

**Online Appendix of:**  
**The Norwegian Tax Holiday:**  
**Salience, Labor Supply Responses, and Frictions**

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## A The Norwegian Tax System

Until the reformed tax system was in place in 1957, the Norwegian fiscal year began on July 1st. This implied that, for example, the direct taxes for the fiscal year 1954/55 are assessed based on incomes earned during 1953 and on property held as of January 1, 1954. This changed in 1957 when taxes paid in 1957 were based on the income earned in that year and the value of the property held as of January 1 that year.

Income taxes were levied both at the national (government) level and the local (municipality) level. The tax paid to the government was progressive while the municipal-level tax was flat but varied across municipalities. Table A.1 presents an overview of the tax schedule for incomes earned in 1952-1955. At the bottom of the tax schedule, for incomes of 12,000 NOK or lower, taxpayers were subject to a 10% tax to the government and 14-18.5% tax to their municipality, depending on where they live. In total a tax rate of about 25%.

Table A.1: Tax Rates

	Government	Municipalities	Total
Of the first 12,000	10%	14-18.5%	24-28.5%
Of the next 8,000	15%	14-18.5%	29-33.5%
Of the next 10,000	25%	14-18.5%	39-43.5%
Of the next 10,000	35%	14-18.5%	49-53.5%
Of the next 30,000	45%	14-18.5%	59-63.5%
Of the next 100,000	55%	14-18.5%	69-73.5%
Any exceeding amount	65%	14-18.5%	79-83.5%

*Notes:* The table present the progressive schedule of rates of taxes paid to the government and to municipalities on earnings in 1952-1955. For municipalities it reports the range from the lowest to the highest rate. *Source:* [Statistisk Sentralbyrå \(1956, 1957\)](#).

Not all income was taxed. At the governmental level, there were deductions from taxes payable where the amount of deduction was based on in which ‘tax class’ individuals were. For example, singles were in tax class 1 and those with one child in tax class 2. If individuals were sick or disabled they were moved up by a tax class. If individuals themselves or their spouse would turn 69 years old before January 1 in the year they were being assessed he would also move up a tax class (see, e.g., [Statistisk Sentralbyrå, 1956](#)). Table A.2 presents an overview of tax deductions and implied tax-exempt income by tax class. Individuals in the first tax class would for example get deducted 400 NOK from their tax payment, which implied that individuals in that class with incomes below 4,100 NOK would not pay tax. At the municipal level, there were similarly 8 tax classes, but the municipalities had 7 options for allowing for tax-exempt income within each class. For example, individuals in tax class 1 living in a municipality with the lowest amount of tax-exempt income could earn 600 NOK before paying a tax to their municipality. In comparison, those living in a municipality allowing for the highest amount could earn 1,300 NOK.

Figure A.1 plots the distribution of income across taxpayers. As explained and documented

Table A.2: Tax Deductions and Exempt Income

Tax class	Government		Municipalities
	Deduction	Lowest taxable income	Tax exempt income
1	400	4,100	600-1,300
2	800	8,100	1,000-2,300
3	1,000	10,100	1,500-3,500
4	1,300	12,700	2,100-4,900
5	1,700	15,400	2,800-6,500
6	2,200	18,700	3,600-8,300
7	2,800	21,700	4,000-10,300
8	3,500	24,500	5,500-12,500

Notes: The table present an overview of tax deductions and resulting levels of tax exempt incomes at both the governmental and municipal level in 1952-1955. All numbers are in Norwegian Krone (NOK). Individuals are separated into 8 tax classes depending on factors such as family and health status. See main text for more details. Source: Statistisk Sentralbyrå (1956, 1957).

in Table A.2, earnings of 600 NOK are the lowest earnings to be taxed at the municipal level and 4,100 NOK at the governmental level.

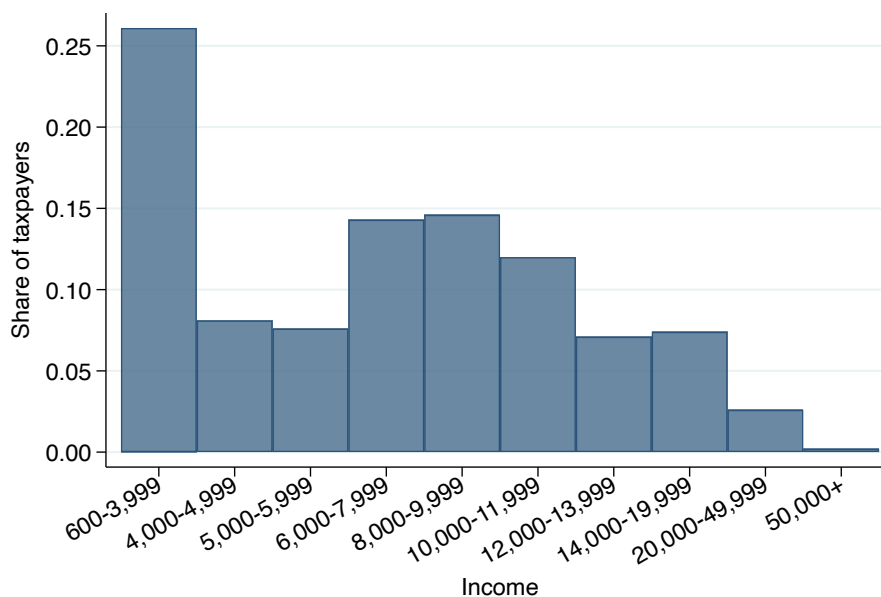


Figure A.1: Distribution of taxable income

Notes: The figure plots the distribution of income of taxpayers for taxes paid in the fiscal year 1954/55. All numbers are in Norwegian Krone (NOK). No individuals with earnings below 600 NOK pay a tax to the government or a municipality. 731,234 individuals paid taxes to central government and 1,581,650 taxpayers were assessed for taxes by the municipalities, or 43% of the total population. Source: Statistisk Sentralbyrå (1956).

## B Survey Questions

The main text reports evidence based on answers to three main questions in the Gallup survey. Figure 2 in the main text reports evidence on salience based on the fraction of people that know about the tax holiday and the earning opportunity it provided. It reports the share of people that answered yes to the following question asked in Norwegian:

*“På grunn av overgangen til skatt av årets inntekt er det i år adgang for alle til å tjene penger skattefritt. Har De lagt merke til disse bestemmelsene?”*

An English translation of this question is:

*“Because of a transition to a pay-as-you-earn tax system, there is an opportunity for everyone this year to earn tax-free money. Did you notice this provision?”*

Figure 3 in the main text reports evidence of labor supply responses to the tax holiday. Among those who answered yes to the former question, it reports the share of people that answered yes to the following question asked in Norwegian:

*“Har De personlig satt Dem i sving for å dra fordel av disse bestemmelsene, f.eks. ved å ta Dem en ekstrajobb, ta overtid eller liknende?”*

An English translation of this question is:

*“Have you personally acted to take advantage of these provisions for tax-freedom, e.g. by taking an additional job, work overtime or similar?”*

Figure 4 in the main text reports reasons for non-response, which was asked to those who answered no to the former question. In Norwegian the question was stated:

*“Hvorfor har De ikke sett deg i sving for å tjene penger skattefritt?”*

An English translation of this question is:

*“Why have you not acted to earn tax-free money?”*

## C Elasticity Calculations

I conduct two sets of calculations in an attempt to get an estimate of the magnitude of a Frisch elasticity for Norway. The first uses the neighboring country Sweden as a counterfactual for Norway in a country difference-in-differences estimation. The second relies on parameter estimates from the literature in a back-of-the-envelope calculation. Both sets of calculations are intended to indicate the likely magnitude of the Frisch elasticity.

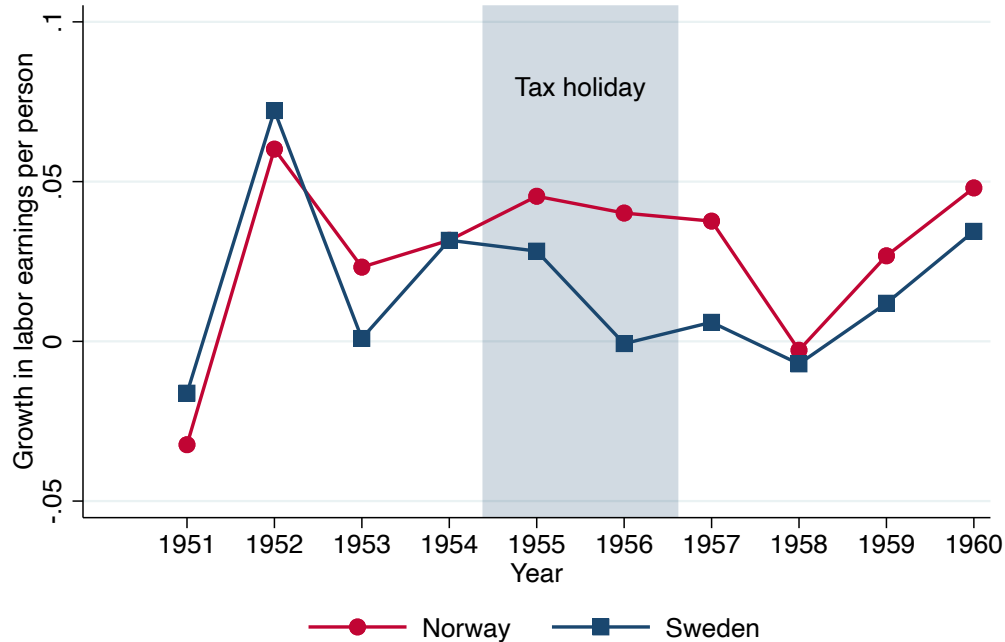


Figure A.2: Labor earnings per person

Notes: The figure plots the growth rates in total labor earnings (wages and salaries) divided by population at working age. Labor earnings are adjusted for inflation using CPI. Data are from National Accounts in Norway and Sweden. The growth rate for Sweden is normalized to equal that in Norway in 1954, the year before the tax holiday.

## C.1 Cross-Country Difference-in-Differences

As my main approach to calculating labor supply elasticity, I estimate cross-country difference-in-differences. The key challenge is to find a suitable control group—countries with similar business cycle trends as Norway, facing similar aggregate shocks but did not have a tax holiday in 1955 and 1956. For my calculations, I rely on using the neighboring country Sweden as the counterfactual. Norway is not only close to Sweden geographically—bordering Sweden to the East—but also economically. The structure of the two economies was in many ways similar and the two countries were the major trading partner of each other and shared other main trading countries. This implies that the two countries are likely to experience similar macroeconomic shocks. Since the 1970s, the foundations of the two economies have drifted more apart, not the least following the discovery of oil in Norwegian waters in 1969, making the Norwegian business cycle heavily influenced by fluctuations in the oil price. In addition, Sweden had already undergone a transition to a pay-as-you-earn system in the 1940s.

For this estimation, I use aggregate data on total labor earnings from National Accounts. Figure A.2 plots the evolution of growth rates of labor earnings per person in Norway and Sweden during the 1950s. In line with the two countries having a common business cycle, labor earnings move similarly in the two countries. Apart from during the tax holiday, when the earnings growth is high in Norway but lower and declining in Sweden.

To estimate a labor supply elasticity, I begin by estimating the following regression:

$$\Delta \log y_{t,c} = \gamma_c + \delta_t + \beta \cdot \text{Tax-Holiday} + \mu_{t,c} \quad (1)$$

where  $\gamma_c$  and  $\delta_t$  are country and year fixed effect, respectively, and *Tax-Holiday* is an indicator for the tax holiday, indicating both the treated country (Norway) and the treatment period. As the data is annual I am unable to separate between the first half of 1955, before the tax holiday, and the second half, when the tax holiday began. Therefore, I choose to set the indicator to one for Norway in 1956, but zero otherwise, and exclude the year 1955.<sup>1</sup> This regression yields an estimate of  $\beta$  of 0.033 (SE 0.017), which implies that the earnings growth in Norway during the tax holiday was 3.3 percentage points higher than in the control country Sweden. To obtain an elasticity, this estimate can be scaled by the difference in the change in marginal tax rates in Norway and Sweden generated by the tax holiday. The tax holiday reduced the average marginal tax rate in Norway from 21.1 percent to zero, while the average marginal tax rate in Sweden was reduced only by 0.1 percent that year.<sup>2</sup> To obtain a point estimate with standard errors, I instead estimate the elasticity using the following regression

$$\Delta \log y_{t,c} = \gamma_c + \delta_t + \varepsilon \cdot \Delta \log(1 - \tau_{t,c}) + \nu_{t,c} \quad (2)$$

where the change in the net-of-tax rate,  $\Delta \log(1 - \tau_{t,c})$ , is instrumented by the *Tax-Holiday* indicator. This gives an estimate of earnings elasticity,  $\varepsilon$ , of 0.137 (SE 0.072). As expected in an estimation using two countries and short time series, the resulting elasticity estimate is not precise, but still statistically significant at the 10% level.

What does this evidence imply about what the Frisch elasticity would be in absence of frictions? Under some strong assumptions, the elasticity estimate and the survey evidence can give some indication. Recall from Section 3 that according to the survey, 80% of people were aware of the tax holiday, 32% of employed workers that knew about the tax holiday responded to it by working more, and 80% of those that did not respond but knew about the reform did not adjust their labor supply due to frictions. The reduced form estimation combined with the survey response implies that the average worker increased his earnings by about 13% in response to the tax holiday ( $0.8 \times 0.32 \times 0.13 = 0.033$ ). Under the strong assumption of homogeneous labor supply response in the population, removing frictions would triple the elasticity estimate, raising it to 0.44. If however, those that were constrained would increase their labor supply by more than the average unconstrained respondent this only gives a lower bound.

<sup>1</sup>Estimates are quantitatively similar when excluding 1955 as when including 1955 as a pre-reform year.

<sup>2</sup>Average marginal tax rates for Norway are calculated using numbers from various editions of the Norwegian Tax Statistics yearbook (“Skattestatistikk”), e.g. Statistisk Sentralbyrå (1956). I calculate the average marginal tax as the weighted average of taxpayers in each bracket of the progressive tax schedule, plus the weighted average of local municipal tax rates. Average marginal tax rates for Sweden are from Stenkula et al. (2014). I thank Mikael Stenkula for providing this data.

## C.2 Back-Of-The-Envelope Calculation

As an alternative approach to quantify a Frisch elasticity for Norway, I use earlier labor supply estimates from other large-scale tax reforms in Norway, in addition to other parameter estimates from the literature. Building on a dynamic labor supply model with time-separable utility in consumption and leisure we can derive the following relationship between the Frisch elasticity, steady-state (Marshallian) elasticity, and other parameters of the model (Ziliak and Kniesner, 1999; Browning, 2005):

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

where  $\rho$  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.

Aarbu and Thoresen (2001) exploit a Norwegian tax reform in 1992 that substantially increased the net-of-tax rate for high-income earners to estimate a permanent (steady-state) labor supply elasticity of 0.21 (see Table 2, column 5, which attempts to address mean reversion). As this estimate does not attempt to separate the substitution and income effects, I interpret this as an estimate of the Marshallian—or uncompensated—elasticity. (Cesarini et al., 2017) report an estimate of the MPE of 0.1 for the sample of Swedish lottery winners. This estimate is similar to estimates from other prominent estimates in the literature, such as Imbens et al. (2001) who estimate an MPE of 0.11 for people playing the lottery in Massachusetts. (Havránek, 2015) conducts a meta-analysis of the estimates of the EIS and reports an average estimate of 0.5. Lastly, I use a  $\frac{A}{wh}$  ratio of 1.21 which is calculated as the ratio of average wealth to average labor earnings in 1955. Together these parameters imply a Frisch elasticity of 0.34, or about twice as large as estimated using cross-country difference-in-differences.

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