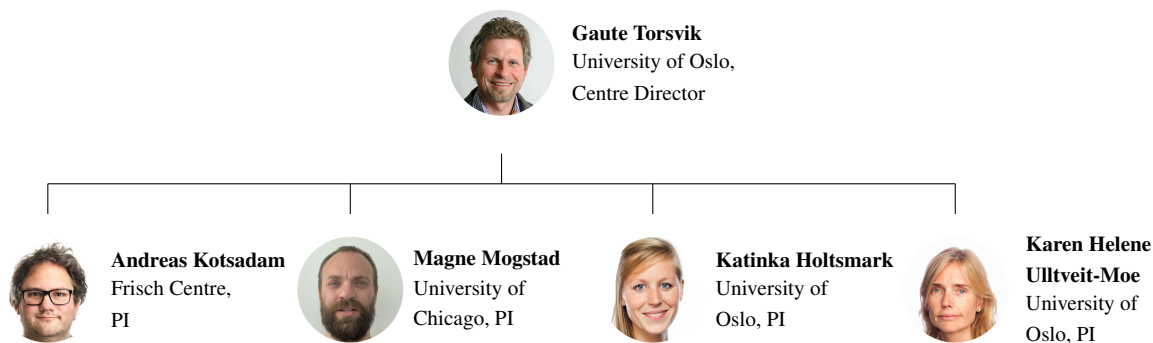


Norwegian Fiscal Studies

University of Oslo



1 Excellence

1.1 State of the art, knowledge needs and project objectives

The Department of Economics at the University of Oslo takes this call for a tax center as an opportunity to create a new and ambitious institute for fiscal studies, Norwegian Fiscal Studies (NFS). The overall goal of NFS is to foster high quality theoretical and empirical tax research that has practical relevance for the design, administration, and enforcement of the Norwegian tax system.

The Norwegian state collects almost half of the national income in taxes. The design of the tax system therefore matters tremendously for the utilization and distribution of economic resources. An evidence-based assessment of how the tax system affects the economy, requires credible information about how individuals and firms respond to different taxes. Much of our current knowledge of how the Norwegian tax system affects economic behavior comes from theory alone, or from empirical studies that either rely on strong parametric assumptions or use data from countries other than Norway.¹ Our understanding of the economic effects of the Norwegian tax system is therefore fairly limited. NFS attempts to close this knowledge gap. Our proposal is inspired and guided by the influential Mirrlees review, whose goal was to identify the structure of an efficient and just tax system in modern open economies [54]. Our ambition is to deliver research for a comprehensive evaluation of the Norwegian tax system, research that will lay the foundation for writing a Mirrlees report for Norway.

Although there exists no consensus of what constitutes a good or optimal tax system, three dimensions are commonly used to evaluate a tax reform; (i) how it affects government revenue, (ii) how it affects economic efficiency, and (iii) how it affects the distribution of disposable income and welfare across households. Another key aspect of the tax system is tax administration, enforcement and compliance, features that have a direct bearing on the revenue, efficiency and distributional effects of imposed taxes.

The economic analysis of taxation is difficult and interesting because agents adjust behavior when a tax is introduced or changed. Providing knowledge about how different tax bases respond to changes in the tax structure and tax rates will be the main objective for NFS. To obtain this knowledge we will combine tax theory and cutting-edge empirical analysis of economic decisions made by firms and individuals. With this combination it is possible identify the parameters that determine how taxation affects government revenue, efficiency and the distribution of economic welfare.

In the spirit of the Mirrlees review, our aim is to recover the various elasticities underlying tax responses and to integrate results from our individual studies into a larger framework to assess how the Norwegian tax system affects public revenues, economic efficiency, and distribution. This so-called tax systems approach [63]

¹For example, the models that currently inform the Norwegian Ministry of Finance of the revenue and distributional effects of changes in labor income taxation either assume no behavioral responses (as in SSB's microsimulation model LOTTE) or assume that the individuals' unobserved taste for work is uncorrelated with productivity. If one in addition makes a parametric assumption about the distribution of the taste for work (e.g. that it is extreme value distributed), it is possible to recover individual's preferences from observed variation in wages. This approach forms the basis for most of the microsimulation studies of labor supply in Norway (see e.g. [2, 1, 65])

is essential to understand the overall impact of taxation, and has formed the basis for influential tax analyses in other countries (see e.g. [54]). The system approach has several implications, for example that we should not judge the neutrality or progressivity of individual taxes alone, but consider the tax and benefits system as a whole. It also means that we cannot analyze responses to income taxation without taking explicit account of the benefits those not working receive. If we use net of tax income to measure inequality, we must account for public provision of in-kind benefits. Finally, to assess the real effects of taxes we must account for non-compliance.

NFS is exceptionally well equipped to provide this type of comprehensive tax policy relevant research. We have already built a broad knowledge base during two (five years) periods of tax centre (OFSI, OFSII). We have also established an extensive micro-data base designed for the analysis of tax policy. These achievements were important steps for improving our research in, and teaching of, public economics at the University of Oslo. We have, however, so far not had the resources, personnel, or data to adequately combine tax theory and advanced micro-econometric analysis for a thorough assessment of the Norwegian tax system. To overcome these limitations, we have now assembled a unique group of established and talented young economists that possesses the combination of theoretical insights, institutional knowledge and micro econometric expertise required to conduct the policy relevant research on taxation that we aim to deliver. Domestically, we have established a solid and fruitful institutional cooperation with Statistics Norway, the Frisch Centre, the research group in the Norwegian tax administration, and faculty at the economics department of several Universities (including University of Oslo, University of Bergen, NHH, University of Stavanger and NTNU). Internationally, NFS has an extended network of researchers that strengthens and complements the quality of the core group. This network includes several of influential scholars in public economics, including Richard Blundell (UCL), Joel Slemrod (University of Michigan), Mikhail Golosov (University of Chicago), Magne Mogstad (University of Chicago). These leading scholars are already working actively with domestic participants at NFS and will be active partners and coauthors in the proposed projects.

We believe high quality research is a prerequisite for high quality teaching. NFS can cement and further improve the teaching of public economics at the Department of Economics at UiO. University of Oslo is an important educator of economics students in Norway. At the Department, the establishment of OFS expanded the teaching of public economics. A sharper focus on public economics has also recruited more students to write master thesis on this topic. To keep the momentum of student interest in the economics of taxation and to improve the teaching of public economics at the PhD level, which is an ambition at NFS, we believe it is absolutely essential to have a tax center, with the extra commitment and funding that comes with it.

1.2 Research questions and hypothesis, theoretical approach and methodology

The call request research on three broad tax questions. How taxes affect production and consumption? How taxes affect the distribution of income and welfare? How the tax administration can improve tax enforcement and compliance? NFS will conduct groundbreaking tax research on all three questions.

Although most individual projects transcend a single theme, we find it useful to sort our planned research into four thematic work packages (WP). The proposal strikes a balance between showing the potential for top quality research without providing a straitjacket that dampens the inherent creativity of research projects. Our outline below presents a subset of projects that the group of researchers at NFS have on their research agenda. NFS plan to expand on these ideas and provide an effective environment for their development. It is, however, important to acknowledge that research is to some extent organic. We believe that NFS will provide a fertile research environment for the development of research ideas and insights that will create new policy relevant knowledge.

As discussed below, our project contains four thematic WPs. The first is centered around core questions of tax acceptance and compliance. The success or failure of any tax system, or tax reform, hinges critically on its implementation, administration, and enforcement. In WP1 we describe novel research ideas on how the predictive analytics the Norwegian Tax Administration apply to target enforcement can be used to estimate the long-term effectiveness of different tax enforcement strategies. We will use cutting edge machine learning techniques to estimate heterogeneity in enforcement responses and to identify group optimal enforcement policies. We will conduct surveys to investigate the nature of people's tax acceptance, and how tax acceptance affect compliance.

In WP2 we study how income and commodity taxation affect labor market decisions, savings, and consump-

tion. Our main contribution here is an ambitious project that combines dynamic theory model with Norwegian micro-data to estimate both the revenue effects and the societal costs of taxing capital and labor income. This WP also addresses more specific questions concerning the effects of labour and capital income taxation in Norway. Another important topic covered by this WP is how changes in commodity taxes affect the behaviour and welfare for different households.

WP3 is concerned with taxation and economic inequality and welfare. We will make key contributions to the measurement of economic inequality, taking account of the fact that much of the income and wealth of the rich are not fully accounted for in official Norwegian statistics because of unrealized earnings, biased tax assessment values of certain assets or because assets and income are hidden in tax havens. We sketch a method we will apply to estimate how the incidence of tax reforms affect the distribution of income across different type of workers and between workers and capital owners.

In WP4, we investigate how taxation affects decisions made by firms and capital owners. How do corporate taxation and shareholder taxation affect investment and innovation? How can corporate taxation be designed to promote structural change towards green production? How can economic rents stemming from e.g. natural resources be identified and taxed?

WP1: Tax acceptance and compliance (PI, Andreas Kotsadam)

A sustainable welfare state requires high fiscal capacity with effective policies that can raise and maintain tax compliance. Such policies need to enforce current tax schemes and maintain the current high acceptance for taxation in society. Detection and punishment of cheaters is important, but so is maintaining taxpayers intrinsic motivation to pay due taxes. Even with extensive and partly automatic third-party reporting, both individuals and firms self-report items that affect paid taxes, and it is crucial that enforcement policies do not undermine honest self reporting.

The tax authorities use a wide range of enforcement strategies, including various types of audits, information campaigns, and real-time guidance. Beyond general preventive effects, these policies have specific impacts on those directly affected, both in the short and long run. In the case of audits, non-compliance may be disclosed, but exposure to the audit may also have behavioral effects on future tax filing. Such behavioral effects can appear beyond the targeted person/firm via social interaction (peer effects). All future impacts must be identified within a framework of counterfactual outcomes, implying a need for experimental research. In recent years, the Norwegian Tax Administration (NTA) has implemented random treatments as well as interventions based on strict risk assignment rules that facilitate regression discontinuity designs. NFS will cooperate closely with the National Tax Authorities using existing data and contribute to the development of effective policies.

We will develop and implement designs for large scale field experiments that utilize the rigour and statistical sophistication of cutting-edge research with the practical and pressing needs of the NTA. An overall objective of the project is to credibly identify what works best for whom. Rather than just asking whether an intervention works in the sense of having an effect statistically different from zero, recent methodological innovations increase the value of experimental trials by helping to identify which interventions are best, how they can be implemented most efficiently, and for whom they are most effective (targeting). In this way, the welfare and learning impacts of the experiments are maximized. While seemingly straightforward, such adaptive and targeting analyses need to resolve substantial methodological challenges, and the resolution of these will also contribute to the academic literatures on machine learning, causal inference, and experimental design.

The research team involved in WP1 has worked with the NTA for many years, have ongoing collaborations, and concrete plans for future work with them to increase tax compliance. This work package is centered around a large set of field experiments where we will apply (i) random assignment to alternative enforcement strategies (e.g. audits) to improve targeting, (ii) recent methods for adaptive field experiments to ensure that continual learning can be achieved while welfare costs are kept at a minimum, (iii) rich micro data to investigate network effects of interventions for both firms and individuals, (iv) tests of how different enforcement policies affect acceptance for taxation

In the field experiments we use and advance methods for optimal learning, and combine the field evidence with survey data and survey experiments to learn about mechanisms. We expect substantial and large spillovers

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from this work package since it develops and strengthens the capacity for doing effective policy evaluations in Norway. The methodological contributions will produce knowledge that is directly relevant for other public institutions and private employers. The project will expand the research frontier of several substantive fields of research, such as public economics and econometrics.

The Field Experiments. We will design and analyse data from field experiments in several different key domains of the tax enforcement policy spectrum. The aim is to analyse existing/planned data, but also work closely with NTA analysts to design new experiments and strategies.

We will work with randomized audits of personal taxpayers focusing on deductions. Although increasing use of third party reporting limits the scope of tax evasion, taxpayers may, at the margin, still under-report income and over-report deductions. Several studies show that audits not only detect and correct infringement on the spot, but have lasting effects on the audited taxpayers' subsequent compliance with the tax code [5]. As we show in our on-going collaborative research with analysts in the NTA, this is true also in Norway [37, 41, 49].

The NTA regularly conducts audit experiments and implements audits as natural experiments that facilitates rigorous ex-post evaluation, in particular by using sharp cutoffs of a risk score to determine audits. By comparing individuals just above and just below the intervention cutoff, causal effects of audits can be identified by means of a regression discontinuity design as we did in [49]. We also have data from several large previous scale field experiments (2013, 2018, and 2021). In 2018 NTA also conducted a large scale (N=15,000) randomized controlled trial comparing the effectiveness of two enforcement policies; a desk based correspondence audit and a letter encouraging tax filers to have a second look at their itemized self-reported income tax deductions. Using and advancing new methods, we will learn from previous experiments and plan for future field experiments in this area that test optimal targeting.

Tax administrations also use softer, less intrusive, and cheaper enforcement policies such as information campaigns, reminders and encouragements. In [41] we show that a simple letter asking individuals to have a second look at their deductions affect long run tax compliance, and present suggestive evidence that most of the effects of being audited seem to go via increased information. A clear policy conclusion from previous work in Norway is therefore that the provision of clearer and simpler information may increase tax compliance substantially. Based on our evidence, NTA has now scaled up the intervention and the letters will be sent to a much larger sample in the coming years.

We also test information treatments and nudges by field experiments with real-time guidance by the tax authority to personal taxpayers and firms as they file their tax returns. Over 80 percent of Norwegian taxpayers receive their tax return in a new and digitalized system. NTA is developing new digitalized platforms for tax filings for personal taxpayers and VAT reporting for businesses. These platforms aim to make reporting more accurate both by correcting mistakes directly and by improving filing compliance. For example, if taxpayers report interest expenses that are very large compared to their debt, they are asked if this is correct. Our preliminary results suggest that these interventions improve reporting substantially. Based on the lessons from the softer enforcement policies in the deductions setting we expect these information treatments to also affect future compliance, but this has not been evaluated yet.

There are also other questions of uttermost importance for organizations using soft treatments and nudges, in particular whether being exposed to many treatments induce fatigue or decreasing marginal returns in general. Since individuals in our setting are randomly assigned to up to 12 different treatments this is something that we intend to test. In future work we plan to use adaptive experiments to support the new real time guidance devices associated with the new digitalized platforms.

In addition to field experiments with individual taxpayers, we are also conducting, analysing, and planning field experiments targeted at firms. Firms account for a large share of the total Norwegian tax revenue, yet most studies are on individual taxpayers (important Norwegian exceptions are [19, 42] and [45]). Firms report at a much higher frequency (bi-monthly reporting for payroll taxes and monthly for VAT) than individuals. In 2017, NTA introduced a random audit program along three themes: labor market regulations, VAT-compliance, and quality of third-party data reporting. We will, for instance, use the thousands of random audits carried out to disclose compliance errors regarding payroll taxes. Also for payroll taxes, NTA have conducted field experiments using letters. In a large scale field experiment, we are now also in the process of comparing the effects of three different tax enforcement policies to increase compliance with VAT reporting for newly established firms as pre-registered in [42]. Also for these types of experiments we hope to conduct optimal

targeting experiments in the coming years, but this will only be possible if we get funding.

Advances in methods to increase learning from the experiments. In order to learn as much as possible from the experiments, we will combine state-of-the-art experimental techniques for causal inference and adaptation with cutting-edge Machine Learning (ML) techniques.

We will use and advance Machine Learning (ML) methods for detecting heterogeneous treatment effects. It is likely that individuals react differently to the same interventions. That is, we would expect substantial variation in what works for whom. The standard practice to deal with heterogeneous effects is to estimate the effect separately in different subsets of the data with noisier effect estimates. Without a pre-specified analysis plan there will be no way to know how many non-reported tests were conducted, and thus no way to know whether significant results reflect real effects or simply the expected number of false positives we would get if we made a large number of statistical comparisons when the true effect was zero [58]. Specifying all possible tests, however, is difficult, especially in a setting where there is uncertainty with respect to treatment heterogeneity. The ML literature recommends randomly splitting the data into several parts to validate the predictive model on a separate sample from that used to train it. Such solutions have in turn been adapted and used to resolve similar issues in economics [66, 21].

Tax administrations regularly use predictive analytics to identify individuals or firms at high risk of misreporting, but has so far, not addressed the heterogeneity in taxpayers' future response to different enforcement instruments. Such information can be used to design better policies simply because targeting can be based on total effects, including future compliance effects. In cooperation with the NTA, we will analyze experimental data within the frames of the current project and the insights will be used to improve NTA's AI models and policies. Based on the different field experiments in NTA we will use ML methods to detect heterogeneity in future compliance effects.

This research greatly benefits from combining data from many field experiments and operational practice within the NTA. Firstly, it increases the sample size, which is important for ML models to detect heterogeneity. Secondly, it enables analyses of parameter stability, i.e., the stability of the effects over time. When we conduct analyses of all previous experiments, we can compare the heterogeneity in the different years. If parameters are not stable over time, the generalizable insights from different field experiments are drastically reduced. To date, there are few examples where effect evaluations of public policies address these challenges when estimating what works for whom. There is also a lack of comparisons of the different methods for heterogeneous treatment effects, implying that it is unclear when the different methods work best in practice.

We will use and advance methods for adaptive field experiments. The most credible estimates of causal effects involve randomization, as this is the best way to ensure that there will be no systematic difference between those exposed to different treatments. The causal effect is the difference in average outcome between groups exposed to different treatments, and the precision of this estimated effect increases with the number of individuals present in each group. This raises a trade-off between exploration (testing potential treatments) and exploitation (using the most effective treatments identified at any stage). At one end there is the risk of calling a winner before the results are clear, channelling future resources into policies whose initial outcomes reflected chance more than inherent effectiveness. At the other end is the risk of wasting time and resources on continued testing of policies that have been shown to be inferior. Both errors also have an ethical dimension, as they risk unnecessarily exposing people to treatments that are ineffective or even harmful.

Though an old idea, adaptive treatment assignment has been revived in recent years following the rise of computer power and large-scale experimentation, also in economic field experiments (e.g. [39]). The method has also been expanded to include the use of contextual information, and to infer treatment differences at an early stage using surrogate measures and indices that provide early indications of the final treatment outcome. To our knowledge, the adaptive field experiments strategy has not yet been implemented in a public administration.

With increasingly digitalized tax reporting, the tax administration can communicate with the reporter that submits information in real time. During this process, the administration can send tailored and targeted information and encouragements to the taxpayers based on their reporting behavior, thereby testing and fine-tuning the guidance nudges based on how taxpayer reporting responds. Behavioural responses among taxpayers will be continuously and directly available. In the longer run, the project will test the effects on future tax compliance and search for important predictors of such compliance (surrogates) that can be included in next years' adaptive experiments. We plan to use the experiences we draw from experiments with personal tax payers to

design and test different optimization procedures when the digitalized VAT system is launched during 2023. Regarding audit treatments with firms we may also be able to use relatively quick adaptation since reporting occurs many times per year.

Using high quality Norwegian microdata we will investigate and exploit Network effects in the experiments. Information spreads in networks and we also expect peer effects to be strong in contexts where social norms and ethical considerations are key. What I think is acceptable in terms of tax evasion is likely to depend on what my peers think and do when they file their taxes. Firms may adjust their subjective detection probability when similar firms are audited. A variety of such peer effects can reinforce (or reduce) the direct effect of enforcement strategies simply because the policy itself or behaviour among those directly affected can spill over to other individuals or firms. The Norwegian register data offer ample opportunities to study such social interactions since we can combine networks of different types, family dynasties, neighbours, colleagues at the workplace as well as business associates and board members. We also aim to explore network effects with firms having the same audit companies. Depending on the type of enforcement policies, different interactions are potentially relevant and we expect network effects to be important for instance both for audits and in the real time information experiments.

Survey data and survey experiments to learn about mechanisms behind tax acceptance. Maintaining a high acceptance for taxation is crucial, our understanding of how to do so is, however, limited. [64] finds that social preferences, such as attitudes toward redistribution and inequality, are much more important than efficiency concerns in explaining attitudes toward taxation in the US. To date, we do not have similar information for a large representative sample of Norwegian taxpayers. Furthermore, we lack crucial information about the interplay between enforcement strategies and tax acceptance. We do not generally know, for instance, how audits and information treatments by the NTA affect norms and beliefs about compliance. [59] show that shaming may backfire by crowding out intrinsic motivation, is the same true with what may be perceived as excessive control and information overload? In particular, we worry that being exposed to many nudge-like treatments may induce fatigue or at least decreasing marginal returns.

The canonical economic model of tax evasion of [7] suggests that sanctions and probability of detection fully determine evasion. We know that this is not true. For instance, punishment for deduction errors is close to non-existent and the risk of detection is minimal, yet many Norwegians do not seem to deduct more than their factual costs. Tax morale and social norms are suggested to be important (e.g. [50]), yet many studies appealing to social norms or tax morality find limited effects on tax compliance. In a metaanalysis of 40 studies, [12] find that non-deterrence nudges are ineffective whereas deterrence nudges seem to have effects. In a large field experiment from Belgium, [24] finds that simplifying the tax filing information increased the number of individuals that filed their report on time and the effect persisted a year after the intervention. Similarly, [41] finds that a letter encouraging tax filers to take a second look at their tax deductions lead to an immediate and lasting reduction in misreporting of taxable income. Following our previous work [41], we know that it is both feasible and informative to survey treated and control individuals from audit experiments. We plan to investigate the effects of different treatments have on beliefs about the prevalence of cheating (social norms), penalty rates, and attitudes toward taxation. We would also investigate the effects of experimentally induced changes in beliefs about social norms on attitudes and future reported deductions.

There are clear links between the other work packages, described below, and acceptance of taxation. For instance, perceptions about inequality and efficiency of the tax system likely affects acceptance also in Norway. In addition to targeted surveys to treated and control populations in the enforcement experiments we plan to conduct large-scale surveys with embedded survey experiments to representative samples of taxpayers. [64] shows that tax acceptance may be increased by various treatments in online surveys. A major advantage of our setting is that we can use such treatments and investigate if they actually affect tax filing behavior in the longer run. We also think that there is a lack of evidence on perceptions and reasoning behind acceptance of different types of taxes. For instance, economists favor taxing things that are difficult to hide and move, such as housing, while such taxes seem to be unpopular in the general public. By gaining a better sense of what drive such opposition we may improve the tax system by giving out more information and label taxes differently.

Reducing inequality via the tax system may also be inherently difficult if wealth and income causally affect tax acceptance, as has been shown in other contexts. [11] show that winners in an Ethiopian housing lottery that became randomly much wealthier are more opposed to a housing tax and they change their beliefs about the causes of poverty by deemphasizing luck and emphasizing laziness. Using lottery data from Norway (as in

WP2) and surveying winners of different amounts we intend to test the effects of wealth on tax acceptance in Norway.

WP2: Household Earnings, Savings and Consumption (PI, Magne Mogstad)

Both the revenue effects and efficiency losses of income taxation depend on the elasticity of the income base. For active market participants, the overall response to changes in net wages or net returns on savings can be decomposed into a substitution effect caused by the change in relative prices, and an income effect. The uncompensated elasticity determines the revenue effect of changing the income tax rate, while the compensated elasticity determines the societal costs or efficiency loss of taxation. In addition to intensive margin responses, income taxation may also affect market participation, for example whether individuals participate in the labor market, or in the stock market.

Evidence-based assessments of income or consumption taxation require credible estimates of the uncompensated and compensated behavioral elasticities at the intensive margin, and estimates of extensive margin responses. Economic theory alone provides limited guidance, and it is challenging to use data to estimate some of the relevant behavioral responses. The revenue effect of taxation can be assessed without distinguishing between extensive and intensive margin responses, or between substitution and income effects at the intensive margin. In contrast, calculating the efficiency loss of income taxation requires knowledge of the compensated behavioral tax response, which cannot be directly recovered from data, not even from a controlled trial that randomly varies tax rates.

WP2 contains research that in different ways shed light on how individuals adjust their behavior to income and consumption taxation. A central contribution in WP2 is a project that combines a rich theoretical model of taxation, detailed Norwegian micro data and novel data sources to estimate the behavioral responses needed to evaluate the revenue, efficiency and distributional effects of labor income taxation. In addition to this larger project, the WP contains projects addressing more specific questions concerning the effects of labour and capital income taxation in Norway and research on the incidence and welfare of commodity taxes.

Combining theory and variation in non-earned income and tax rates to identify revenue and efficiency effects of income taxation. Our theoretical framework builds and extends the model used in [34], a dynamic model where individuals, differing in preferences and productivity, choose whether to participate in the labor market and how hard they work to generate taxable income if they participate. In addition to work intensity, they also choose the time profile of their consumption. The government taxes labor income with a progressive non-linear tax scheme. This framework is more general than the one commonly used in the empirical public finance literature to estimate the elasticity of taxable income [62]. The standard model ignores participation decisions, and circumvent the difficulty of estimating compensated responses on the intensive margin by assuming away income effects. Instead of assuming away income effects, we combine earnings responses to random variation in non-earned income and earnings responses to tax reforms, to estimate the parameters that are relevant for policy evaluations.

[34] use US data on lottery winnings to estimate how non-earned income affects labor market earnings and to bound model parameters and policy reforms. In a similar fashion we will use Norwegian data on lottery wins to obtain variation in non-earned income. Relative to [34], an important methodological extension of our project is to supplement earnings responses to non-earned income with estimates of how exogenous changes in the marginal tax rates, using tax reforms as instruments, impact on taxable income. Combining this information with empirical estimates of extensive margin responses and estimates of the progressivity of the Norwegian income tax schedule will allow us to point identify model parameters and therefore to calculate efficiency losses and optimal income tax rates (for given welfare weights).

Several studies have used Norwegian tax reforms to obtain reduced form estimates of the elasticity of taxable income (ETI) [65, 17]. Our approach is novel because (i) we combine ETI estimates with information on how earnings respond – both on the extensive and intensive margin – to changes in non-earned income and (ii) we will use a rich theoretical model to translate these data moments to the behavioral elasticities that matters

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for the revenue and efficiency effects of labor income taxation. Another central contribution is that we allow for heterogeneous earnings responses across the income distribution. We will use the income gradient in responses to tax reforms and lottery winnings to characterize this heterogeneity. A question of particular interest that we will be able to answer, is how the effective tax rate of low-income earners, taking account of both the taxes they must pay on earnings and the benefits they lose if they participate in the labor market, influence participation rates, government revenue and efficiency costs of income taxation at the low end of the earnings distribution. Another important extensive margin is older workers' decision to leave work for retirement. This decision also depends on the effective tax rate, that is, on how labor market earnings are taxed as well as on how the pension system rewards stayers.

We plan to use the same approach to estimate the parameters that determine revenue effects and efficiency losses associated with capital income taxation. Taxing savings (wealth), or the returns to savings, affect accumulation of wealth and intertemporal consumption through a substitution and an income effect. Again, the tax revenue effect depends only on the overall response in savings, while the efficiency loss is associated with the compensated saving elasticity. We allow individuals to save in different assets that are - potentially - treated differently in the tax system. Hence, and in accordance with the Norwegian wealth and capital income tax system, households face both a wealth tax and a capital income tax. We plan to use Norwegian wealth and income tax reforms to estimate the elasticity of taxable wealth (ETW), similar to, for example, [68]. Our key contribution is twofold. First, we will combine the ETW estimates with saving responses to lottery winnings and in this way untangle the relative importance of compensated and uncompensated saving responses. Second, we use a newly constructed population panel data set with information on the market value of assets (and not only their tax assessment).

The latter contribution is essential (but largely ignored) to measure how individuals respond to wealth and capital income tax reforms. A major difficulty faced by researchers who want to study savings behavior of households is the lack of reliable panel data on household expenditures. One possibility is to use surveys that follow the same households over time, but such data are rare, and they typically have small sample sizes and face significant measurement issues. An alternative approach is to use the accounting identity that total household spending is equal to income plus capital gains minus the change in wealth over the period. Several of the participants at NFS have already invested heavily in examining the advantages and difficulties of using this accounting identity to construct a population panel data with information on household expenditure.

The sustainability of the Norwegian welfare state. The Norwegian population is ageing fast, despite substantial immigration over the last decades. This has important implications for the tax and transfer system.

First, the ageing in itself will imply more retirees per worker. "Perspektivmeldingen 2021" argues that the welfare state, with its current level of taxation and spending, is unsustainable. Future governments will either have to increase taxes substantially or cut spending. Such analyses are very important for addressing the future structure of the tax system. However, much more work is needed along these dimensions. The analysis behind the existing studies typically abstracts from risk. The models must be extended to incorporate the salient aspects of risk, including uncertainty about future productivity growth and the cost of producing public services. The fact that the Norwegian oil fund already finances a large share of government expenditure (around one fifth), suggests that a comprehensive view on the future tax system requires a model incorporating the risk embedded in the return on the oil fund (whose portfolio has an equity share of 70 percent).

Second, an increased tax burden is likely create more distortions. [35, 36] argue that a higher tax burden will make the progressivity of the tax system more costly. This suggests a trade-off between the desire to achieve redistribution and government-provided insurance through taxes and transfers versus through the provision of public goods, which might be more important for the poor. We will document the extent of redistribution—both through the tax and transfer system and through the pension system—and quantify the consequences of varying the progressivity and the pension system in response to the looming increase in the fiscal burden.

The welfare effects of consumption taxes. Despite the practical prominence of consumption taxes as a means of raising government revenue, little is known about the welfare effects of consumption taxes. Drawing credible inference about the welfare effects of consumption taxes, is in general, difficult. A notable exception is the textbook model with perfectly elastic supply, zero cross-price elasticities, and log-linear demand. Under these assumption, one can use variation in consumption taxes across markets and time to identify the (constant) elasticity of demand, which is a sufficient statistics for the welfare effects of both marginal and larger changes in sales taxes.

Nonlinear demand curves, however, create several challenges. First, variation in consumer taxes across markets and over time will only identify a particular weighted average of (non-constant) demand elasticities. In work in progress we show that this weighted average is not a sufficient statistic for the welfare effects, even if one considers a marginal change in the consumption tax. Second, if demand is nonlinear, the welfare effects of non-marginal changes in consumption taxes require information not only about the elasticities of demand but also the changes in these elasticities that are caused by the tax reforms and potentially, depending on the level of precision desired, information about higher-order derivatives [40]. Similarly, estimates of the deadweight loss of current taxes depend on the exact shape of the demand between current prices and counterfactual prices under a tax rate of zero. In addition, large reforms may involve tax rates and prices that are outside the support in the data which requires extrapolating the demand and supply curves. where we take the challenges imposed by nonlinear demand curves seriously. Combining structural estimates with policy reforms we have shown that we can both point identify and bound the welfare effects of hypothetical sales tax reforms in the US and we plan to apply the framework to Norwegian data to get credible estimates of the welfare effects of VAT in Norway.

Brief descriptions. WP2 contains several other high quality sub-projects that we describe briefly here because of space constraints. We plan a study of **Heterogeneity in returns to wealth and household savings**. [25] documents substantial variation in returns to wealth in Norway. The methodology developed in [52, 51, 53] can be used to partial identify two mechanisms that can generate wealth inequality; type-dependent or scale-dependent returns to wealth [30]. We plan to use these results in a realistic structural framework including both scale and type dependence to compute the optimal mix of wealth and capital income taxation under alternative social welfare functions. Housing is the most important asset in private households wealth portfolio. We will analyze the effects of **housing taxation on home prices** by exploiting the interplay between municipal and state decisions in property taxation. For instance, we can use the staggered differences induced by municipalities setting different taxes and tax caps introduced by the state which exogenously, from the point of view of the municipalities, reduced property taxes. We will conduct **Micro-level Cross-country Analyses of the Effects of Tax Policy Reforms** by using microdata from both Sweden and Norway and compare developments before and after important tax policy decisions. Such analyses have the potential of measuring important general equilibrium effects that are lost if microdata from only one country is used. We aim at developing **A matching model of the labor market** aimed at deriving the equilibrium distributions of hours of work and labor income and demonstrate how these changes with changes in taxes and transfers. We will study **Taxation and labour flows**. Reallocation of workers from unemployment to employment and across firms is important to achieve allocative efficiency and knowledge of how the tax system influence reallocation of workers on firms is of first-order importance when designing tax systems. We analyse the deadweight losses of income taxes and optimal taxation schemes in a setting in which workers do costly search to find a job if unemployed or to find a better job if employed (climbing the “job ladder”). We will investigate **Tax credits** by advancing theoretical models with an innovative calibration using the tax treatment of commuter costs, commuter expenses and information on how income and housing costs vary with geographical centrality.

WP3: Wealth and Income inequality (PI: Katinka Holtsmark)

How economic resources and the tax burden are distributed between the working class, the middle class, and the rich is a key aspect of the tax policy debate. Therefore, it is critical to have a sound way to assign the income, wealth, and tax burden by income groups and analyze how proposed tax reforms affect each group. Theoretically, this is the classical question of tax incidence in public economics (see [29] for a survey). Empirically, distributional tax analysis of the full tax system is difficult and rare. There are three broad challenges, which we will try to address in a series of projects in this WP.

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Challenge 1: Improving the measurement of wealth and income. A primary challenge for any distributional analysis is to obtain comprehensive measures of total individual and household income and wealth, both before and after taxes and transfers. A natural starting point is the information reported to the Norwegian tax authorities. This data forms the basis for official statistics on income (before and after tax and transfers) inequality in Norway. The data has several advantages, as it provides reliable measures of several important income and wealth components, including earnings, self-employment income,

and cash transfers, as well as market values of most types of assets (such as deposits, liabilities, real estate, securities, pension plans) measured at the end of each year. However, the tax data have several limitations.

One key limitation is that measures of business (or capital) income tend to be incomplete, since they capture only the share of business income that is realized and reported on personal owners' tax returns each year, and not the part of business income that is retained within firms. Another key limitation is that tax assessment values of certain assets, such as unlisted companies and real estate, may differ significantly from their potential market values. A third limitation is the lack of information on the value of publicly provided in-kind transfers, which constitute a substantial share of total government spending in European countries.

To come closer to such an ideal income measure,[3] supplements tax data with data from several other sources. For example, data on the ownership of Norwegian limited liability firms, together with detailed information from firm level balance sheets and income statements, allowed the authors to measure both realized and unrealized business income and to estimate market values of private businesses. Moreover, data on housing prices and real estate transaction allow the authors to construct reliable measures of the market value of real estate and the income from owner-occupied housing. The combination of detailed information on public expenditures, household characteristics, and a model of government spending allowed the authors to construct an extended measure of income that reflects the value of in-kind transfers and differences in needs for public services.

The current project extends this earlier work in several important ways. First, it will estimate the market values of unlisted companies, which is a common form of ownership among the richest households in Norway. An unlisted company is not listed on a stock market where its shares can be traded. Thus, it is difficult to directly assess its market value. To address this issue, we will use detailed information from firm level balance sheets and income statements of unlisted and listed firms to impute or estimate market values of unlisted companies. These imputed values can be compared to or validated against the observed market values when an unlisted company is purchased or when it is listed on the stock exchange. To address concerns about selection bias in this comparison, we will use reforms that changes the cost of purchasing or listing unlisted companies as an instrument.

Second, we will make an attempt to broaden the measure of income to include estimates of wealth and income stashed away abroad. [9] estimate that wealth worth around 10 per cent of global GDP is placed in tax havens. Since much of this wealth is placed offshore precisely to avoid visibility, it is notoriously difficult to estimate the value of these holdings. Our plan is to combine a dynamic model of tax evasion and Norwegian tax amnesty data to estimate the amount of wealth the rich hide in offshore locations. The tax law in Norway has a clause allowing citizens with non-disclosed assets to avoid penalty taxes if they voluntarily disclose hidden wealth or income. We have data on all incoming disclosure applications from 2006 until 2018. Combining these data with the announcement and introduction of two international tax information exchange agreements, that dramatically changed the probability that the tax administration will obtain information about hidden wealth, we can, within the framework of a dynamic tax evasion model, obtain estimates the stock of wealth that is hidden abroad.

Third, we plan to expand the analysis of income and wealth inequality to investigate the differences between snapshots of inequality versus inequality in permanent income and lifetime wealth. To gauge inequality in living standard, the distribution of lifetime income is more relevant than the distribution of current income. Yet, contemporary empirical studies of income (or wealth) inequality are typically based on observations of income (or wealth) for one or a few years. This empirical simplification is due to the simple fact that researchers seldom have access to data on long-run or lifetime income and wealth.

To provide evidence on inequality in current and lifetime income and wealth, we will use a data set covering the entire Norwegian population with information on individual and household long-term and yearly income and wealth (including all the income components discussed above). We will apply these data to contrast snapshot and longer run inequalities (with particular focus on the top of the distribution). We will describe and make an attempt to understand income dynamics, and assess the role of so-called life-cycle bias in empirical analysis of income inequality and wealth that uses current income and wealth variables as proxies for lifetime income and wealth.

Challenge 2: Taking account of tax incidence in distributional analysis. A second challenge is that a full analysis of the distributional effects of a tax reform should incorporate how a change in taxes affect pre-tax prices and the distribution of income. That is, to measure the distributional effects of a tax reform one needs to

take account of its incidence. For example, while a corporate tax cut reduces the taxes paid by shareholders, it might also increase the capital stock and the wages earned by workers. In this project, we will combine findings from WP1 on tax compliance and the behavioral responses and elasticities estimated in WP2 and WP4 with the comprehensive measures of income and wealth discussed above, with the ambitious goal of performing distributional analyses that incorporate behavioral responses and indirect effects of tax reforms.

In general, the incidence of a tax depends on the shape of the relevant demand and supply curves and the market structure. For example, the incidence of corporate tax and employers' social security contribution are (potentially different) functions of the same underlying quantities, the demand and supply curves for labor and capital and the market structure. On its own, neither a change in the corporate tax nor a change in the employers' social security contribution allow one to point identify these unknown quantities. However, estimates of the pass-through to workers, consumers and firms of each change impose restrictions on the logically possible values of demand, supply and market power.

To extract this information and do distributional analyses with tax incidence, we plan to construct a model of the Norwegian economy that we can analyze by combining the estimates from WP1, WP2 and WP4 with a partial identification approach that builds and expands on the framework of [55, 56]. The flexibility of that framework allows us to incorporate multiple pass-through estimates of different taxes (e.g. corporate tax and employers' social security contribution) while ensuring that they are all consistent with one another. We call these constraints mutual consistency, since they enforce the requirement that the multiple pass-through estimates do not contradict each other on the collection of relevant unobserved quantities (demand and supply curves and market structure) for which they all generate values. The mutual consistency condition enables information from different pass-through estimates to be aggregated to achieve point identification or bounds on the shape of the demand and supply curves and parameters governing the market structure. Armed with these estimates, we can perform a full analysis of the distributional effects of a tax reform that incorporates how a change in taxes affect pre-tax prices and the distribution of income.

Challenge 3: Defining the right dimension to assess distributional equality. Any distributional analyses begs the question: Equality of what? There are multiple dimensions of inequality and redistribution. One important distinction is at which stage in human development inequalities arise and to what extent individual differences are mitigated or aggravated by public policy. Humans are born with different capacities. During childhood and adolescence these capacities are transformed into human capital and skills that gets transformed into wages in the labor market and then to disposable income after the government has imposed its tax and transfer policy. The aim of this project is to synthesize and extend the evidence base on how the Scandinavian welfare model enhance equality. Our study will examine to what extent the Scandinavian countries achieve equality within and between generations mainly through (i) post production redistribution via progressive tax and transfer policies, as argued by [44] or through (ii) re-distributive policies at the pre-production phase via universal access to high quality health care services and education (see [57] for a discussion for how such policies can enhance intergenerational mobility).

Another important dimension that matters for distributional equality and taxation is how families should be treated. First, differences in size and composition make it hard to compare families by their economic status [13]. Yet, these comparisons are inevitable for the design of fair and efficient income taxes. Equivalence scales account for households' economies of scale and produce a comparable index of economic well-being, named equivalized incomes [47]. Standard social welfare criteria building on equivalent incomes lead to controversial policy implications: it favours economic inequality across families, endorses taxes for smaller families and subsidies for larger families, and recommends distorting fertility choices. We address these shortcomings by proposing and axiomatically characterizing welfare criteria inspired by fairness and efficiency. The key innovation is to introduce fairness principles inspired by horizontal equity [16]. The expected result is to derive a range of welfare criteria, depending on: (i) the standard trade-off between equity and efficiency; and (ii) a novel social dilemma between compensating families with smaller economies of scale and keeping individuals responsible for their chosen family structures (related to [26]).

Using these welfare criteria, we explore their implications for optimal income taxation and redistribution policies. This will allow us to construct a menu type of result: each policymaker/reader can freely pick the social welfare function that best captures her ethical views and our analysis will identify the optimal tax schedule corresponding to these views.

WP4: Taxation of corporate and capital income (PI, Karen Helene Ulltveit Moe)

The Mirrlees Review rightly points out that all taxes are ultimately paid by individuals, and hence that corporate income taxes are, in the end, borne by customers, employees or shareholders. The Review alludes that governments choose to tax corporate income to reduce tax avoidance and for administrative convenience and political reasons. Increased globalization and tax competition has, however, made it more costly to tax corporate income, and tax rates has been cut dramatically over the last forty years. To compensate for lower corporate taxation, some countries, including Norway, have increased taxation at the shareholder level (St.Meld. 4, 2015).

We have very limited knowledge about how these changes in corporate income taxes and dividend taxes influence investment and the distribution of economic resources. The incidence of business taxes, whether they are paid by workers, owners or customers is unclear and depend on many structural parameters on the supply and demand side of the economy. With respect to dividend taxes, there are conflicting theoretical views, old and new, on how they affect investments and there are few empirical studies to back up either of these views. This work package contain several projects that use high quality Norwegian data to close this knowledge gap.

Business taxes can be used to incentivize firms to shift production, or the means of production, in directions where the social returns are higher than private market returns. This WP also contains research on how carbon taxation can be used to foster green innovations and cleaner production, and an empirical study of how carbon taxes may have differential effects on workers, depending on their education, skills and occupation. Lastly we discuss a theme that is of particular relevance in Norway, namely the taxation of resource rents and other types of super profits.

The incidence of business taxes This project provides new evidence on the incidence and distributional effects of business taxes. We take advantage of unusually rich longitudinal administrative data on workers and firms in Norway, and adopt quasi-experimental designs to evaluate the causal effects of corporate and payroll tax changes on workers' wages and employment, firms' profits, their location choices, entry and exit decisions and their job creation and destruction.

Despite the policy relevance of understanding the incidence and efficiency of corporate taxes, the empirical knowledge is relatively scarce. One notable exception is [28] that studies if the corporate tax is paid by partly by workers in terms of lower wages. This study exploits within-country differences in corporate tax rates, which might have a different effect on firms and workers than national tax changes, since company and worker mobility is different within and across countries. We complement this study by considering national changes in the corporate tax rate. We further contribute to the existing literature on the incidence of payroll taxes, recent studies include [61, 43, 46] by looking at a wide range of firm-level adjustments in response to changes in the payroll tax rate.

To investigate the incidence of payroll taxes we will exploit changes in the system of geographical differentiated payroll taxes in Norway. In particular, in 2004, the EU imposed a harmonization of tax rates that led to an increase in the tax for many medium to large firms. In 2007 the reform was reversed, which led the same firms to experience a sudden decrease in the tax rate. We shall compare the short-term effects on firms, workers and consumers from a sudden tax increase and a subsequent sudden decrease.

To study the incidence of corporate taxes, we will exploit that the design of the Norwegian corporate tax is non-neutral with respect to debt and equity-financed capital investments. Debt finance is favored since corporate interest payments are deductible in calculating the company's taxable income. Furthermore the depreciation rules for the use of capital are defined for broad groups of assets, which means that for many assets the real rate of depreciation differ from the tax deductible costs. Changes in the corporate tax rate will therefore affect companies differently, depending on their their initial debt to capital ration and the type of capital they use in production. We plan to use this variation to study to what extent the corporate tax is shifted over to consumers (higher prices) and workers (lower wages).

Dividend taxation and investments A central question in public economics concerns the effects of dividends taxation on investment and capital allocation. The theoretical literature on this question is vast, but give conflicting views on how dividends affect investments, making the effect of dividends taxation on investment an empirical question. The empirical literature on this topic is, however, sparse, largely because of the challenges

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in identifying causal effects of tax changes that typically affect all firms. Studies on the 2003 tax cut by the Bush administration find that increased dividends in listed firms [22], increased use of debt financing [48], but no effect on investment [67].

While most studies focus on mean response, we also need to consider capital misallocation, because dividends taxes could divert capital from profitable to less profitable use. Dividends tax cuts have been found to affect the allocation of investment across firms [15] and investment in equity-dependent (but not average) firms in Sweden [8].

More recently, [20] investigate the effects of a 2013 threefold increase of the dividends tax for a subset of French private firms in a difference in difference setup, finding that dividends payout dropped considerably for treated firms. The retained earnings led to increased investment in the firm as well as increased cash holdings and credit extended to customers. Building on subsample comparisons of firms proxied to be profitable and less profitable, the authors find suggestive evidence for reduced capital misallocation and support for an intertemporal tax elasticity story: Owners postpone dividends payouts in anticipation of future tax reductions, and in the meanwhile the retained earnings are invested in profitable projects.

In 2014, Norway started gradually decreasing the corporate income tax rate from 28 to 22 percent in 2019. Because this would eventually reduce taxation on capital income relative to labor, with the risk of income shifting among entrepreneurs, Norway introduced an adjustment factor in 2016, effectively increasing the dividends tax from 25 to 28.75 percent and further increasing it to 35 percent in 2022.

Dynamically, however, this tax change was not neutral, as shareholders had a strong incentive to extract dividends before the introduction of and the increase in the adjustment factor. With increasing dividends tax rate and decreasing corporate tax rates, investors have incentives to expedite dividends payout and delay the accrual of corporate profits (if possible) in order to minimize both tax bases.

We aim to investigate the response in and distribution of dividends and investment to the hike in dividends taxed introduced and expanded in Norway in the years 2016-2019. Importantly, our rich registry data allows us to connect shareholders and companies and track dividends, in contrast to most of the literature. To address issues of layered ownership, we propose to perform the analysis at the owner level, exploiting the unique links in the shareholder registry to aggregate firm-level measures at multiple levels to the personal owner.

This approach allows us to investigate the effects of the dividends tax hike on dividends payout and investments. Furthermore, it allows us to include in the analysis investments in new firms, an important piece of the puzzle that previous research has been unable to address despite evidence of changes in the composition of new firms in e.g. [20] following the reform.

To address issues of endogeneity, we will adopt two alternative difference in differences-approaches. Unlike in the French setting, we do not have access to a pure control group of firms who are not subject to the 2016-2019 dividends tax hike, as this tax change affected most firms. Instead, we propose to compare owners with low and high exposure to the reform, as measured by e.g. their pre-reform tendency to use dividends, controlling for overall wealth. Alternatively, we can use foreign owned firms, exploiting the fact that foreign owners are not subject to the dividends tax.

Dividend tax the elasticity of intertemporal substitution. The elasticity of intertemporal substitution (EIS) describes how the growth rate of consumption responds to interest rate changes. This parameter is crucial for determining the optimal capital tax rate, the transmission of monetary policy, and dynamic investor behavior. Estimating the EIS is difficult because exogenous variation in relevant returns to wealth are hard to come by. Moreover, while several noticeable exceptions exist, for example [18] and [38], the estimates vary widely by study, making it hard to understand which estimate is relevant for a specific policy.

This project aims to estimate the elasticity of intertemporal substitution using a dividend tax reform in Norway. In 2006, the Norwegian government increased the dividend tax rate from 0% to 28%. Importantly, the reform was announced already in 2004 to allow firm owners to adjust prior to the reform. This period between announcement and implementation of the reform is crucial to identify the elasticity of intertemporal substitution. While a higher dividend tax rate, all else equal, represents a negative income shock for firm owners, resulting in lower spending after the reform, the spending response prior to the reform is a textbook example where substitution and income effects work in opposite directions. Similar to the post-reform response, the income effect should result in lower spending also prior to the reform. In contrast, the substitution effect should work in the opposite direction because the lower future interest rates induce investors to withdraw funds from firms to consume today [27]. The sign and size of the pre-reform response is thus informative about the

strength of the substitution effect and thus the elasticity of intertemporal substitution.

We will first estimate the spending response of firm owners in response to plausibly exogenous variation in dividend tax rates in a difference-in-difference framework. A necessary step here is to appropriately define a control group for firm owners, using either synthetic controls or applying a Bartik setup with ‘exposure’ to the reform. Once the empirical results are established, we will interpret them through the lens of a structural worker-capitalist model (or similar). The model will be set up to closely resemble the empirical setting. By calibrating the model to the empirical results, the project will provide estimates or bounds on the elasticity of intertemporal substitution.

Deferred taxation of capital income. Tax authorities worldwide require assets to be realized before built-in gain or loss is included in taxable income. Owners of capital assets may therefore defer tax by choosing not to sell - resulting in “lock-in” effects in which assets that would be realized in the absence of this distortion instead remain unrealized. We want to analyze such behavior in the Norwegian tax system. The project is divided in two parts..

In the Norwegian system prior to 2005, unrealized capital gains disappeared at death, which creates strong motivation to hold assets until death. To analyze the strength of these asset lock-in effects, we plan to use variation in the timing of this tax change for different asset classes. Norway abolished its policy of stepped-up basis at death in 3 steps: first removing it for publicly listed shares, then partly for unlisted shares in 2009 and then for most other asset classes. By 2014, heirs in Norway primarily carried-over the built-in gains or losses from their predecessor.

This project has several important policy applications. First, the removal of step-up was a major change in the Norwegian tax system, which had been discussed for decades prior to its implementation (see e.g., NOU 2000:8). However, we are not aware of other research projects analyzing the effect of this change in the tax system. Second, answering this question has important policy implications for other countries, particularly for the US which currently have a step-up system similar to the Norwegian system prior to 2006. In the second part of the project, we plan to analyze lock-in effects in the current Norwegian tax system. This system is designed to be neutral when it comes to the timing of realization of capital gains. However, recent studies indicate that many Norwegian capital owners do not realize their gains, but rather choose to postpone realizations to the future. Why is this happening? Postponing realization can for example be useful if there are other option values related to not paying taxes today. Such option values may relate to moving the capital gains abroad or waiting for lower tax rates in the future. However, in this case capital owners may need to find other ways to finance consumption today. We want to analyze if capital owners borrow both from their own firms and from other sources to pay for this consumption. From October, 2015, borrowing from own firms became taxed as dividends, which may have made borrowing more expensive and less available. We plan to use adaptations to this reform to understand how debt is being used to finance consumption and postpone taxation of capital gains. This research question has major policy implications for understanding the current Norwegian tax debates related to capital owners moving abroad, as well as for understanding the growth of retained earnings in Norwegian unlisted firms.

Green Taxation. The importance of carbon pricing as a policy instrument for mitigating climate change has been underlined by economists for decades. Emission of greenhouse gases has negative externalities, and these can be internalized by taxes, as showed already by [60]. Moreover, carbon pricing will increase demand for clean technologies and thus strengthen the incentives for investment in development of these technologies (see e.g.[6, 14].

There are important open questions concerning the effects of carbon pricing. One issue is that reduced profitability in fossil energy production in general, and carbon taxes in particular, may affect innovation and technological development in the energy production sector through various channels. Perhaps most importantly, higher taxation of fossil energy use will increase demand for substitutes. When demand for renewable energy increases, it is likely that profitability of innovation in this sector will increase. Thus, carbon pricing may indirectly affect clean innovation.

Another channel works directly through firms and innovators in the dirty energy sector. Carbon taxation leading to lower demand and thus lower productivity in the fossil energy sector may reduce profitability in innovation in fossil energy technologies. If the human capital necessary for this type of innovation can be used also for innovation in clean/renewable energy technologies, carbon taxes may indirectly affect clean innovation as it fosters reallocation of human capital towards this sector.

Innovation in clean and fossil innovation may also be connected through direct spillovers. If a decrease in

innovation activity in fossil energy technologies leads to fewer spillovers, there may be a negative relationship between carbon taxation and clean development in the fossil energy sector.

We will use a theoretical model of directed technical change ([4] provides a starting point), to illustrate the different mechanisms that may connect dirty and clean innovation and investigate the role played by carbon taxation. Relying on the rich Norwegian administrative data with details on firm performance, innovation and patenting, we will investigate the empirical relationship between the innovation in these two sectors further.

Taxation of resource rents and super profits. Taxation of natural resource rents has been important to the development of the Norwegian welfare state. Currently two industries face resource rent taxation, but it has been debated whether to introduce such taxation also to other industries that rely heavily on the use of publicly owned natural resources. The transition to a low-carbon emission economy may lead to the expansion of such industries, and it is therefore of increasing importance to investigate theoretically the optimal design of resource rent tax regimes and to study empirically the impact of the existing ones.

Economic profits obtained from utilizing natural resources is related to the term resource rent. According to the UN System of Environmental-Economic Accounting, resource rents are income from the harvest operations that remains after all necessary input factors registered in the National Accounts (NA) have received their remuneration (SEEA, 2014). Resource rents are income you earn beyond the income you would normally earn by investing in real capital and human capital in competitive industries.

Calculating resource rents is interesting from a taxation perspective. First, there is an allocative justice argument for taxing the extra income from utilizing a natural resource. To the extent that the natural resources of a country belong to the people, either by law or by common practice, it is by many seen as unfair that a few prospectors get away with a major share of the extra-normal profit. Second, it is generally acknowledged that taxing such rents will not distort the economy [31]. In Norway both the petroleum and the hydropower sector are subject to resource rent taxation. However, several natural resource sector do not have resource rent taxation even if the extra-normal profit from these sector can be significant (Ministry of Finance, 2019). The resource rent in forestry, mining and windpower are today relatively modest, but this may increase in the future.

The proposal for a resource rent tax on aquaculture was met with fierce resistance from the industry and from the local municipalities hosting to the industry [10]. It was argued that such a tax would not be neutral, and in particular, would hurt investments in research and development, while the local municipalities argued that a federal resource rent tax would not pay proper attention to their need for compensation from hosting aquaculture pens.

Our goal is to investigate the optimal design of a resource rent taxation in order to make it neutral, and thereby in particular pay attention to the the incentives to do research and development. We will analyze taxation in combination with other means the state could use to extract rents, such as auctions and regulation. To guide the theoretical analysis we shall also conduct an event study of the Norwegian petroleum sector in order to uncover how changes in the resource rent taxation in this sector has affected the incentives to do research and development by using patent data. We shall moreover examine how the government may design resource rent taxation in order to maximize its political feasibility without compromising too much of the fiscal benefits.

Market power, rents and taxation. A growing phenomenon in market economies such as the U.S. over the last twenty years has been firms with high returns in many sectors of the economy, not only resource sectors [23]. As for resource rents, such rents can be taxed without creating distortions and can therefore represent an appealing tax base. The existence of extra high returns which reflects entrepreneur specific efforts, investments or innovations will not, at least in the longer run, be insensitive to the tax level. But extra high profits has raised the issue of progressive corporate taxation, with higher rates for firms with higher returns to capital [32, 33]. The Mirrlees Review also suggested a zero corporate tax rate on normal returns and higher one on above-normal returns. Few, if any, countries have, however, implemented such a progressive capital income tax.

Using Norwegian administrative register data we will seek to (i) investigate the extent of abnormal returns across industries in Norway and their sources; (ii) derive theoretical insights on when progressive capital taxation may be reasonable from an efficiency point of view; and (iii) theoretically and empirically investigate how to define the tax base necessary for the implementation of a progressive capital tax.

1.3 Novelty and ambition

The present project starts where previous literature ends. Considering the scarce evidence of how different tax bases respond to changes in the tax structure and tax rates in Norway and of how to optimally target enforcement strategies, our project will push the research frontier in several ways. We expect that all WPs will lead to significant empirical, methodological, and theoretical contributions. By taking a system approach to the Norwegian tax system the project will generate deeper knowledge beyond the individual WPs. In particular, we aim to foster high quality theoretical and empirical tax research that has practical relevance for the design, administration and enforcement of the Norwegian tax system. The quality aim is very high, as we hope to significantly push the research frontier.

The aims are bold, but there are several features of the proposal that make them viable. In particular, the combination of theory and empirics in a holistic framework; the use of completely novel and high quality data; the advance of methods for field experiments (WP1) and new designs for observational analyses; and the absolute top quality of the team of researchers.

2 Impact

2.1 Potential impact of the proposed research

NFS will have significant impact on the academic community, practices of government organizations and actual policies.

By gaining credible causal evidence on key questions at the research frontier on a topic of high societal interest, we expect the project to draw considerable attention and to have substantial academic impact. We aim to publish the results in the top journals in economics. Several of the team members regularly publish in such journals. NFS will also improve the quality and widen the scope of tax policy research in the participating research institutions in Norway.

NFS has an ambitious research agenda and we believe our findings will also have practical relevance for the design, administration and enforcement of the Norwegian tax system. Whatever priorities policy makers have with respect to the size of the government, economic efficiency, and economic equality, they need to know how individuals and firms respond to tax changes in order to identify their preferred policy. Another prerequisite for good policy is information about how it affects the distribution of economic resources and welfare. Our research will provide such knowledge and this will significantly improve our understanding of the Norwegian tax system, and the effect of altering it. In addition, by pushing the tax research frontier NFS will facilitate high quality teaching and research training in public economics. The project relates to several of the UN's Sustainable Development Goals, such as "peace, justice and strong institutions", and "reduced inequalities".

We strongly believe that the center will lead to national competence building within government organizations through close cooperation between their analysts and academic researchers (spillovers); by organizing more and better graduate courses in public economics at the University of Oslo; and by recruiting as well as encouraging early career researchers to work in teams with more senior academics.

2.2 Measures of communication and exploitation

While academic impact is achieved by publishing in highly ranked journals, influence on society at large hinges on dissemination of insights from the research. Since the project aims to advance the research frontier and generate important insights for policymakers and practitioners, the communication activities are tailored for these purposes. Within the academic community, our research will be presented at scientific conferences such as the annual meetings of the American Economic Association. We will also give academic seminars, attend as well as organize workshops, and circulate working papers - within and beyond academic circles - before publication.

For policy, the major audience is government agencies. Apart from the obvious interest and integration of the NTA, we will explicitly target the Ministry of Finance and the Ministry of Labor and Inclusion. We will have yearly meetings with key users of our research and we will present at conferences and seminars aiming to reach policymakers and practitioners in Norway. We will also continue to actively contribute to the highly successful bi-annual "Skatteforum" where researchers and policymakers meet and discuss. We also believe that

important users should include labor market organizations as well as major consultancy companies that utilize methods and research findings, and major media houses that communicate and comment on research findings and their political implications.

Many of the research topics are of significant interest to the general public and we will actively share our findings to stimulate open and evidence-based discussion of tax policies. Our dissemination will reach the general public via writing op-eds in major newspapers, participate on podcasts, and discuss findings on the radio, television and other media.

3 Implementation

Centre director and project group The center will be hosted by the Economics Department at the University of Oslo, which is the leading economics department in Norway (see Repec ranking). The center will be managed by a director and four principal investigators. Director Gaute Torsvik will be accompanied by four PIs; Katinka Holtmark, Karen Helen Ulltveit-Moe, Magne Mogstad and Andreas Kotsadam. Torsvik has excellent leadership experience in addition to his academic competence. He currently leads Oslo Fiscal Studies and has a record as PI for other projects financed by NRC. Magne Mogstad is a world leading economist at the University of Chicago, focusing on core issues in public and labor economics with frequent publications in the best economics journals. Karen Helene Ulltveit-Moe and Andreas Kotsadam are experienced high profiled economists with several top publications such as in *The Quarterly Journal of Economics* and *The American Economic Review*. Katinka Holtmark is a young and promising economist with an excellent ability to combine theory and empirical work. The leader team know each other well, and have cooperated on many projects in the past. Having PIs from different institutions ensures anchoring at several places and also reflects the broadness of the center.

Project organization and management The center is lead by the director and each of the four PIs will be responsible for a topical work package (see the figure on page 1). NFS will organize the activities in order to reap the many synergies across researchers, topics, methods, and data infrastructure that would be lost if each work package was independent. We will have seminars, conferences, and workshops together across the work packages. Synergies will also arise from key contributors participating in several work packages (see the boxes for "key contributors" at the start of each WP). The Gantt chart reflects this integration of the different activities in that the key milestones and developments are the same across WPs. See the dissemination plan for more details.

Main activities	2023				2024				2025				2026				2027			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Data collection, maintenance, and analyses																				
International workshops (including starting, midline, and endline)																				
Yearly NFS Lecture and Skatteforum																				
PhD Course in Public Economics																				
Post Doc Joint with University of Chicago																				
PhD student 1																				
PhD student 2																				
Writing up academic papers, submissions to working paper series and top journal, resubmissions																				

Figure 1: Gantt chart

NFS will collaborate with research centers in Norway and abroad. We will maintain the fruitful collaboration established with the Frisch Centre (Kotsadam as one of the PIs) and Statistics Norway, and also collaborate with The Housing Lab at OsloMet. In our projects we collaborate with researchers in the NTA, as well as faculty at the economics department of several universities (including University of Oslo, University of Bergen, NHH, University of Stavanger). A particular strength of NFS is to work with team members from NTA that have PhD education in economics. NFS will have an advisory board, we plan to ask Jim Poterba (MIT), Monica Costa Dias (IFS), Katrine Løken (NHH), and Claus Thustrup Kreiner (Director CEBI). The advisory board meet regularly and will also participate in the workshops to provide valuable feedback on the research conducted at NFS.

Each partner institution will take an active role in the research and there will be significant integration of the different environments by visiting programs and cross-institution collaboration. This is most visible by having

several PIs from different institutions. Working closely with partners in the NTA, in addition, will greatly enhance the spread of the knowledge gained to practitioners.

An advantage of NFS is that we can reap large economies of scale with respect to research infrastructure. This is important for organizing workshops and seminars, research visits, teaching and supervision. Perhaps most importantly, NFS will expand the unique microdata set for empirical research in public economics.

International collaboration We are very happy to have established a cooperative partnership with Institute of Fiscal Studies (IFS) in the UK. This partnership entails joint projects, research visits, exchange of ideas and knowledge. IFS was responsible for the Mirrlees report and the principal investigator for that report, Richard Blundell, will provide useful support in our endeavor to emulate this task for Norway. We will also collaborate on tax research and graduate education in public economics with the newly established tax center for excellence in Finland at Tampere University. Most importantly, we will develop a close collaboration with the world leading Ronzetti Initiative for the Study of Labor Markets at the University of Chicago (from where we also have one of the PIs). Together, the collaborators will greatly enhance the quality of the research at NFS.

Researcher training and recruitment The public sector is in dire need of knowledge and expertise in public and tax economics. The centre will help to fill that gap by training students, including at the PhD level; by working together with practitioners, in particular at the NTA; and by the extensive measures for widespread communication, such as Skatteforum. As reflected in the description of our research, many of the planned projects involve researchers from other universities and research centers in Norway and abroad. While researchers affiliated with NFS will have their daily work place at their respective institutions, NFS will constitute a platform for high quality research collaboration, and dissemination of research findings, within tax analysis and public economics. In addition to offering a home for policy relevant tax research, NFS will collaborate with other Nordic tax centers to offer PhD courses in public economics.

We plan to finance two PhD positions and one post doc position. One of the PhD positions are financed by the Department. The post doc will be financed joint with University of Chicago (external). It will give a young economist an excellent opportunity to work with high quality Norwegian tax data and spend some time at one of the best economics departments in the world. At any regular year we plan to have four adjunct researchers that spend 20 percent of their working time at NFS, we will also have four persons with 10 percent position at NFS. PhD students will be given the opportunity to visit the partner institutions for longer and shorter stays, in particular at the University of Chicago.

Gender issues, ethical perspectives, and overall budget outline NFS, like the Department of Economics, has a general goal to attract more female researchers. At NFS two out of four PIs are women and good fraction of the key contributors at the different workpackages are women, often young researchers (Schreiner, Gaarder, Merker, Breivik, Drange, Isaksen and Hauge). We believe that having a gender balance at the management of the center, may motivate younger women to enter the field. Gender is also an important substantive dimension in several of the projects, such as in understanding behavioural responses by gender in WP1-3.

The project will use microdata that contain confidential information about individuals and firms. The access and use of the data requires great care by the involved researchers. NFS will, as was the practice at OFS, strictly abide to the guidelines set by the Norwegian Data Protection Authority and by Statistics Norway for the use of such data.

We apply for a total of 30 million NOK and the resources will be spent evenly across the years (6 million each year).

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