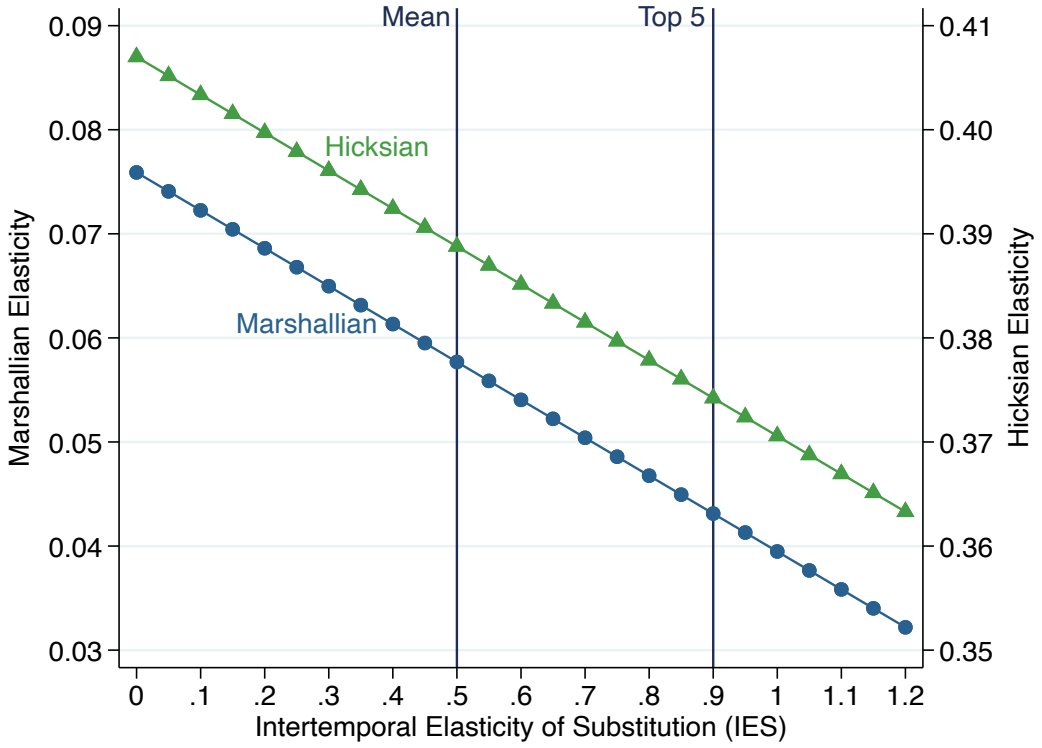


Figure A.17: From Frisch to Hicksian and Marshallian Elasticities

Notes: The figure reports values of the Hicksian elasticity, Marshallian elasticity and intertemporal elasticity of substitution consistent with my intensive margin Frisch elasticity estimate. The calculations assume the marginal propensity to earn (MPE) out of wealth, ε_{A}, is 0.11, which is based on estimates from Imbens et al. (2001) for lottery winners. The ratio of wealth to labor income, $\frac{A}{wh}$, of 3.01 is the median ratio in 1986, calculated using individual tax records. The vertical line "*Mean*" denotes the average of 2,735 estimates of the EIS reported in 169 empirical studies summarized in the meta-analysis in Havránek (2015). Vertical line "*Top 5*" marks the average estimate across 33 studies published in the top-five general interest journals.

I Supplementary Tables

Table A.1: Effect of Tax-Free Year on Labor Income and Weeks Worked: Employees vs. Self-Employed

	Log labor income				Weeks worked			
	Wage earners		Self-employed		Wage earners		Self-employed	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2SLS DD ($\frac{dy}{d\log(1-\tau)}$)	0.403	0.404	0.576	0.446	5.423	4.865	15.022	15.306
	(0.067)	(0.107)	(0.122)	(0.120)	(2.174)	(2.596)	(5.020)	(6.052)
Reduced form (dy)	0.067	0.063	0.100	0.075	0.907	0.756	2.594	2.582
	(0.011)	(0.016)	(0.021)	(0.020)	(0.357)	(0.392)	(0.879)	(1.026)
First stage ($d\log(1-\tau)$)	0.167	0.155	0.173	0.169	0.167	0.155	0.173	0.169
	(0.013)	(0.013)	(0.015)	(0.015)	(0.013)	(0.013)	(0.015)	(0.015)
Mean of outcome variable	—	—	—	—	47.38	47.38	61.76	61.76
Weighted	No	Yes	No	Yes	No	Yes	No	Yes
Observations	146,593	137,147	26,242	24,759	147,109	137,602	26,299	24,807

Notes: The table presents results from difference-in-differences (DD) regressions, where each row and column entry corresponds to one regression estimate. Columns (1)–(2) and (5)–(6) report estimates for wage earners and columns (3)–(4) and (7)–(8) 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 (y) is defined in the top panel and the net-of-tax rate ($\log(1-\tau)$) 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 defined in the top panel. 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, the number of children aged 0–18 years, and pre-reform occupation. "Weighted" refers to the regressions being weighted to have the same distribution of demographics in the treatment and control groups; see main text for details. Robust standard errors clustered at the tax-bracket by municipality level are in parentheses.

Table A.2: Effect on Earnings and Employment-Related Income

Wages and salaries	93%
Fringe benefits, travel allowances, etc.	2.1%
Drivers' payments	2.6%
Gifts from employer	0.1%
Pension payment from employer	0.5%
Bonuses, sales commission, etc.	0.4%
Board remuneration	1.3%
Sum	100%

Notes: The table presents results from a 2SLS estimation of equation (2), where the dependent variable is that stated in each row, in 1981$. Estimates are presented as the share 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 aged 0–18 years.

Table A.3: Effect of Tax-Free Year on Capital Income

	All	Wage earners	Self-employed
	(1)	(2)	(3)
2SLS DD ($\frac{dy}{d\log(1-\tau)}$)	492	507	532
	(239)	(239)	(473)
Reduced form (dy)	77	79	90
	(39)	(38)	(80)
First stage ($d\log(1-\tau)$)	0.179	0.174	0.199
	(0.019)	(0.019)	(0.023)
Mean of outcome variable	91.9	86.5	117.6
Share of treatment effect on labor earnings	0.032	0.032	0.035
Weighted	Yes	Yes	Yes
Observations	166,427	137,807	24,807

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$. The bottom row presents results from a first-stage DD estimation of equation (1), where the outcome variable is the logarithm of one minus the marginal tax rate. Controls are gender, age, education, marital status, whether living in the capital area or not, the number of children aged 0–18 years, and pre-reform occupation. "Weighted" refers to the regressions being weighted to have the same distribution of demographics in the treatment and control groups; see main text for details. "Share of treatment effect on labor earnings" refers to the ratio of the top row to a similar estimate of real labor earnings in 1981$. Robust standard errors clustered at the tax-bracket by municipality level are in parentheses.

Table A.4: Effects on Labor Income in 1987 – Alternative Standard Error Clustering

	(1)	(2)	(3)	(3)
2SLS DD ($\frac{d\log y}{d\log(1-\tau)}$)	0.407	0.407	0.407	0.407
	(0.099)	(0.101)	(0.113)	(0.081)
Reduced form ($d\log y$)	0.064	0.064	0.064	0.064
	(0.015)	(0.015)	(0.017)	(0.012)
First stage ($d\log(1-\tau)$)	0.157	0.157	0.157	0.157
	(0.013)	(0.013)	(0.015)	(0.006)
Clustering	Municipality × Bracket	Close municipalities × Bracket	Regions × Bracket	Age × Bracket
Weighted	Yes	Yes	Yes	Yes
Observations	165,044	165,044	165,044	165,044

Notes: The table presents results using alternative clustering of standard errors that in the main text. The estimates are results from difference-in-differences (DID) regressions, where each row and column entry corresponds to one regression estimate. Column (1) repeats Column (2) in Table 1. Column (2) clusters standard errors at the level of geographically close municipalities by tax bracket, where municipalities are aggregated to a 2-digit level. Column (3) clusters standard errors at the level of the nine geographic regions of Iceland by tax bracket. Column (4) clusters standard errors at the level of taxpayer's age by tax bracket. The sample period for each regression is 1986-1987. The top row presents results from a 2SLS estimation of equation (2), where the net-of-tax rate ($\log(1-\tau)$) is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DID estimation of equation (1). The bottom row presents results from a first-stage DID estimation of equation (1). Controls are gender, age, education, marital status, whether living in the capital area or not, the number of children aged 0–18 years, and pre-reform occupation. Clustered robust standard errors are in parentheses.

Table A.5: Effects on Employment in 1987

	Income > 0		Income $>$ Threshold		Weeks > 4		Weeks > 12	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2SLS DID ($\frac{dy}{d\log(1-\tau)}$)	0.024	0.031	0.057	0.026	0.071	0.080	0.084	0.094
	(0.011)	(0.015)	(0.034)	(0.037)	(0.046)	(0.059)	(0.047)	(0.056)
Reduced form (dy)	0.004	0.005	0.010	0.004	0.012	0.012	0.014	0.015
	(0.002)	(0.002)	(0.005)	(0.006)	(0.008)	(0.009)	(0.008)	(0.009)
First stage $(d\log(1-\tau))$	0.168	0.157	0.168	0.157	0.168	0.157	0.168	0.157
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Mean of outcome variable	0.996	0.996	0.918	0.918	0.954	0.954	0.937	0.937
Weighted	No	Yes	No	Yes	No	Yes	No	Yes
Observations	182,870	170,806	182,870	170,806	182,870	170,806	182,870	170,806

Notes: The table presents estimated effects on employment under different definitions. The sample period for each regression is 1986-1987. The outcome variable, defined in the top panel of each column, is either a condition on income earned or weeks worked in a given year. The income threshold corresponds to 1.6×guaranteed income, which is a reference amount used in calculations of various kinds for governmental income support. This roughly corresponds to the lowest minimum wage earnings according to collective bargaining agreements. The top row presents results from a 2SLS estimation of equation (2), where the net-of-tax rate ($\log(1-\tau)$) is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents results from a reduced-form DID estimation of equation (1). The bottom row presents results from a first-stage DID estimation of equation (1). Controls are gender, age, education, marital status, whether living in the capital area or not, the number of children aged 0–18 years, and pre-reform occupation. "Weighted" refers to the regressions being weighted to have the same distribution of demographics in the treatment and control groups; see main text for details. Robust standard errors clustered at the tax-bracket by municipality level are in parentheses.

Table A.6: Effects of the Tax-Free Year on Extensive Margin

	All	Young	Prime age	Old
	(1)	(2)	(3)	(4)
2SLS DD ($\frac{dy}{d\log(1-\tau)}$)	0.056	0.211	0.013	0.276
	(0.025)	(0.105)	(0.023)	(0.120)
Reduced form (dy)	0.005	0.011	0.002	0.020
	(0.002)	(0.005)	(0.003)	(0.008)
First stage $(d\log(1-\tau))$	0.098	0.053	0.117	0.071
	(0.002)	(0.002)	(0.002)	(0.004)
Mean dependent variable	0.618	0.413	0.694	0.580
Elasticity	0.090	0.510	0.019	0.476
Observations	551,438	131,627	373,273	46,538

Notes: The table presents results from life-cycle difference regressions, where each row and column entry corresponds to one regression estimate. "*Young*" are individuals younger than 25 years old in 1987, "*Prime age*" are individuals between 25 and 59 years old, and "*Old*" are individuals 60 years and older. The top row presents results from a 2SLS estimation of equation (4), where the dependent variable (y) is employment and the net-of-tax rate ($\log(1-\tau)$) is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents reduced form estimates based on equation (3). The bottom row presents first-stage regression estimates based on equation (3), where the outcome variable is the logarithm of one minus the average tax rate in columns. Regressions control for match-strata fixed effects, i.e. group fixed effects where each group is a cell used in coarsened exact cohort matching. Elasticity is calculated as the ratio of the semi-elasticity (top row) and the mean of the dependent variable. Robust standard errors clustered at the demographic group level, i.e. by gender, age, education, and municipality, are in parentheses.

Table A.7: Effects of the Tax-Free Year on Extensive Margin — Robustness To Sector Shocks

	All	Young	Prime age	Old
	(1)	(2)	(3)	(4)
	Population			
2SLS DD ($\frac{dy}{d\log(1-\tau)}$)	0.056	0.211	0.013	0.276
	(0.025)	(0.105)	(0.023)	(0.120)
Mean dependent variable	0.618	0.413	0.694	0.580
Elasticity	0.090	0.510	0.019	0.476
Observations	551,438	131,627	373,273	46,538
	No Fishing Sector			
2SLS DD ($\frac{dy}{d\log(1-\tau)}$)	0.060	0.220	0.019	0.267
	(0.026)	(0.117)	(0.025)	(0.122)
Mean dependent variable	0.603	0.388	0.682	0.576
Elasticity	0.099	0.568	0.027	0.464
Observations	523,794	123,857	354,063	45,874
	No Tradable Sector			
2SLS DD ($\frac{dy}{d\log(1-\tau)}$)	0.091	0.354	0.042	0.249
	(0.027)	(0.136)	(0.025)	(0.123)
Mean dependent variable	0.646	0.386	0.730	0.671
Elasticity	0.141	0.917	0.058	0.372
Observations	432,013	100,566	297,320	34,127

Notes: The table presents results from life-cycle difference regressions, where each row and column entry corresponds to one regression estimate. "*No Fishing Sector*" excludes all firms and workers employed in the fishing sector, including both fishing and fish-processing. "*No Tradable Sector*" excludes all firms and workers employed in the tradable sector, defined as employment in exporting firms in fishing, agriculture, and manufacturing firms. "*Young*" are individuals younger than 25 years old in 1987, "*Prime age*" are individuals between 25 and 59 years old, and "*Old*" are individuals 60 years and older. The top row presents results from a 2SLS estimation of equation (4), where the dependent variable (y) is employment and the net-of-tax rate ($\log(1-\tau)$) is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents reduced form estimates based on equation (3). The bottom row presents first-stage regression estimates based on equation (3), where the outcome variable is the logarithm of one minus the average tax rate in columns. Regressions control for match-strata fixed effects, i.e. group fixed effects where each group is a cell used in coarsened exact cohort matching. Elasticity is calculated as the ratio of the semi-elasticity (top row) and the mean of the dependent variable. Robust standard errors clustered at the demographic group level, i.e. by gender, age, education, and municipality, are in parentheses.

Table A.8: Robustness of Effects of the Tax-Free Year on Extensive Margin

	Income > Threshold	Income > 0	Weeks > 4	Weeks > 12
	(1)	(2)	(3)	(4)
2SLS DD ($\frac{dy}{d\log(1-\tau)}$)	0.056	0.015	0.158	0.165
	(0.025)	(0.014)	(0.023)	(0.026)
Reduced form (dy)	0.005	0.007	0.015	0.016
	(0.002)	(0.002)	(0.002)	(0.003)
First stage ($d\log(1-\tau)$)	0.098	0.098	0.098	0.098
	(0.002)	(0.002)	(0.002)	(0.002)
Mean dependent variable	0.618	0.947	0.880	0.824
Elasticity	0.090	0.016	0.180	0.200
Observations	551,438	551,438	551,438	551,438

Notes: The table presents results from life-cycle difference 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 (y) is employment and the net-of-tax rate ($\log(1-\tau)$) is instrumented with an interaction between indicators of treatment status and tax-free year. The middle row presents reduced form estimates based on equation (3). The bottom row presents first-stage regression estimates based on equation (3), where the outcome variable is the logarithm of one minus the average tax rate in columns. Regressions control for match-strata fixed effects, i.e. group fixed effects where each group is a cell used in coarsened exact cohort matching. Elasticity is calculated as the ratio of the semi-elasticity (top row) and the mean of the dependent variable. Robust standard errors clustered at the demographic group level, i.e. by gender, age, education, and municipality, are in parentheses.

Table A.9: Heterogeneous Labor Supply Responses by Flexibility of Employment Arrangement

	Temporal flexibility		Constrained in primary job		Hours flexibility	
	Low (1)	High (2)	Yes (3)	No (4)	Low (5)	High (6)
	A. Labor Income					
2SLS DD estimate	0.375	0.432	0.382	0.557	0.363	0.551
	(0.102)	(0.099)	(0.104)	(0.106)	(0.084)	(0.093)
Observations	165,044		161,906		110,497	
	B. Weeks Worked					
2SLS DD estimate	4.898	5.932	3.631	11.169	9.175	11.202
	(2.959)	(3.291)	(2.754)	(3.772)	(2.670)	(3.236)
Mean weeks pre-reform	53.62	46.71	53.68	46.03	49.38	49.37
Observations	163,084		162,409		109,686	

Notes: The table presents results from a 2SLS estimation of equation (2), where each row and column entry corresponds to one regression estimate. The dependent variable is indicated above each panel. Estimates by subgroups are obtained by interacting group indicators with the log of net-of-tax rate and the instrument in regression (2). *Temporal flexibility* splits the sample by a measure of relative variability in weeks worked within an occupation; see the main text for details. "Low" flexibility refers to workers below the median of the distribution over the job flexibility measure and "High" refers to those above the median. *"Constrained in primary job"* is an indicator that equals one (*"Yes"*) if working 52 weeks in the primary job prior to the tax-free year, and zero (*"No"*) for those working 51 weeks or less. *Hours flexibility* splits the sample by occupations based on the share of workers with fixed-salary contracts, where "Low" share refers to occupations with a fixed-salary share below the median of the distribution and "High" share refers to occupations above the median. All regressions are weighted to have the same distribution of demographics in the treatment and control groups; see main text for details. Controls are gender, age, education, marital status, whether living in the capital area or not, the number of children aged 0–18 years, and pre-reform occupation. Robust standard errors clustered at the tax-bracket by municipality level are in parentheses.

Table A.10: 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 aged 16–70. Column 2 includes individuals with nonzero labor earnings. Column 3 includes the subpopulation working in self-employment, either as a primary or secondary job. The number of children is those aged 0–18 years. 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.

Table A.11: Occupation Classification

Group	Occupation category	No. of subcategories
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 ILO's website.

Table A.12: Sector Classification

Group	Sector category	No. of subcategories
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 the United Nations' International Standard Industrial Classification of All Economic Activities (ISIC). For a detailed description of the classification, see UN's website.

Table A.13: Education Classification According to Statistics Iceland's Education Register

Level	Description	Broad category	No. of subcategories
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		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

Table A.14: Details and Sources for Figure A.15

Study	Label	Group	Variation	Notes
Intensive margin – Figure A.15a				
Martinez, Saez, and Siegenthaler (2021)	MMS 20	Population	Taxes	Table 2, column (2)
Looney and Singhal (2006)	LS 06	Population	Taxes	Table 5, column (3). SIPP and NBER tax panel.
Saez (2003)	Saez 03	Population	Taxes	Table 5, column (3). Elasticity of wage income.
Bianchi, Gudmundsson, and Zoega (2001)	BGZ 01	Population	Taxes	Based on Table 6 and own calculations. See footnote in Section E.1 for details.
Martinez, Saez, and Siegenthaler (2021)	MMS 20	Prime-age men	Taxes	Appendix Table A2, column (2).
French (2004b)	French 04	Prime-age men	Wages	Table 3 (median of estimates). PSID, Men.
Pistaferri (2003)	Pistaferri 03	Prime-age men	Wages	Table 2. Men aged 26–59.
Ham and Reilly (2002)	HR 02	Prime-age men	Wages	Table 1, column (4). PSID, men of age 23–60.
Lee (2001)	Lee 01	Prime-age men	Wages	Table 2. PSID, men aged 25–60.
Angrist (1991)	Angrist 01	Prime-age men	Wages	Table 2. PSID, men of age 21–64.
Altug and Miller (1990)	AM 90	Prime-age men	Wages	See Keane (2011) for calculation of elasticity. PSID, Household-heads of age 25–46.
Altonji (1986)	Altonji 86a	Prime-age men	Wages	Table 2, column (7). PSID, men aged 25–60.
Altonji (1986)	Altonji 86b	Prime-age men	Wages	Table 4, column (3). PSID, men aged 25–60.
Browning, Deaton, and Irish (1985)	BDI 85	Prime-age men	Wages	See Keane (2011) for calculation of elasticity.
MaCurdy (1981)	MaCurdy 81	Prime-age men	Wages	Table 1, column (1). PSID, men of age 25–46.
Angrist, Caldwell, and Hall (2020)	ACH 17	Uber drivers	Wages	Table 5, column (1).
Giné et al. (2017)	GMV 17	Boat owners	Wages	Table 6, column (3).
Saia (2017)	Saia 17	Pizza deliverers	Wages	Table A1.
Goldberg (2016)	Goldberg 16	Agricultural workers	Wages	Table 4, column (1). Standard errors calculated as elasticity is calculated by author.
Farber (2015)	Farber 15	Taxi drivers	Wages	Table 6.
Stafford (2015)	Stafford 15	Lobster hunters	Wages	Table 2.
Fehr and Goette (2007)	FG 07	Bicycle messengers	Wages	Table 3 and text. Average of two estimates.
Oettinger (1999)	Oettinger 99	Baseball stadium vendors	Wages	Table 6, column (5).
Extensive margin – Figure A.15b				
Martinez, Saez, and Siegenthaler (2021)	MMS 18	Population	Taxes	Table 2, column (1).
Carrington (1996)	Carrington 96	Population	Wages	Calculated based on estimates in Table 2. See Chetty et al. (2013) for details.
Manoli and Weber (2016)	MW 16	Retirement-age	Pension	Table 3. Full sample, 6 months from threshold.
Brown (2013)	Brown 13	Retirement-age	Pension	Table 4, column (4).
Gruber and Wise (1999)	GW 99	Retirement-age	Taxes	Calculated using data reported in Table 1. See Chetty et al. (2013) for details.

Notes: Estimates refer to the authors' main, representative, or preferred specification. Confidence intervals either based on reported standard errors or computed using the delta method estimates in MaCurdy (1983) of 6.25, as reported in Keane (2011), and negative elasticities in Camerer, Babcock, Loewenstein, and Thaler (1997), are excluded for visual purposes.