

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

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Abstract

An emerging consensus is that the Frisch elasticity of labor supply is small. This may reflect a lack of salience, inelastic preferences, or prevalence of frictions. Studying survey data collected during a tax holiday in Norway, when earnings were untaxed during a transition between tax systems, I report three findings. First, 80 percent of adults were aware of the tax holiday. Second, one-fifth of adults responded by working more. Third, frictions in adjusting working hours or non-working time are the reason for more than half of the non-responses. The findings support the long-held notion that labor supply choices are constrained.

JEL Classification: E65, H24, J20, J22.

Keywords: Labor supply, Frisch elasticity, Salience, Adjustment frictions.

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1 Introduction

How responsive is labor supply to transitory wage changes? The quest for quantifying this response, measured by the Frisch elasticity of intertemporal labor supply, dates back to the seminal work of [Lucas and Rapping \(1969\)](#) and [MaCurdy \(1981\)](#) and has since constituted an important research program in economics. This is for a good reason. Understanding how people respond to temporary changes in wages is key to understanding business cycles and labor markets.

Empirically identifying the Frisch elasticity is, however, no easy task. It requires exogenous and transitory changes in wages. The most prominent estimates rely on short-run (experimental) variation in pay in specific occupations or exploit natural experiments such as ‘tax holidays’ which temporarily exempt earnings from taxes during a transition between tax systems.

The evidence from these studies is mixed. Occupation-specific studies—such among bicycle messengers ([Fehr and Goette, 2007](#)) and taxi drivers ([Farber, 2015](#); [Angrist, Caldwell, and Hall, 2021](#))—tend to report relatively large elasticities. In contrast, [Martinez, Saez, and Siegenthaler \(2021\)](#) study a two-year-long tax holiday in Switzerland and estimate a near-zero intensive margin elasticity and find no evidence of employment responses. Studies of the tax-free year in Iceland, however, find evidence of increased labor supply in response to a tax holiday ([Bianchi, Gudmundsson, and Zoega, 2001](#); [Sigurdsson, 2022](#); [Stefánsson, 2019](#)). [Sigurdsson \(2022\)](#) estimates a positive and significant Frisch elasticity on both the intensive and extensive margins, documenting how the hours and employment responses are driven by those with the ability to adjust. Still, the elasticity estimates are small relative to the elasticities required for calibrating real business cycle models to match aggregate data (e.g. [King and Rebelo, 1999](#)).

Although estimates vary considerably, an emerging consensus building on earlier work is that the Frisch elasticity is small (e.g. [Banerjee and Duflo, 2019](#)). While a small elasticity estimate may reflect inelastic preferences, there can be other explanations. These include lack of salience ([Chetty, Looney, and Kroft, 2009](#)), where inattentive workers fail to recognize the transitory wage increase that, e.g., a tax holiday generates, and prevalence of adjustment frictions ([Chetty, 2012](#)) that hinder workers in exploiting a temporary earnings opportunity. As the Frisch elasticity puts an upper bound on the steady-state labor supply elasticity, a near-zero Frisch elasticity has far-reaching implications, e.g., for calculating the welfare consequences of tax policy. It is therefore essential to understand why workers do not adjust in response to transitory wage increases. Shedding light on the relevance of salience and adjustment frictions is, however, difficult without having

direct evidence of workers' knowledge of the transitory wage increase, their labor supply responses, and the reasons for possible non-response.

This paper provides new evidence on these three aspects. To do so, I take advantage of a tax policy reform when in 1957 Norway replaced a retrospective tax system where workers paid taxes based on their income in the previous two years with a standard pay-as-you-earn tax system. Income earned in the transition period—between mid-1955 and throughout 1956—was never taxed.

Using data from a survey conducted by Gallup during the tax holiday among a representative sample of the Norwegian population, I report three main findings. First, the Norwegian tax holiday was very salient. Four out of five adults report having known about the tax reform and understood that they had the opportunity to earn tax-free income during the transition period. While insiders in the labor market were more likely to take notice—men more than women and high-income earners more than those with low incomes—few people, in general, seem to have been unaware of the reform.

Second, 20 percent of all adults, or 25 percent of those aware of the opportunity to earn tax-free income, adjusted their labor supply in response. The largest response rate was among those employed before the reform, among whom more than a third of workers increased their labor supply, responding by, e.g., working overtime or taking additional jobs. In addition to the intensive margin, the tax holiday also triggered some extensive margin responses, as a fraction of housewives and pensioners report to have entered the labor market.

Third, when asked about the reason for not responding to this earnings opportunity, frictions in increasing hours worked constitute the main reason. Among those that knew about the tax reform but did not take advantage of it, close to 80 percent say that the main reason is adjustment frictions. This includes frictions in increasing working time—such as hours constraints in the current job—or frictions in reallocating non-working time to hours at work—such as child-care obligations. Other reasons, including labor demand, health, or lack of understanding or motivation for working more constitute the remaining but small share of explanations. In sum, adjustment frictions—broadly defined—are the reason for roughly 60 percent of the non-responses, and frictions and inattention to tax rates together explain 85 percent of the non-responses.

To put these results in context, I use aggregate data on labor earnings in Norway and its neighboring country Sweden, which did not have a tax holiday at the same time, to estimate an earnings elasticity of about 0.15. This small elasticity estimate is quantitatively in line with existing evidence and falls in the middle between the estimates based on the Swiss tax holiday and the Icelandic tax-free year. In addition, I present cross-country

evidence consistent with the notion that in the same way as adjustment frictions seem to explain heterogeneous labor supply responses across individuals, differences in labor market flexibility may explain variation in elasticity estimates across countries.

Taken together, my findings imply that in settings where the effect of behavioral optimization frictions—such as inattention to tax rates—is likely to be small due to the salience of incentives, and the utility cost of not adjusting labor supply is high, the estimated labor supply elasticities may still be small. Rather than workers' labor supply behavior being inelastic to such incentives, the reason lies primarily in their inability to adjust their working time. These findings are consistent with a long-held view that frictions, such as adjustment costs (Cogan, 1981; Ham, 1982), hours constraints (Altonji and Paxson, 1988; Dickens and Lundberg, 1993), and costs of changing jobs (Altonji and Paxson, 1992), attenuate observed labor supply responses relative to optimal labor supply determined only by preferences.

This paper unfolds as follows. Section 2 describes the Norwegian tax holiday, its background, and the survey data. Section 3 presents evidence on the salience of the tax holiday, labor supply responses, and reasons for the non-response. Section 4 puts these findings in a context through a cross-country analysis of labor supply elasticity estimates and labor market flexibility. Section 5 concludes the paper. Additional background material is relegated to an appendix.

2 Background and Data

2.1 The Tax Holiday Reform

On June 30, 1955, the Norwegian Parliament passed a reform to the law on capital- and labor income taxes, changing the timing of tax collection. According to the tax law in place from 1911, taxes were levied each year based on income in the previous year. This transition had been in preparation for some time, starting in 1953 when a special directorate—*Directorate for Taxation of this year's income*—was established to prepare the practical and legal aspects of the transition (Pedersen, 2013).

The reform was seen to benefit both the government and the taxpayers. Many taxpayers faced trouble paying their outstanding taxes on previous years' earnings due to various situations, such as unemployment, wage reductions, or retirement. As a result, many taxpayers fell into arrears, regularly around 10 percent, whose taxes for the most part were irrecoverable (Pedersen, 2013). These large tax arrears were a burden on the government and municipalities. From the government's perspective, a pay-as-you-earn

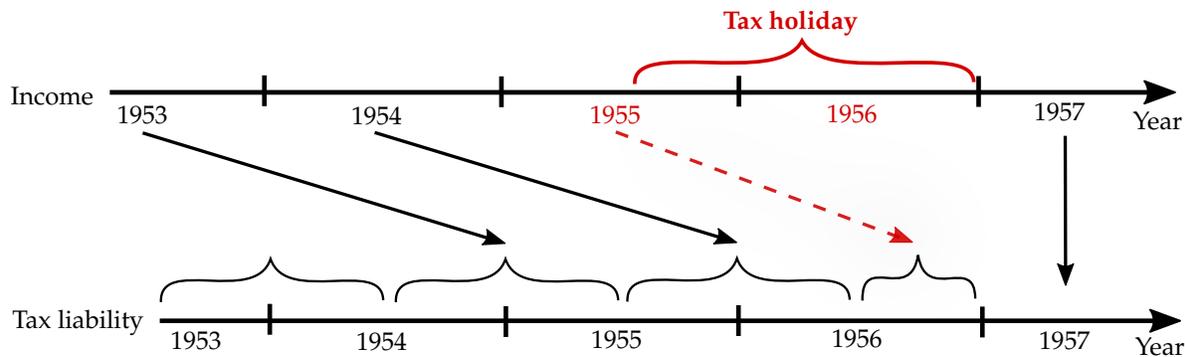


Figure 1: Tax holiday: Transition between tax systems

Notes: The figure illustrates the transition from the old tax system with retrospective taxation and a fiscal year from July to June, to a new system in 1957 with annual pay as you earn and a fiscal year from January to December. According to the retrospective tax system, taxes paid in July 1955 to June 1956 were based on income earned in 1954. Taxes paid in July to December 1956 were based on half of earnings in 1955. Taxes paid in 1957 and onwards were based on earnings in the same year. As a result, all income earned in 1956 and half of income earned in 1955 were never taxed.

system was therefore considered to be likely to lead to increased realized tax revenue.

The transition to the pay-as-you-earn tax system took place on January 1, 1957. When the new tax laws were passed and the reform was announced, the government also set rules about how the transition would take place—*Overgangsreglene*. These specified that income earned during the transition period would not be taxed. The reason for this was to prevent taxes from being paid simultaneously on two years of income during the transition. Figure 1 illustrates the transition between the two tax systems and the tax holiday that resulted from the reform. Prior to the reform, the taxation was retrospective and the fiscal year was between July 1st and June 30th.¹ Income taxes paid during the fiscal year 1955/56 were based on earnings in 1954. Due to the change in the fiscal year, income taxes paid in the second half of 1956 were based on half of the income earned in 1955. From 1957 onwards taxes were paid on income in the same year as it was earned. This transition, therefore, resulted in a tax holiday where all income earned in 1956 and half of income earned in 1955 were never taxed.

For most Norwegians, this reform generated a strong incentive to temporarily increase labor supply, either through longer hours or labor market entry. The average tax rate paid on income earned in 1954, the year before the tax holiday, was 13.8% on all labor income and 17.2% when measured only in terms of taxable income after deductions and exemptions (Statistisk Sentralbyrå, 1957). As documented in Appendix Table A.1, the tax schedule consisted of a flat municipal tax that varied across municipalities and a progressive government tax. For the income year 1954, the average marginal tax rate was 21.1%.

The Norwegian authorities were supportive of people taking advantage of this reform.

¹Appendix A provides a more detailed description of the Norwegian tax system around the time of the reform.

As was explained and conveyed in the media, there was nothing legally—or morally—against increasing working time or effort this year and seizing the opportunity to earn tax-free income.² However, the authorities emphasized that misreporting income as if earned in 1955 or 1956 which should be taxed in other years would not be tolerated. The tax authority stated that it would actively investigate any evidence of such behavior and untaxed income due to such misreporting behavior would be taxed at a rate as high as 100%.

While the government did announce that earnings would be exempt from taxes from July 1955 until December 1956 and that taking advantage of this was viewed positively, the government did impose restrictions on how much earnings could increase until marginal income was taxed. The rules specified that earnings in 1955 and 1956 could only increase by 20% from the earnings in 1954 and 1957, whichever was higher, but that this restriction would only apply to those earning 18,000 NOK or more in either 1955 or 1956. In practice, this was therefore unlikely to bind for most taxpayers as those earning 20,000 NOK before the reform were in the top 95th percentile of the earnings distribution (see Appendix Figure A.1).

To give an example of the opportunity that individuals had for earning tax-free income, let us consider three individuals: A, B, and C. Taxpayer A earns the equivalent of the average income in 1954 of 8,400 NOK. This average taxpayer could increase earnings to 18,000 NOK, or more than double her or his earnings during the tax holidays, without paying any taxes on this marginal income. Still, as part of the retrospective tax system that was being phased out, in 1955 and 1956 workers would pay taxes on their earnings from 1954 and half of 1955. Another taxpayer B was a high-income earner, earning 20,000 NOK in 1955. This taxpayer could increase her or his earnings by 20%, or to 24,000 NOK, without paying tax on these earnings. The third individual C was out of the labor force before the tax holiday. This individual could enter the labor market during the tax holiday, and earn up to 18,000 NOK without paying taxes, before leaving the labor market again.

The tax holiday offered a particularly strong incentive for couples where one of the spouses was out of the labor market. In normal times the couple was taxed on the joint earnings, but the lower-earning spouse could ask for his or her income to be taxed independently. If individuals B and C in the example above are married couples, the tax reform allows spouse C to enter the labor market and earn 18,000 NOK without paying taxes. Under this scenario, in 1957 the couple pays taxes on only 20,000 NOK instead of 48,000 NOK if it had not been for the tax holiday. This was emphasized in the media and

²See, e.g., article on page 7 in *Aftenposten* on March 1, 1955.

in job advertisements, which were targeted at housewives, encouraging them to enter employment and earn tax-free income during the tax holiday.³

2.2 Data

During the tax holiday, Norwegian workers were not required to file taxes, as they did before the tax reform and would do after the tax reform.⁴ In official Norwegian statistics on taxable income, the tax holiday period has a gap. As explained in *Statistisk Sentralbyrå (1960)*: “The reduced statistics for 1956 is due to the fact that at the transition to the new method of tax payment (‘pay as you earn’) there was no assessment of personal taxpayers for this year.” As a result, there exist no individual-level tax data from this period that would allow for estimating a labor supply elasticity.

Fortunately, however, there exists survey data from this period that exactly allows for gaining insights into the salience of the tax holiday, labor supply responses, and reasons for possible non-responses. *Norsk Gallup Institutt AS*, which was part of the Gallup International Association, conducted a survey during the tax holiday. The survey was conducted in April 1956 among a random representative sample of the Norwegian population aged 18 and older. The sample size was about 2,300 men and women, or about 0.1 percent of the adult population. Despite many efforts, the raw individual-level data from this period could not be found in the archives of *Norsk Gallup Institutt*. I am therefore restricted to reporting group averages computed by Gallup.

3 Survey Evidence

This section presents descriptive empirical evidence based on survey data. First I present evidence on the salience of the tax holiday, then evidence on labor supply responses, and lastly evidence on the reasons that people gave for not taking advantage of this transitory opportunity.

3.1 Salience

A central assumption in labor and public economics is that agents optimize fully with respect to wages and tax policies. Under this assumption, empirically estimated responses

³See, e.g., article on page 2 in *Bergens Tidende* on August 24, 1955. In addition, many job advertisements in newspapers in 1955 and 1956 highlight this intensive for housewives.

⁴This is different to what was required in Iceland and Switzerland during their respective tax holidays, where people were required to report their income to be eligible for the tax exemption ([Martinez et al., 2021](#); [Sigurdsson, 2022](#)).

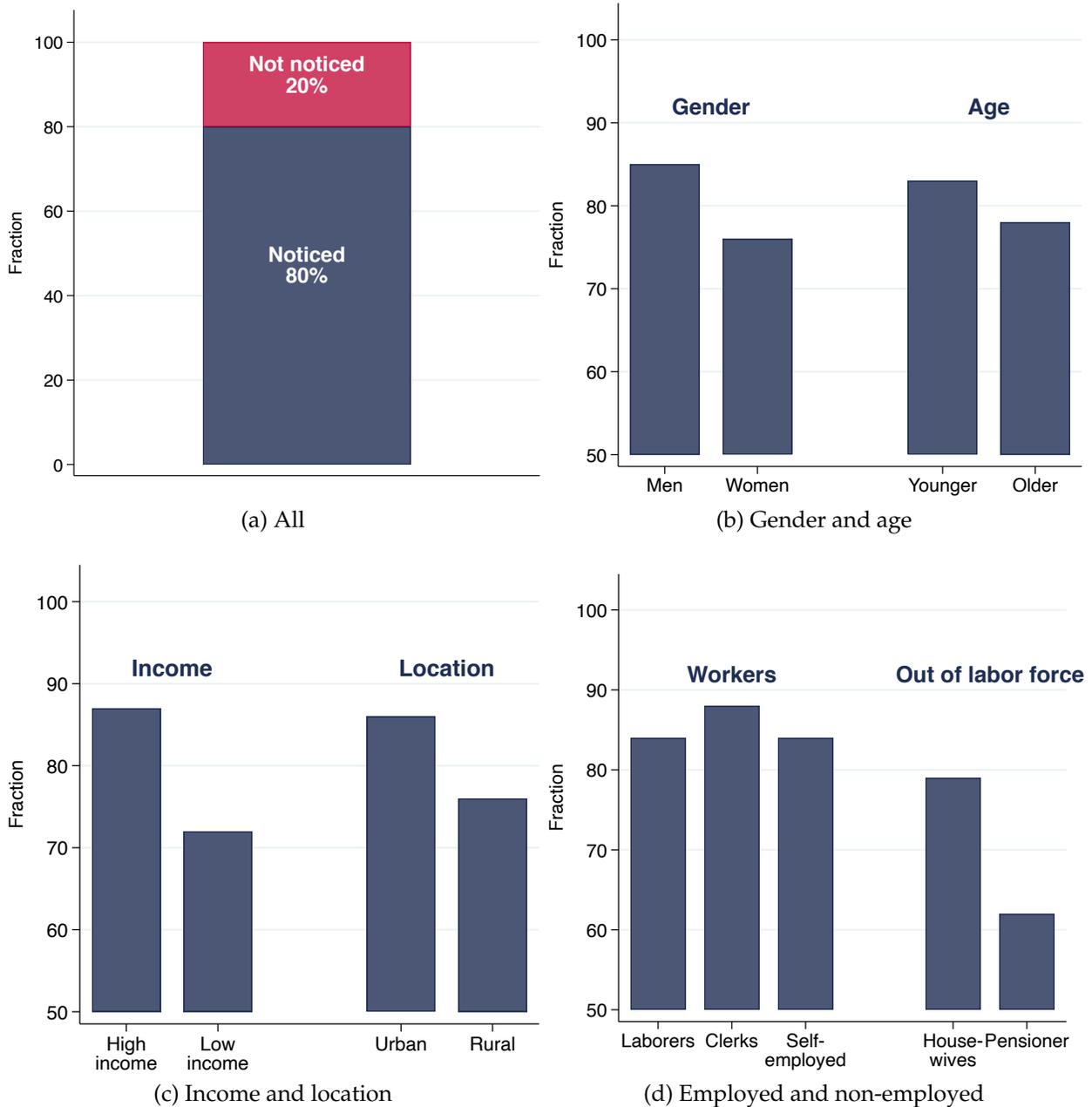


Figure 2: Saliency of the tax holiday: Fraction of people that noticed the earnings opportunity

Notes: Panel (a) plots the share of people that responded yes (*Noticed*) to a question of whether they had noticed that due to a transition to a pay-as-you-earn tax system, everyone had the opportunity to earn tax-free income that year, and the share that responded no to the question (*Not noticed*). Panels (b), (c), and (d) plot the share of a given subgroup that noticed. See Appendix B for exact wording of the question in Norwegian and English translation.

to changes in wages or taxes, therefore, reflect the true behavioral elasticities. Accumulating work has, however, documented how individuals respond imperfectly to incentives, highlighting the importance of salience of taxes and various incentives in explaining differences in responses (Chetty, 2009; Chetty et al., 2009). In addition to providing suitable natural experiments for estimating Frisch elasticities, a clear advantage of ‘tax holidays’ is the salience of the tax reform in comparison to other more usual, but perhaps less noticeable, tax reforms. However, even though tax holidays are undoubtedly salient events, direct information on how a large fraction of the population is aware of them has previously remained unknown.

Figure 2 plots the share of people that was aware of the earnings opportunity that the tax holiday created. More precisely, it presents the share of the population and subgroups that replied yes to the following survey question: *“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?”*⁵ The figure illustrates that the Norwegian tax holiday was very salient and noticed by most adults. Figure 2a documents that among those 18 years and older, 80 percent took notice of this opportunity. Figure 2b and 2c report the same statistic for subgroups of the population. Figure 2b documents that men were on average more likely to notice the opportunity than women and younger workers more than those that were older. Figure 2c documents that low-income workers were considerably less likely to notice the opportunity than those with higher income—72 percent compared to 87 percent—and those that lived in urban areas more than those living in rural areas. Interestingly, those lower-income workers that could benefit more from the reform in both absolute and relative terms were less likely to be aware of it. This might explain in part why previous studies have documented larger labor supply responses to tax holidays among high-wage earners (e.g. Martinez, Saez, and Siegenthaler, 2021; Sigurdsson, 2022). Lastly, Figure 2d reports the fraction of people aware of the reform among groups inside and outside the labor force. Among employed workers—laborers, clerks, and self-employed workers—the rate of notice is around or above 85 percent. For those outside the labor force, the rate is somewhat lower. While among housewives 80 percent were aware of the reform, the share is 60 percent among pensioners.

⁵Appendix B provides an overview of the survey questions and exact wording in Norwegian, which I translate to English.

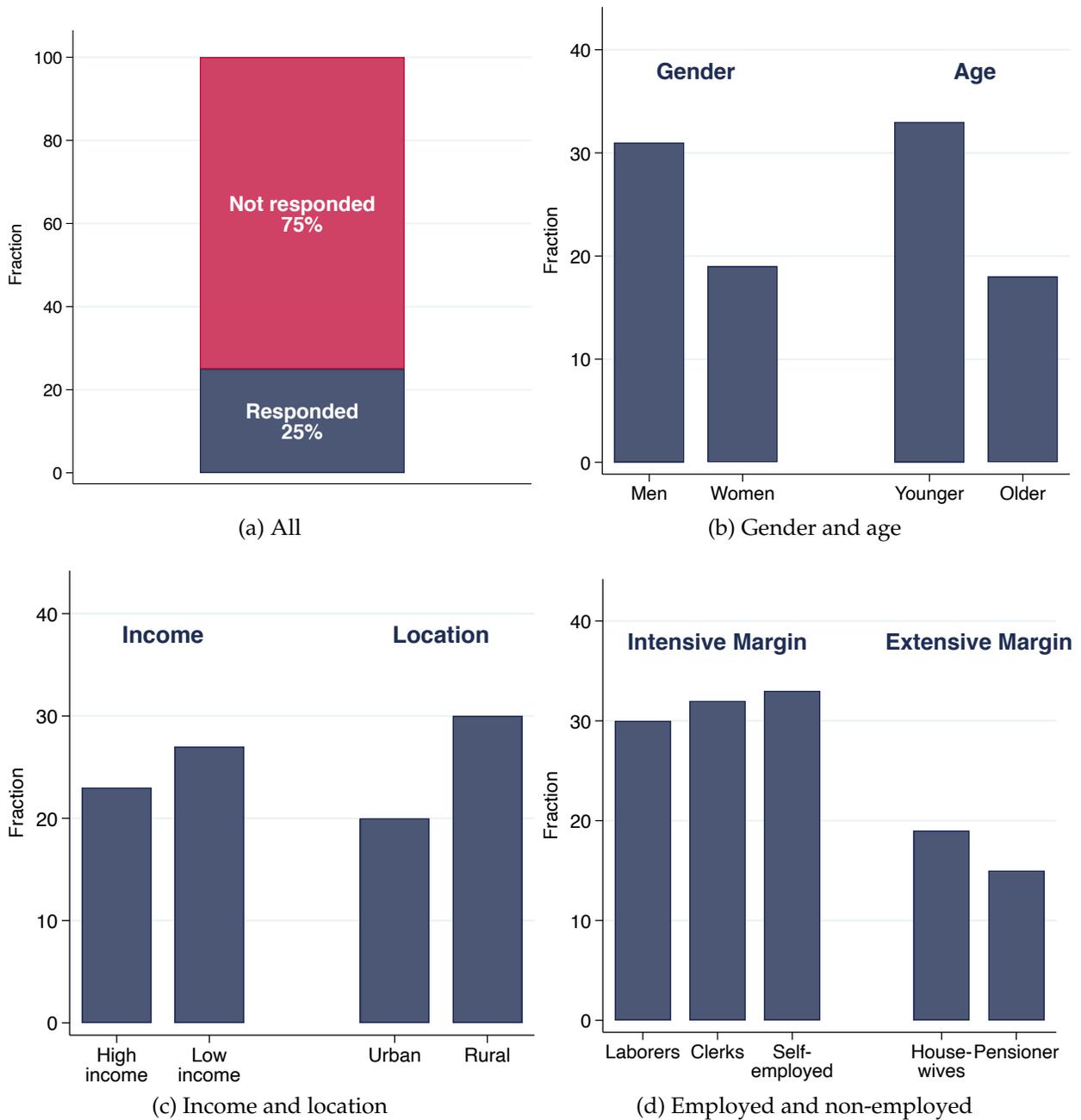


Figure 3: Labor supply response: Fraction of people that responded to the earnings opportunity

Notes: Panel (a) plot the share that responded yes (*Responded*) to a question of whether they had acted to take advantage of the fact that due to a transition to a pay-as-you-earn tax system, everyone had the opportunity to earn tax-free income that year, and the share that responded no to the question (*Not responded*). Numbers presented are the share of adults aware of the reform. Panels (b), (c), and (d) plot the share of a given subgroup that responded. This question was asked conditional on answering yes to the question of whether the individual was aware of the tax holiday. See Appendix B for exact wording of the question in Norwegian and English translation.

3.2 Labor Supply Response

Figure 3 plots the share of people that increased their labor supply in response to the tax holiday. More precisely, among adults aware of the reform, the figure presents the share that replied yes to the following survey question: “Have you personally acted to take advantage of these provisions for tax-freedom, e.g. by taking an additional job, working overtime, or similar?”. As reported in Figure 3a, 25 percent of those aware of the transitory earnings opportunity—or 20 percent of all surveyed adults—took advantage of it. As in the case of salience, Figures 3b and 3c report this rate of response among subgroups of the population. Figure 3b reports that conditional on being aware of the opportunity, men were substantially more likely to take advantage of it than women—31 percent of men compared to 19 percent of women. Figure 3b also reports that younger workers are more likely to respond than older workers—33 percent compared to 18 percent. Figure 3c reports that low-income workers responded on average similarly, if anything slightly more strongly, than those with higher incomes. Figure 3c also reports geographic differences in responses, documenting that workers in rural areas are more likely to respond than those in urban areas, in line with differences in knowledge about the reform. Figure 3d reports responses separately for those employed—i.e. intensive margin labor supply—and those that were out of the labor force—i.e. extensive margin labor supply. A much larger fraction of workers that responded to the tax holiday were employed and adjusted their hours on the intensive margin, e.g. by working overtime, or by taking an additional job. But among the employed there is a small difference in responses, with self-employed responding most and laborers the least, which is in line with findings from other tax holidays (Martinez, Saez, and Siegenthaler, 2021; Sigurdsson, 2022).

While smaller than among those employed, there is still a share of workers that were out of the labor force who adjusted their labor supply. Among housewives, 19 percent of those aware of the reform and 15 percent of all housewives say that they have acted to respond to this transitory earnings opportunity. Similarly, 15 percent of pensioners aware of the reform adjusted their labor supply, and 9 percent of the total. In comparison, Sigurdsson (2022) estimates a small extensive margin Frisch elasticity for those around retirement age and a zero elasticity for the prime-age population, finding that extensive-margin responses are almost entirely driven by the youngest cohorts, some of which were at schooling age. Martinez, Saez, and Siegenthaler (2021) estimate a zero Frisch elasticity on the extensive margin in a population that excludes cohorts close to retirement age and at schooling age, but includes housewives.⁶

⁶Mui and Schoefer (2021) show how large changes in the incentive to work—such as a tax holiday—can generate small extensive margin elasticities, while small changes in wages induce a relatively large share

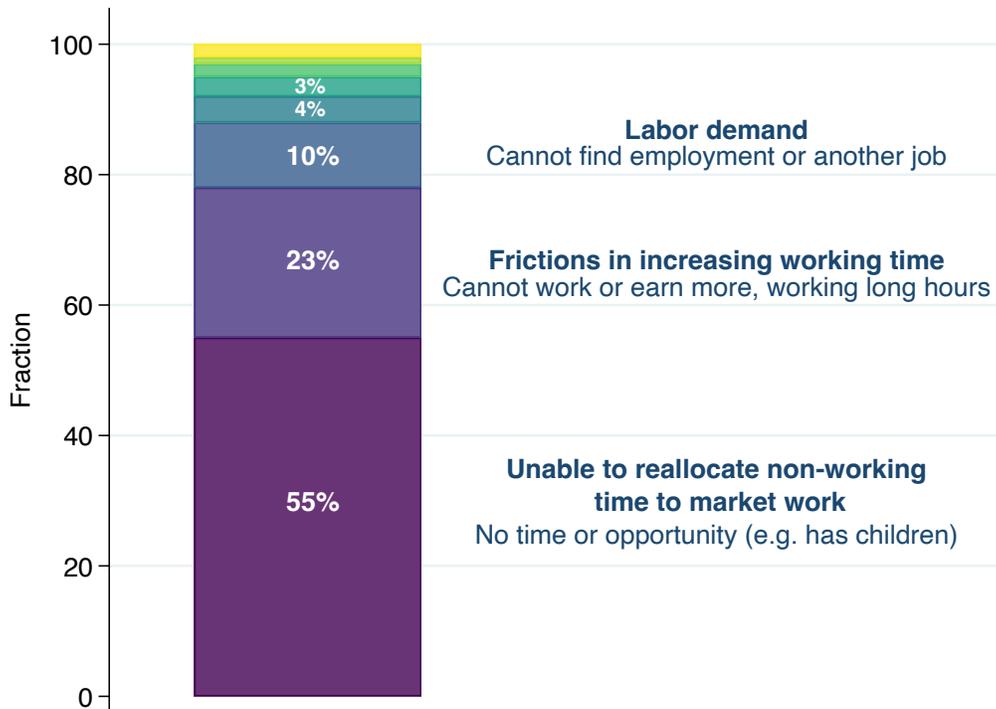


Figure 4: Reasons for not responding: The importance of frictions

Notes: The figure documents the reasons for non-response to the opportunity to earn tax-free income. Numbers are shares of adults aware of the reform but who report not to have adjusted their labor in response. 55% say they have no time or opportunity, e.g. because of children. 23% say they cannot work more than they currently do, or they are already working long hours or overtime. 10% say they cannot find employment or another job, or that firms do not want workers of their type or age. 4% say they have not thought about working more, or cannot justify not responding. 3% are not able to work more because of disability or sickness. 2% say they think a tax holiday will not be the reality and they will be taxed in the end. 1% do not respond because they do not pay taxes. 2% give other reasons for not responding. See Appendix B for the exact wording of the question in Norwegian and English translation.

3.3 Reasons for Non-Response

Despite offering a once-in-a-lifetime opportunity to earn tax-free income, 75 percent of people aware of the opportunity did not take advantage of it by increasing their labor supply. A valuable piece of information is why they did not adjust their labor supply in response, knowing that the increase in the net-of-tax wage, and therefore the utility cost of not responding, was large.

Figure 4 reports reasons that those surveyed gave for not responding, answering the following question: “Why have you not acted to earn tax-free money?” The answers are collected in 9 groups, plus a residual group. The largest share of people—55 percent—say that the reason is that they do not have the time or the opportunity to work more, for example as they have children that they need to take care of. In other words, these work-

of workers to enter the labor market and therefore generate large extensive margin elasticities, consistent with business cycle evidence.

ers seem to not respond as they face frictions in reallocating non-working time to market work.⁷ The second most common reason, given by 23 percent of respondents, is that they cannot work more hours or earn more income within their current work arrangement, or that they already work long enough hours which prevents them from working overtime. That is, their current arrangement of work and non-working activities imposes frictions in increasing working time. The third most common reason for non-response is that 10 percent say that they cannot find employment or more work, including an additional job. This includes pensioners that say that they cannot find work as firms do not want to hire older workers (5 percent). In other words, 10 percent of people seem to not respond due to a lack of labor demand. The remaining 12 percent give a variety of reasons, including bad health (3 percent), already not paying taxes (1 percent), have not given much thought to how to adjust (4 percent), belief that they will be taxed at the end (2 percent), or give a variety of other reasons (2 percent).

In sum, 59 percent of adults, or 78 percent of those aware of the reform, did not increase their labor supply in response to the tax holiday because of adjustment frictions, either related to their professional or private life. Together, frictions and inattentiveness to tax rates explain 84 percent of the non-responses.

4 Cross-Country Comparison

The survey evidence implies that heterogeneous adjusting frictions—broadly defined—explain most of the non-response to the Norwegian tax holiday. This is in line with the long-held hypothesis that optimization frictions, such as hours constraints, may explain heterogeneity in empirical estimates of labor supply elasticities (e.g. [Chetty, 2012](#)). The findings in the current paper imply that such frictions are important in explaining small responses in situations where changes in taxes are very salient and known to most people, implying that the effect of inattention to tax rates is small ([Chetty et al., 2009](#)), and the change in the net-of-tax wage is high, implying that the utility cost of not responding is high ([Chetty, 2012](#)).

Evidence from other tax holidays indicates that adjustment frictions may be important in explaining small but heterogeneous responses to transitory wage changes. For example, [Sigurdsson \(2022\)](#) documents substantial heterogeneity in labor supply responses to the tax-free year in Iceland depending on the flexibility of jobs and non-work-related com-

⁷Preferences likely factor into how people choose to allocate their time between work and non-working time, both leisure and home production. People may differ in how sensitive their non-working time is to changes in wages, e.g., depending on preferences and family structure.

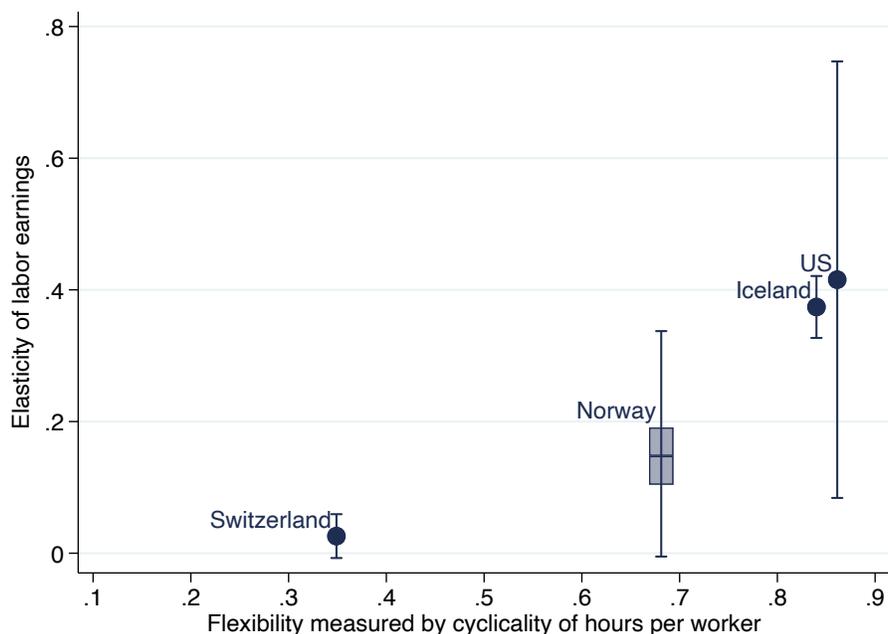


Figure 5: Earnings elasticity by hours flexibility

Notes: The figure plots the intensive margin Frisch elasticity estimates by country against the flexibility of working hours. Elasticity estimation for Norway is based on cross-country difference-in-differences using Sweden as a counterfactual. Details on the estimation are provided in Appendix C. The box plots the range of estimates, the vertical bar the average across estimates, and the horizontal bars the confidence intervals on the largest and smallest estimates. Elasticity estimates for Iceland and Switzerland are average population estimates from Sigurdsson (2022) and Martinez, Saez, and Siegenthaler (2021), respectively. For the US the dot is the average across the two US estimates and the vertical bar spans the higher estimate (Looney and Singhal, 2006) and the lower estimate (Saez, 2003). The flexibility of working hours is measured by the correlation between total hours and hours per worker. Total hours worked, th , are defined (in logarithmic terms) as $th = h + n$, where h is the average number of hours worked per worker, and n is the number of people employed (both divided by the size of the labor force). The time series are detrended using the Hodrick–Prescott (HP) filter so that th , h , and n reflect the cyclical components. The measure for Norway is calculated by the author using data for workers in manufacturing during 1951-1970. Measures of the cyclical component of hours for Iceland are from Sigurdsson (2011) and are based on data for 1991-2010. For other countries, the measure is from Rogerson and Shimer (2011) and based on 1965-2008 data from the OECD database.

mitments, and Martinez, Saez, and Siegenthaler (2021) document significant responses in certain occupations and among self-employed workers, who may have more flexibility in adjusting their hours, while the estimated elasticity for the average Swiss worker is close to zero. Similar explanations for heterogeneity in labor supply responses within a country may explain heterogeneity across countries. That is, countries with more flexible labor markets may display larger elasticities than those where labor markets are more rigid.

To shed some light on this and to put the evidence from Norway into context, Figure 5 documents a relationship between labor market flexibility and Frisch elasticity estimates across countries. I collect Frisch elasticity estimates for countries where estimates using representative samples are available (see, e.g., Figure 9 in Sigurdsson, 2022, for a survey). This is limited to three countries for which estimates from earlier studies exist: Iceland, Switzerland, and the US. Estimates from Iceland and Switzerland are headline intensive-margin elasticity estimates from Sigurdsson (2022) and Martinez, Saez, and Siegenthaler

(2021), respectively. For the US, no evidence exists from a large-scale natural experiment, but studies have exploited transitory and anticipated changes in taxes for identification. I present the average of estimates from two studies and the range of estimates is presented with a vertical bar. The smaller of the two estimates is from [Saez \(2003\)](#), which exploits movements across tax brackets, which are set in nominal terms, during periods of high inflation. The larger estimate is from ([Looney and Singhal, 2006](#)) who use anticipated changes in tax rates associated with changes in family composition to estimate labor supply elasticity.

I measure labor market flexibility by the cyclicalities of hours per worker, computed as the correlation between hours per worker and total hours. As the figure plots the earnings elasticity of employed workers this is a natural measure of flexibility. If workers have the flexibility to adjust their hours as wages change, it is expected that hours per worker move with the business cycle. As documented in prior work, e.g. [Sigurdsson \(2022\)](#), this measure is strongly correlated with the relative importance of hours per worker in explaining the overall variation over the business cycle, as well as being correlated with other measures of labor market flexibility, such as “fluidity” of labor markets and institutional flexibility.⁸ While the figure only includes a few countries, it indicates a positive correlation between hours flexibility and labor supply elasticity. On one end of the spectrum are Iceland and the US, which are broadly similar both in terms of elasticities and hours flexibility, although elasticity estimates for the US, which are not estimated using large-scale natural experiments, span a large range. On the other end of the spectrum is Switzerland which has low hours flexibility according to this measure and close to zero elasticity.

According to this measure, as well as other measures of labor market flexibility, hours flexibility in the Norwegian labor market is between that in Iceland and the US that is Switzerland. If hours flexibility is a predictor of Frisch elasticity, this would imply that labor supply elasticity in Norway also falls in the middle between the elasticity estimates for these countries. Unfortunately, as described earlier, no individual-level data exists on the hours or earnings of Norwegians during the tax holiday. This renders conventional methods for estimating a labor supply elasticity by, e.g., exploiting cross-sectional variation in tax reduction during the tax holiday infeasible. Moreover, as the Gallup survey only provides information about the fraction of workers that responded to the tax holiday but not by how much they adjusted their labor supply, elasticity cannot be calculated.

In an attempt to estimate a Frisch elasticity using the Norwegian tax holiday as a nat-

⁸For discussion and evidence on measures of labor market flexibility across countries, see the Online Appendix of [Sigurdsson \(2022\)](#).

ural experiment, I use aggregate data to conduct a cross-country difference-in-differences analysis. A prerequisite for such analysis is a suitable counterfactual for Norway. That is, a country with a similar business cycle as Norway and facing the same aggregate shocks, but where there was no tax holiday. One such candidate is the neighboring country Sweden.⁹ In Appendix C I describe the estimation procedure in more detail. Appendix Figure A.2b documents how marginal tax rates and growth in labor earnings evolved 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. I estimate an earnings elasticity by relating the differential change in aggregate labor earnings in Norway compared to Sweden during the tax holiday to the differential change in the average marginal tax rate, which the tax reform reduced to zero.¹⁰

Figure 5 presents an elasticity estimate for Norway. I present an average elasticity of 0.148 across specifications, and the range of estimates, from 0.10 and 0.19, is presented as a box around the average. The specifications differ in how they treat the year 1955—when there was a tax holiday during half of the year but data is at annual frequency—and in the use of comparison periods. In line with hours flexibility in Norway relative to Switzerland, Iceland, and the US, the magnitude of these elasticity estimates for Norway also falls between the estimates from these countries. This supports the notion that labor market flexibility may be an important determinant of how strongly labor supply responds to transitory changes in wages.

What does this evidence imply about what the Frisch elasticity for Norway would be in absence of frictions? Under some strong assumptions, back-of-the-envelope calculation using the elasticity estimate and the survey evidence can give some indication. The average reduced-form estimate, combined with the survey response, implies that among those that responded to the tax holiday, the average worker increased his earnings by 18% ($0.036/0.2$). Under the strong assumption of homogeneous labor supply response in the population, alleviating adjustment frictions would quadruple the Frisch elasticity estimate, raising it to 0.58. Moreover, increasing also the salience of the reform such that

⁹Before 1947, Sweden had a similar retrospective tax system as Norway. Laws replacing that system with a modern pay-as-you-earn tax system were passed in 1945 and the transition to the new system took place on January 1, 1947. Similar to the transition that took place in Norway a decade later, there was a tax holiday during 1945-1946. On income earned in 1945, a tax to the central government was only paid on half of that year's earnings but no tax to municipalities. Earnings in 1946 were never taxed. For more discussion, see [Lundin \(2003\)](#).

¹⁰In Appendix C I also conduct a back-of-the-envelope calculation of the Frisch elasticity for Norway using earlier labor supply estimates and other parameter estimates from the literature. These calculations rely on, among others, estimates from [Aarbu and Thoresen \(2001\)](#) who exploit a Norwegian tax reform in 1992 that substantially increased the net-of-tax rate for high-income earners. This calculation implies a Frisch elasticity of 0.34.

all adults are aware of the reform would further raise the elasticity to 0.72. However, it is not unlikely that those that were constrained or uninformed would increase their labor supply by more than the average unconstrained respondent. Then these calculations only give a lower bound.

5 Conclusion

There is a long-standing debate in economics over the magnitude of the Frisch elasticity of labor supply. While macroeconomic models require large elasticity to match aggregate data, conventional wisdom based on microeconomic estimates is that the Frisch elasticity is small. Furthermore, prominent recent research implies that it might be close to zero. While small empirical estimates may reflect that the underlying preferences are inelastic, they may also imply a high prevalence of optimization frictions, such as inattentiveness or hours constraints.

In this paper, I have shed new light on the reasons for small labor supply responses to temporary wage changes by studying a tax holiday in Norway. In this setting, the transitory incentive to adjust labor supply is very salient and most people are aware of it. In addition, the utility cost of not adjusting in response, as measured by the drop in tax rates, is large. Still, only a third of the employed adults responded by increasing their hours and earnings. In line with the long-held view that adjustment frictions make observed labor supply responses differ from those determined by preferences, most adults that did not take advantage of this earnings opportunity explain their non-response by frictions in increasing their hours of work. Either friction in the labor market or friction in exchanging their non-working time for hours at work.

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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 and 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%.

Not all income was taxed. At the governmental level, there were deductions from taxes payable where the amount of deduction was based on which 'tax class' individuals were in. 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 spouses would turn 69 years old before January 1 in the year they were being assessed they 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

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 \(1956, 1957\)](#).

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.

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 \(1956, 1957\)](#).

Figure [A.1](#) plots the distribution of income across taxpayers. As explained and documented 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.

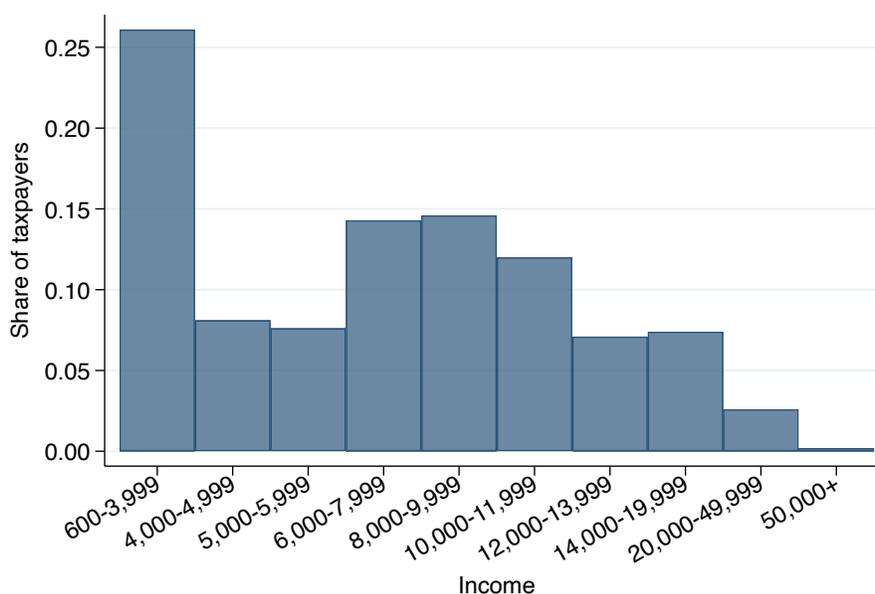


Figure A.1: Distribution of taxable income

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?”

Gallup organizes the answers into the following categories (English translations in parenthesis):

- *“Ikke tid, anledning, har barn, hus, ...”* (“Does not have time, opportunity, has child, house, ...”)
- *“Kan ikke tjene mer enn jeg gjør, lang nok arbeidstid”* (“Can not earn more than I do, long working hours, ...”)
- *“Ikke arbeid å få”* (“No work available”)
- *“For gammel, de vil ikke ha eldre folk”* (“Too old, they do not want older people”)
- *“Er arbeidsufør, syk”* (“Is incapacitated for work, sick”)
- *“Tror at vi får skatt allikevel, bare noe de sier”* (“Think we will be taxed anyway, just something they say”)
- *“Har ikke tenkt over det”* (“Have not thought about it”)
- *“Ikke nødvendig, pensjon, er ikke skattyter”* (“Not necessary, pension, is not taxpayer”)
- *“Diverse andre svar”* (“Various other answers”)
- *“Kan ikke begrunne”* (“Can not justify”)

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.

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. As an indication of this, GDP growth in Sweden and Norway was highly positively correlated (0.77) during the 50s and 60s. 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 from both countries. Figure A.2 plots the marginal tax rates and labor earnings in Norway and Sweden around the tax holiday. Panel (a) plots the average marginal tax rates, documenting slightly higher and rising taxes in Sweden compared to Norway. Any annual changes are, however, very small compared to the tax holiday. Panel (b) plots the evolution of growth rates of labor earnings per person in Norway and Sweden according to National Accounts. 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.

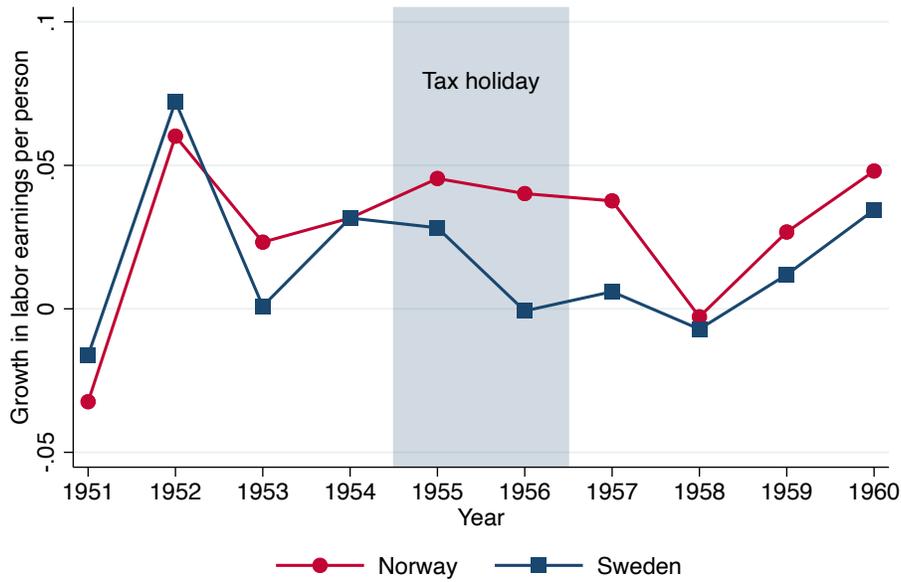
To estimate a labor supply elasticity, I begin by estimating the following regression:

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

where $y_{t,c}$ is the log difference in total labor earnings per person, γ_c and δ_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. To obtain an elasticity, the differential change in earnings 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. To obtain a point estimate with standard errors, I instead estimate the elasticity using the following



(a) Average marginal tax rate



(b) Labor earnings per person

Figure A.2: Marginal tax rate and labor earnings

Notes: The figure plots average marginal tax rate (panel a) and the growth rates in total labor earnings (wages and salaries) divided by population at working age (panel b). Marginal tax rates for Norway are computed using data from annual publications of Statistics Norway's "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. The tax rate in 1955 is set to 50% of the statutory rate, reflecting that half of the year was a tax holiday. Marginal tax rates for Sweden are from Stenkula et al. (2014). Labor earnings are from National Accounts in the two countries, adjusted for inflation using CPI. The growth rate for Sweden is normalized to equal that in Norway in 1954, the year before the tax holiday.

Table A.3: Frisch elasticity estimates

	Exclude 1955		Include 1955	
	(1)	(2)	(3)	(4)
Elasticity (ε)	0.191** (0.046)	0.131** (0.040)	0.165** (0.058)	0.104* (0.047)
Reduced form (β)	0.041** (0.010)	0.033*** (0.006)	0.040** (0.010)	0.030*** (0.008)
First stage ($\Delta \log(1 - \tau_{t,c})$)	0.215*** (0.011)	0.250*** (0.039)	0.245*** (0.052)	0.291*** (0.072)
Reference period	Before	Before & After	Before	Before & After

Notes: The table presents estimates of Frisch elasticity based on cross-country difference-in-differences. The first row presents the elasticity estimate (equation (2)), the second row presents estimates of the differential earnings growth (equation (1)), and the third row presents the estimate of the differential change in net-of-tax rates (equation (1)). Columns (1) and (2) exclude the year 1955, when there was a tax holiday for half of the year. Columns (3) and (4) include the year 1955, setting the *Tax-Holiday* indicator to 0.5 in 1955, 1 in 1956, and 0 otherwise. Specifications in odd-numbered columns use four years before the tax-holiday as the reference period in the difference-in-difference estimation, but even-numbered columns include both four years before and four after. Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

regression

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

where the change in the net-of-tax rate, $\Delta \log(1 - \tau_{t,c})$, is instrumented by the *Tax-Holiday* indicator.

Table A.3 presents the regression estimates. 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. I address this in two ways: (i) by setting the *Tax-Holiday* indicator to one for Norway in 1956, but zero otherwise, and excluding the year 1955, and (ii) by including the year 1955 but setting the *Tax-Holiday* indicator to 0.5 in that year. In addition, I present difference-in-difference estimates with only pre-reform years as the reference period as well as estimates where both years before and after the tax holiday constitute the reference years.

Estimates of regression (1) yield reduced-form estimates (β) between of 0.030 and 0.041, depending on specification. This coefficient estimate implies that the earnings growth in Norway during the tax holiday was between 3 and 4 percentage points higher than in Sweden. The coefficient ε in regression (2) gives an estimate of the Frisch elasticity, which I estimate to be between 0.104 and 0.191, depending on specification. In the main text, I present an average of the coefficients across regression specifications as an estimate of the Frisch elasticity for Norway.

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, as well as parameter estimates from the literature. A dynamic labor supply model with time-separable utility in consumption and leisure gives 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 ρ is the intertemporal substitution in consumption (EIS), mpe is the marginal propensity to earn (MPE) out of unearned income, 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. I use an MPE of 0.1 in the calculation. Havránek (2015) conducts a meta-analysis of the estimates of the EIS and reports an average estimate of 0.5, which I use in the calculation. 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.