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ESSAYS ON INCOME INEQUALITY AND FINANCIAL INCENTIVES TO WORK

Joonas Ollonqvist



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To Noel and Daniel

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OLLONQVIST, JOONAS: Essays on Income Inequality and Financial Incentives to Work

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ABSTRACT

This dissertation is about income inequality and financial incentives to work and it aims to take part to a long-lasting discussion about the equity-efficiency trade-off. It consists of an introductory chapter and three separate essays. The introductory chapter discusses income inequality and financial incentives to work in a broader sense and provides a background for the essays. Then the first essay focus solely on income inequality and analyses how changes in demographics and in tax-benefit legislation have shaped the income inequality in Finland. Second essay analyses how the recent changes in the Finnish tax-benefit system affected the income inequality and financial incentives to work in non-behavioural and behavioural settings using microsimulation. Third essay studies the link between health and reactions to financial incentives in the context of Finnish 2005 pension reform.

The aim of the first essay is to account the determinants shaping the evolution of income inequality in Finland from 1993 to 2014. It introduces a new decomposition technique which combines microsimulation based decomposition with multivariate regression based decomposition into a unified framework. The new technique allows analysing how the policy changes have affected the importance of different individual characteristics in income inequality. The main findings are that the changes in the importance of the characteristics on income (i.e. price effect), the changes in the distribution of the characteristics (i.e. quantity effect) and the residual effect have contributed to the change in income inequality. Changes in the tax-benefit legislation have also increased the inequality, but since 2005 those have equalized the income distribution. In addition, prior 2005 policy changes explained around 2/3 of the total price effect.

The second essay analyses the changes in the tax-benefit legislation, which came into force at the beginning of 2020 in Finland. The main contribution of the essay is that it illustrates a transparent procedure to account for the behavioural responses of the tax-benefit changes in the distributional analysis. Instead of using structural labour supply model, the approach utilizes externally estimated labour supply elasticities. Furthermore, the behavioural responses are, for the first time in Finland, analysed also at the intensive margin. The results indicate that the changes in the tax-benefit system mildly decreased income inequality but also weakened the financial incentives to work at both margins. However, any Covid19 related changes in demographics or in politics could not be taken into account and therefore the result should be viewed cautiously.

Third essay studies the link between financial incentives and health in the context of 2005 Finnish pension reform. It utilizes a rich register data of pensions and health and the exogenous variation in retirement incentives created by the reform. The focus of the essay is on how health and reactions to incentives interact. The findings are that stronger incentives to continue working postpone retirement while the larger level of pension wealth increases the likelihood of retirement. Furthermore, ill-health was found to increase the risk of retirement. The results also suggest that many types of individuals, with different health statuses, are reacting to the incentives with an expected manner.

KEYWORDS: Income inequality, financial incentives to work, retirement, health

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TIIVISTELMÄ

Tämä väitöskirja käsittelee tuloeroja ja työnteon kannustimia koostuen johdanto luvusta ja kolmesta erillisestä esseestä. Johdanto luku johdattaa esseiden aihepiireihin käsittelemällä tuloeroja ja työnteon kannustimia sekä esittelemällä tulonjaon ja tehokkuuden välistä valintaa (equity-efficiency trade-off). Ensimmäinen essee käsittelee tuloeroja ja analysoi väestön sosio-demograafisten tekijöiden ja vero-etuusjärjestelmän muutosten vaikutuksia tulonjakoon Suomessa. Toisessa esseessä esitellään, miten voidaan arvioida vero- ja etuusjärjestelmän muutosten vaikutuksia tulonjakoon huomioimalla muutosten aiheuttamia käyttäytymisvaikutuksia aiempaa monipuolisemmin. Kolmannessa artikkelissa tutkitaan terveyden ja taloudellisten kannustimien välistä yhteyttä.

Ensimmäisen esseen tavoitteena on selvittää, miten väestön eri sosio-demograafiset tekijät ovat vaikuttaneet tuloerojen kehitykseen Suomessa vuodesta 1993 vuoteen 2014. Esseessä esitellään uusi dekomponointimenetelmä, jossa yhdistyvät mikrosimulointi- ja regressiopohjainen dekomponointimenetelmä. Tällä menetelmällä on mahdollista tutkia, kuinka politiikka muutokset ovat vaikuttaneet eri sosio-demograafisten tekijöiden rooliin tulonjaossa. Tutkimuksessa löydetään, että muutokset väestön sosio-demograafisten tekijöiden jakaumassa sekä muutokset näiden tekijöiden vaikutuksissa tulojen muodostuksessa ovat myötävaikuttaneet tuloerojen kasvuun. Lisäksi muutokset vero-etuus järjestelmässä kasvattivat tuloeroja ennen vuotta 2005, mutta sen jälkeen näillä on ollut tuloeroja tasaava vaikutus. Muutokset vero-etuus järjestelmässä näyttävät pääosin vaikuttaneet tulojakaumaan muuttamalla eri sosio-demograafisten tekijöiden arvoa tulomuodostuksessa, mutta ne ovat vaikuttaneet myös tavalla, jota ei pystytty selittämään.

Toisessa esseessä analysoidaan vuoden 2020 alussa voimaan astuneiden vero-etuusjärjestelmän muutosten vaikutuksia tuloeroihin ja työnteon kannustimiin. Tämän esseen päätavoitteena on esitellä käytännössä, miten voidaan arvioida vero- ja etuusjärjestelmän muutosten vaikutuksia tulonjakoon huomioimalla muutosten aiheuttamia käyttäytymisvaikutuksia aiempaa monipuolisemmin. Tutkimuksessa hyödynnetään aiemmassa kirjallisuudessa estimoituja työn tarjonnan joustoja ja esitellään, kuinka näitä voidaan hyödyntää politiikka-arvioinneissa ilman rakenteellista työn tarjonnan mallia. Lisäksi tässä esseessä huomioidaan ensimmäistä kertaa Suomessa käyttäytymisvaikutuksia myös intensiivisellä marginaalilla. Tulosten mukaan vero-etuus järjestelmän muutokset pienensivät tuloeroja maltillisesti, mutta samalla pienensivät työnteon kannustimia molemmilla marginaaleilla. On kuitenkin

huomattava, että tutkimuksessa ei pystytty huomioimaan Covid19:ään liittyviä muutoksia väestössä tai lainsäädännössä. Tämän vuoksi tuloksiin on syytä suhtautua varauksella.

Kolmannessa esseessä tutkitaan taloudellisten kannustimien ja terveyden välistä yhteyttä keskittymällä Suomessa vuonna 2005 toteutettuun eläkereformiin. Tutkimuksessa käytetään yksilötason rekisteritietoja eläkkeistä ja terveydestä sekä hyödynnetään reformin aiheuttamaa eksogeenista variaatiota eläköitymisen kannustimissa. Tutkimuksen päätavoitteena on tutkia eroavatko reaktiot taloudellisiin kannustimiin jatkaa työelämässä ihmisten terveydentilan mukaan. Tutkimuksessa löydetään, että korkeammat kannustimet jatkaa työskentelyä lykkäävät eläköitymistä kun taas korkeampi eläkevarallisuus lisää eläköitymisen todennäköisyyttä. Lisäksi huonon terveydentilan huomattiin lisäävän eläköitymisen todennäköisyyttä. Tutkimuksen tulokset antavat ymmärtää, että eri terveyden tilan omaavat henkilöt reagoivat kannustimiin saman suuntaisesti.

ASIASANAT: Tuloerot, työnteon kannustimet, eläköityminen, terveys

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Table of Contents

Acknowledgements	8
Table of Contents	10
Abbreviations	11
List of Original Publications	12
1 Introduction	13
1.1 Income inequality	15
1.1.1 Why study income inequality?	15
1.1.2 Measuring and analysing income inequality	17
1.1.3 Determinants of income inequality	19
1.2 Financial incentives to work	20
1.2.1 Conceptual framework	21
1.2.2 Empirical findings	25
2 Summary of the Essays	30
2.1 Accounting the role of tax-benefit changes in shaping income inequality: A new method, with application to income inequality in Finland	30
2.2 The distributional effects of tax-benefit policies: A reduced form approach with application to Finland	31
2.3 Incentive, Health, and Retirement: Evidence from a Finnish Pension Reform	33
List of References	35
Original Research Articles	39

Abbreviations

EMTR	Effective marginal tax rate
ETI	Elasticity of taxable income
MTR	Marginal tax rate
PTR	Participation tax rate
PW	Pension wealth
SWF	Social welfare function

List of Original Research Articles

This dissertation is based on the following original research articles, which are referred to in the text by their Roman numerals:

- I Joonas Ollonqvist. Accounting the role of tax-benefit changes in shaping income inequality: A new method, with application to income inequality in Finland. *Published manuscript*
- II Joonas Ollonqvist, Jussi Tervola, Jukka Pirttilä & Thor O. Thoresen. The distributional effects of tax-benefit policies: A reduced form approach with application to Finland. *Published manuscript*
- III Joonas Ollonqvist, Kaisa Kotakorpi, Mikko Laaksonen, Pekka Martikainen, Jukka Pirttilä & Lasse Tarkiainen. Incentives, Health, and Retirement: Evidence from a Finnish Pension Reform. *Published manuscript*

1 Introduction

This dissertation consists of three empirical essays that study income inequality and financial incentives to work. The essays are highly relevant from the policy perspectives since the rising inequality has returned inequality to the top of the political agenda and to public discussion in many developed countries, which in turn has raised concerns related to the efficiency. This dissertation contributes to the literature by providing new insights about the equity-efficiency trade-off and methodological improvements to existing methods used in the literature of income inequality and in the distributional analysis of tax-benefit changes. Methodologically all the essays have in common that those utilize microsimulation techniques in different contexts. In the first two essays microsimulation is used to analyse the distributional effects of tax-benefit-changes. In the third essay microsimulation is used to form the variables of interest and to provide descriptive evidence about the effect of major pension reform.

Income inequality is very complex phenomenon and one of the major concerns in modern societies. It is crucial to policymakers to have detailed level knowledge about the determinants behind the income inequality. However, the complexity of the income inequality makes it difficult to analyse and find causal relationships. The trends in income inequality can be analysed, for instance, using different decomposition methods, which are originating from the factor source decomposition presented by Shorrocks (1982). These methods usually lack with causal interference but are beneficial in understanding what factors are contributing to the evolution of income inequality (Bourguignon and Ferreira, 2005). The first essay contributes to the income inequality literature in two ways. Firstly, it introduces a new decomposition technique to analyse the trends in income inequality. It combines microsimulation based decomposition (Bargain and Callan, 2010) with a multivariate regression based decomposition (Fields, 2003; Yun, 2006) into a unified framework. This allows analysing how changes in tax-benefit-system have changed the importance of characteristics in income inequality. Secondly, this method is applied to analyse the evolution of income inequality in Finland from 1993 to 2014. The results indicate that the changes in tax-benefit system have had an important role in shaping the income inequality mostly through changing the importance of characteristics in individual incomes. Still, changes in the socio-demographic characteristics made a larger contribution to changes in income inequality.

One important way to tackle income inequality is the redistribution of incomes via taxes and transfers. However, the proper level of redistribution is a controversial topic, since, as is well-known in economics, there is a trade-off between the equity and efficiency. Budget neutral changes in tax-benefit policies that enhance the redistribution of incomes typically decrease the financial incentives to work. Therefore, some of the potential benefits of these changes may be faded away when individuals change their labour supply. At the practical level it is crucial to be able to analyse the distributional effects of tax-benefit changes with and without behavioural responses. These effects are possible to analyse with microsimulation techniques (see Figari et al., 2015, for the extensive summary of the methodology) and the behavioural responses are typically estimated using structural labour supply models (see e.g. Aaberge and Colombino, 2018). However, structural labour supply models require substantial amount of information and those models are not very transparent. The second essay contributes to this branch of the literature. It describes a reduced form procedure to analyse the distributional effects of tax-benefit changes with behavioural responses utilizing externally estimated labour supply elasticities. In addition, it further develops methods of evaluating policy effects. The benefit of the procedure is that compared to structural labour supply models it is less data hungry and provides more transparent way of analysing behavioural responses. The proposed approach builds on the model of Immervoll et al. (2007), but instead of estimating the behavioural responses at the group level those are analysed at the individual level. It is also the first attempt in Finland to evaluate the distributional effects of tax-benefit changes by taking into account the labour supply responses at both margins. The method is then applied to analyse the changes in tax-benefit legislation in Finland that came into force at the beginning of 2020. The results indicate, that these tax-benefit changes moderately decreased the income inequality and mildly increased the unemployment.

Naturally, it is an enormous question in economics whether individuals have heterogeneous responses to incentives and less is known how health interacts with the reactions to incentives. Individuals with ill-health, for instance, may have limited capabilities to react optimally to incentives created. This may imply that e.g. the benefits of policy reforms are concentrated on those elderly individuals who are already in a relatively advantaged positions. Therefore, a new kind of trade-off between equity and efficiency may rise if only individuals in already advantage position are able to take the benefit of the incentives created. The third essay concentrates on this equity-efficiency trade-off by analysing the connection between health and reactions to incentives in the context of retirement. It contributes to the literature by providing new insights about the connection between health and reactions to financial incentives. The connection between health and reactions to incentives is studied in the context of 2005 Finnish pension reform by utilizing the exogenous variation in retirement incentives created by the reform. In the analysis high quality register data

on individual health and retirement behaviour is used. According to the results there might not be significant and consistent trade-off between providing the incentives and equal treatment of individuals with different states of health. However, the results may not hold for the unhealthiest part of the work force. In addition, our health measures might still hide substantial unobserved heterogeneity in the severity of the health issues.

The rest of the introductory chapter is constructed the following way. In the next section, I provide an overview about income inequality in general and how it can be measured and analysed. In addition, I discuss the earlier findings about the determinants behind the income inequality. Then in Section 1.2 I concentrate on the financial incentives to work. I start by presenting the conceptional background and then discuss the empirical findings. Section 2 summarizes the essays in this thesis.

1.1 Income inequality

1.1.1 Why study income inequality?

One of the major concerns in the modern world is the income inequality. It has risen during the past decades in the majority of developed countries and Finland is not an exception in this matter (Keeley, 2015; Morelli et al., 2015).¹ In addition, the developed countries have seen a rise in the top income shares as well (OECD, 2011b; Atkinson et al., 2011). In the developing countries income inequality has partly evolved in the opposite direction, but the overall levels of income inequality and poverty are still high in comparison with the developed world (Alvaredo and Gasparini, 2015; Ravallion, 2014). However, there is also positive development happened in the past decades, as the number of people living in extreme poverty has decreased since the year 1990 by 1.216 billion individual (The World Bank, 2021) and for the first time since the industrialization the global inequality has decreased (Milanovic, 2013).

There are many reasons why income inequality matters. Income inequality links to issues such as poverty and life expectancy (Salverda et al., 2011), may weaken the ability of economic growth to reduce poverty (Ravallion, 2004) and it may affect or link to the overall performance of the economy (Dabla-Norris et al., 2015; Quadrini and Ríos-Rull, 2015). Income inequality is also a matter of social justice and connects with social cohesion (Salverda et al., 2011). Perhaps the most importantly, income is often considered as proxy for individual well-being (Decancq et al., 2015). This is because income, especially disposable income, gives a relatively clear sign

¹However, the choice of the time period may matter. In Finland, for instance, income inequality has risen compared to the mid 1990s, but decreased after the 1960s and remained rather stable since the beginning of 2000 Statistics Finland (2020a). Furthermore, despite the recent changes in income inequality in Finland it still has one of the most equal income distributions in the world.

about the abilities to meet the proper standards of living. Still, there is a well-known trade-off between equity and efficiency. Therefore, despite the severe consequences of high levels of income inequality, some level of inequality is needed in order the economy can function properly. It is, however, extremely difficult or even impossible to say what is the optimal level of income inequality. Therefore, this thesis does not even try to answer that question.

Income is not, however, the only relevant and perhaps not even the most relevant dimension to use in inequality analysis.² Other dimensions analysed in the literature of economic inequality are for instance happiness, consumption and wealth. Consumption and wealth are relatively easy to measure and are directly linked to well-being through economic models, for instance the permanent income hypothesis (Friedman, 1957) and life-cycle models (Modigliani and Brumberg, 1954). The data sources, however, for those are rather scarce, usually come from surveys and may not be suitable for international comparisons (Morelli et al., 2015). In addition, with consumption there is a risk of mixing voluntary low levels of consumption with a material deprivation (Hagenaars et al., 1994, p. 8). Issue with wealth, on the other hand, is that it is not necessarily obvious what types of resources should be included and how to evaluate resources that do not have a market price (Cowell, 2000). The importance of happiness on well-being is also easy to understand, but it is much more complicated to measure and make comparisons. Happiness is, also, a subjective measure, which relies on surveys that may be subject to bias (Alesina et al., 2004).

Income is not a perfect measure either. Firstly, income varies substantially over the lifetime and focusing on income inequality may, thus, have a large intergenerational component (McGregor et al., 2019). Secondly, it is well-known that the same amount of income may yield different amounts of well-being depending on the situation of an individual (Decancq et al., 2015). Furthermore, the choice of income source matters³ and the level of inequality and even the direction of the trend in inequality may depend on the choice. Typically, the after-tax income inequality, for instance, is smaller than the pre-tax income inequality. Still, the economic literature of inequality has traditionally focused on income. The main reason for this is that, due to income taxation, precisely measured data of income for long time periods is much more available than for other variables. This is also why the focus in this thesis is on income inequality. Still, for a comprehensive analysis of inequality of

²This thesis focus on the equality of the outcomes, but equality or inequality could be analysed from the perspective of opportunities (such as abilities and access to schooling) as well. More details about the equity of opportunities can be found for instance from Roemer and Trannoy (2015).

³This is not necessarily a bad thing since the use of different income sources may give additional insights about the income inequality. In addition, the income source will vary depending on the research question. For example, market incomes are used in the analysis of top income shares Atkinson et al. (2011).

well-being multi-dimensional approach would probably be needed.

1.1.2 Measuring and analysing income inequality

Ultimately, the objective of measuring inequality is to be able to compare different income distributions in a meaningful and a consistent way. This can be done by using different inequality measures to characterize the income distribution. Inequality measures may be either positive or normative measures and the difference is that the positive measures make no explicit assumptions about the concepts of social welfare or social justice (Sen, 1972). The first group of measures includes measures like the variance, the Gini coefficient and the entropy indices. The latter group consists of measures like the Atkinson measure.

Naturally, different inequality measures have different properties. For instance, those weight differently different locations of the income distribution. This means that even with positive measures implicit assumptions about the social welfare are made (Sen, 1972). The Gini coefficient, for instance, weights the middle of the distribution whereas the variance of log of incomes concentrates more heavily on the bottom of the distribution (Trapeznikova, 2019). This indicates that the changes in different parts of the income distribution have different effects on income inequality depending on the inequality measure. It is therefore possible that at the same time inequality decreases with one measure but increases according to other measure of inequality. In addition, the decomposability differs between the measures (Bourguignon, 1979). Indices part of the generalized entropy family, for instance, are possible directly to decompose to within and between components of inequality. Also, the variance of log of incomes have desirable decomposability properties, as the change in inequality is possible to decompose to price, quantity and residual effects. This is the main reason why it is used in the first essay, even though the Pigou-Dalton principle of transfers cannot be guaranteed hold.

In the measurement of income inequality, researcher needs to address several other practical issues as well. These include, among others, the choices related to population (e.g. within country or some other region) and resource sharing units (e.g. individual or household) (Morelli et al., 2015). In the end, the choices related to measuring inequality are mostly driven by the research question and data in hand.

What makes analysing income inequality or the trends in inequality difficult is that many forces are simultaneously affecting the income distribution. These forces may, for instance, be associated with the changes in socio-demographic factors, income structure, exogenous shocks or macroeconomic situation. Furthermore, these may interact with each other as well. These difficulties can, at least partly, be overcome by using different decomposition methods, which literally decompose the inequality into the contributions of different variables (e.g. income sources or individual characteristics). These methods, however, usually lack with causal interference,

but can be seen as a first step in explaining the changes in inequality (Bourguignon and Ferreira, 2005).

Cowell and Fiorio (2011) broadly categorize decomposition methods used in the inequality analysis into two groups: 1) A priori approaches and 2) explanatory models. The decomposition methods included in the first group are based on the theoretical axioms to identify the contributions of different determinants on income inequality. These include methods such as the factor source decomposition (Shorrocks, 1982) and the sub-group decomposition (Shorrocks, 1984). The latter ones build on econometric modelling. For example, multivariate regression based decompositions by Fields (2003) and Morduch and Sicular (2002) are included in this group. The large range of different methods allows analysing the trends in income inequality from multiple perspectives (see e.g. Fortin et al., 2011, for an extensive summary of decomposition methods used in economics).

One decomposition method that has been increasingly used in analysing the effect of tax-benefit changes on income inequality bases on microsimulation (Bargain and Callan, 2010; Bargain, 2012). Microsimulation is a broad concept and refers to a large range of modelling techniques, that simulate different outcomes (e.g. incomes) according to various rules at the individual-unit level (e.g. individuals or households). These techniques are used in many fields and may be deterministic or stochastic.⁴

In inequality analysis, tax-benefit microsimulation models (for instance the SISU-model and the EUROMOD-model) are typically used to analyse the effects of tax-benefit changes. Microsimulation models may be non-behavioural (static) or behavioural (dynamic) in nature. In both types of models, the components of disposable incomes are simulated with different tax-benefit-legislation. In other words, it forms a counterfactual income distribution corresponding the tax-benefit-legislation in interest. Moreover, microsimulation models can be used to calculate the financial incentives to work as well. In static models the individual characteristics stay constant, but in dynamic models the characteristics may change in response to policy changes or for other reasons (for instance due to ageing). However, behavioural responses are also possible to analyse with a static microsimulation model as is done in the second essay. The benefit of microsimulation in distributional analysis is that it allows to isolate the effects of policy changes on disposable income from the other effects. Furthermore, it can be used to enrich the already existing microdata. Downside of microsimulation in inequality analysis is that it usually requires a microsimulation model to operate. More details about the use of microsimulation methods in inequality analysis can be found from Figari et al. (2015). In addition, the first and second essay of this thesis provide more detailed description about microsimulation

⁴The definition of microsimulation is adapted from the definition provided by International Microsimulation Association: www.microsimulation.org.

in distributional analysis.

One contribution of this thesis is that it illustrates the versatility of microsimulation techniques, as all the essays utilize microsimulation, but in different contexts. In the first two essays, microsimulation is used to analyse the distributional effects of tax-benefit changes. The first one shows how microsimulation can be combined with regression based decompositions in the analysis of long-term evolution of income inequality. The second essay analyses the distributional effects of recent policy changes in Finland using microsimulation methods. In addition, the second essay demonstrates in the spirit of Immervoll et al. (2007) how in practice the behavioural labour supply responses may be taken into account with a static microsimulation by utilizing labour supply elasticity estimates. In the third essay microsimulation is used to form the variables used in the estimation. Individual employment and national pensions are calculated using microsimulation for each possible retirement date with the rules before and after the 2005 pension reform. In addition, microsimulation is used to describe the effect of the 2005 pension reform on the pension wealth and accrual of pension wealth.

1.1.3 Determinants of income inequality

Income inequality is an extremely complex phenomenon and there are multiple possible causes behind income inequality. Inequality has also evolved differently in different countries or regions, which makes it even harder to say universal reasons behind the income inequality. Because of the sheer volume of the potential drivers of the income inequality, it is possible to address only a tiny share of them here. Extensive survey on the recent evidence from OECD countries can be found, for instance, in Förster and Tóth (2015).

Existing literature has found that many determinants are affecting inequality or the trends of inequality. This thesis focus on how the demographic structure and the redistribution via taxes and transfers contribute to the income inequality, but there are other important factors and causes behind the income inequality as well. Earlier studies have found, for instance, that determinants related to globalization (Kanbur, 2015), macroeconomic structure (Quadriini and Ríos-Rull, 2015) and the labour market (Salverda and Checchi, 2015) to be significant. These include determinants like the technological change and trade openness. Furthermore, the contribution of income sources has been studied and in many countries capital incomes have been the main driver of inequality (OECD, 2011a), which is the case in Finland as well (OECD, 2011a; Riihelä et al., 2008; Ollonqvist, 2017).

According to a recent literature survey (Förster and Tóth, 2015), taxes and transfers have found to decrease income inequality, but the impact of redistribution has become smaller in the recent decades. Similar findings have been found in Finland as well (see the first essay and Honkanen and Tervola, 2014). Second-order effects

(incentives) are found to be smaller than the first-order effects. These effects usually drive the inequality in the opposite directions and thus some benefits of the policies are faded away. Therefore, in the policy evaluations the second-order effects should be taken into account as is done in the second essay. Furthermore, cash transfers are generally equalizing income inequality more than income taxes. However, this depends on the methodology, because the factor source decomposition (Shorrocks, 1982) is known to underestimate the role of transfers. Furthermore, there is substantial variation in the magnitude of redistribution between countries (see e.g. Causa and Hermansen, 2017).

Despite, the central role of redistribution policies on income inequality, it has its limitations. Atkinson (2015, Chapter 11) analysed several budget-neutral tax-benefit reforms and concluded that those reforms can only offset a part of the rise in inequality that has occurred in the UK in past decades. Therefore, other policies are also needed to tackle the inequality. In addition, there are other issues than just the incentives that relate to the efficiency of re-distributive policies, for instance the non-take-up of benefits. If a large part of individuals entitled to benefits are not claiming the benefits the policy does not achieve its target (Bargain et al., 2012). According to earlier studies there seems to be differences in the non-take-up of benefits between countries (Eurofound, 2015). Furthermore, a recent study (Tervola et al., 2021) comparing the social assistance in Sweden and Finland finds, among other things, differences in the estimated non-take-up rates of social assistance between these two countries.

The demographic structure may directly affect income distribution by changing the size of different population groups or by changing the importance of characteristics in individual incomes. Moreover, demographic structure may affect indirectly via changing the behaviour of individuals. Earlier literature has found age, education, employment status and household structure to be important determinants in the evolution of income inequality (OECD, 2011a; Peichl et al., 2012; Brewer and Wren-Lewis, 2016). According to the first essay of this thesis, the age of men, education and employment status are important determinants in the evolution of income inequality also in Finland.

1.2 Financial incentives to work

The labour supply decision is typically analysed separately at the intensive (how many hours of work) and extensive margins (whether to work or not). Key measures for the financial incentives to work are the marginal tax rate (MTR) or the effective marginal tax rate (EMTR) at the intensive margin and participation tax rate (PTR) at the extensive margin. MTR is the share of the income increase that is taxed when earning more, whereas EMTR takes in to account the (possible) loss in means-tested benefits as well. PTR, on the other hand, measures the share of the wage that is taken

away when employed and it takes into account both the increases in taxes and losses in benefits. Retirement is one type of extensive margin decision, but it is typically analysed in different setting than the standard (static) labour supply framework and used. In addition, the measures for the financial incentives are different, which are discussed in the next section.

The rest of this section is constructed as follows. Section 1.2.1 shows the theoretical background about the equity-efficiency trade-off and how the financial incentives to work affect individual labour supply decision. Then Section 1.2.2 focus on the empirical findings of financial incentives to work. It also shows which parts of the tax-benefit-system in Finland are contributing to the participation tax-rate and what factors explain the variation of PTRs. In the final part of Section 1.2.2, I discuss briefly about the potential measures to strengthen the financial incentives to work and what are the possible issues and the trade-offs related to these actions.

1.2.1 Conceptual framework

In the previous section were described that redistributive policies can lower the income inequality and that the redistribution via taxes and transfers has decreased in developed countries. This is due to many tax cuts, especially the top marginal tax rate, that were introduced in developed countries starting from the 80s. One reasons for the tax-cuts was to incentivize individuals to work more. The mechanism is rather simple: Tax rates decrease the price of leisure relative to the price of consumption, which decreases the working hours if the substitution effect dominates the income effect and if income and leisure are both normal goods. On the other hand, the benefits for the poor increase the cost of entering the labour market and thus lower the employment. Therefore, there is a negative connection between equity and efficiency. In economics, this trade-off is known as the equity-efficiency trade-off and ever since the seminal contribution by Mirrlees (1971) it has been a major focus in the literature of optimal income taxation.

In the Mirrleesian type of analysis the government's objective is to maximize the social welfare of the individuals with respect to government budget constraint.⁵ The model is static, but the earnings decision of the individual is endogenous. Individuals receive utility from consumption c which is equal to income and disutility from working l . Individuals differ regarding their earnings capabilities. In other words, there are individuals with high productivity (wage) and with low productivity. For-

⁵This is a utilitarian approach, where the government's problem is to choose the taxes so that the social welfare is maximized. Social welfare function (SWF) is used to aggregate the individuals' utilities and in the simplest form it is the weighted sum of individual utilities. The form of the SWF illustrates the re-distributional preferences of the government and many types are used in the earlier literature. Good discussion and summary of the classical theories of social justice that can be found from Sen (2000). For more recent developments in SWF and welfare effect analysis of policy reforms see e.g. Hendren and Sprung-Keyser (2020) and Saez and Stantcheva (2016).

mally, the problem of an individual of type i is to maximize utility $u(c_i, l_i)$ subject to a budget constraint $c_i = (1 - \tau)w_i l_i$, where τ is the marginal tax-rate for labour income. However, the government does not know the type of the individual and it only observes the earnings of the individuals. Therefore, in order to redistribute incomes from the rich to the poor government has to implement tax-rate on earnings. This will cause efficiency losses, as the second welfare theorem does not hold any more.⁶ The main reason why taxation distorts the efficiency is the fact that taxes are based on the actions of the individuals and not the abilities of individuals.

The main contribution of Mirrlees (1971) is that he introduced and solved the general problem of government with endogenous earnings. However, the results are hard to interpret and do not many provide many practical relevant results, but since the Mirrlees (1971) original contribution the field has evolved substantially (see Piketty and Saez, 2013, for more details).

The Mirrleesian model consisted of only the behavioural responses at the intensive margin (how much to work decision) and these were measured with the working hours. However, individuals may respond to tax changes also in other ways than just adjusting working hours. Individuals may, for instance, change their work effort as well. Also, the extensive margin (whether work or not decision) responses were absent in the Mirrleesian model.

Since the original contribution of Feldstein (1995, 1999), the optimal income taxation literature has been focusing on the elasticity of taxable income (ETI) rather than the elasticity of working hours. Feldstein's idea was that individuals receive disutility from creating and reporting (taxable) income z . In comparison to standard labour-supply model the taxable income is more general and can capture other sources of disutility received while working than just the working hours, for example reporting incomes may be costly or individual may change her work effort.

Following Piketty et al. (2014) and considering non-linear taxation. The setting is static and individual receives utility from consumption c which is equal to disposable income. Therefore, individual's i problem is to maximize quasi-linear utility function⁷ of form $u_i(c, z) = c - h_i(z)$ with respect to budget constraint $c = z - T(z)$, where $h(z)$ is the cost of earning z and $T(z)$ is tax function. The utility maximizing reported income supply function is $z(1 - \tau)$, which depends negatively on the marginal tax-rate τ .

⁶According to the fundamental welfare theorems there is not necessarily a trade-off between equity and efficiency. First welfare theorem states that with certain conditions the market equilibrium is Pareto efficient. The second one states that with certain conditions any Pareto efficient market equilibrium can be achieved by changing the endowments. If the government observes the type of the individual it could introduce a lump-sum tax, which varies according to the type of individual. In this case there would be no violations to the second welfare theorem and thus no trade-off between redistribution and efficiency.

⁷With quasi-linear utility function there is no income effect. Therefore, the compensated and uncompensated elasticities are equal. Previous studies have shown that the income effects are typically small or insignificant, see for instance Saez et al. (2012).

With these assumptions, the elasticity of taxable income with respect to the net-of-marginal-tax rate is defined as:

$$ETI = \frac{1 - \tau}{z} \frac{\partial z}{\partial(1 - \tau)} \quad (1)$$

This is the elasticity of taxable income without income effects that is usually estimated in the literature and used in the second essay to evaluate labour supply responses at the intensive margin. It measures in relative terms how much reported taxable income changes with respect to relative change in the net-of-tax rate. It is the key measure in the evaluation of the effects of changes in financial incentives to work at the intensive margin. The larger the elasticity of taxable income is the more individuals react to the changes in marginal tax-rates.

Elasticity of taxable income captures only the labour supply responses at the intensive margin. In real world there are also costs in entering the labour market, for instance the cost of searching for a job. Following Piketty and Saez (2013), these costs are simple to include in the model by introducing a discrete cost d_i which is positive when individual choose to provide labour (i.e. $z > 0$) and is zero when $z = 0$. Assuming linear utility function, i.e. $u_i = c_i - d_i \cdot l_i$, where c_i is the disposable income and l_i is indicator for working (equal to one if working and zero otherwise). Then in the pure extensive margin model individual works if and only if $z_i - T(z_i) - d_i \geq -T(0)$, where $T(z_i)$ is taxes paid when earning z_i and $-T(0)$ is the net income (benefits) received when not working. In other words individual chooses to earn the amount of z_i if the disposable income with fixed costs are larger than the disposable income when not working. By rearranging the condition, individual works if $d_i \leq z_i - T(z_i) + T(0) = z_i \cdot (1 - \tau_p)$ where τ_p is the participation tax-rate, formally defined as $\tau_p = [T(z_i) - T(0)]/z_i$. Therefore, whether individual works or not depends on the net-of participation tax-rate.

As with the intensive margin labour supply reactions, the elasticity of participation with respect to net-of participation tax-rate measures how sensitive individuals are with the changes in participation tax-rate. Formally, this is defined as:

$$\eta = \frac{(1 - \tau_p)}{h_i} \frac{\partial h_i}{\partial(1 - \tau_p)} \quad (2)$$

This is the elasticity utilized in the second essay to evaluate the behavioural responses at the extensive margin.

In the third essay, the importance of financial incentives to work is considered in the case of retirement. Retirement decision is one kind of extensive margin labour supply decision and in principle it could be analysed in the same setting as other extensive margin decisions. However, in theory all individuals make the decision of retiring at some point and the more relevant question is when individual retires. Typically, delaying retirement increases the pensions (private, public or both) and

there are specific rules for retirement, for instance the statutory ages of retirement and medical criteria for disability pensions.

This thesis uses pension wealth (see e.g. OECD 2019) to measure the retirement incentives. Other approach used in the literature bases on the option value model (Stock and Wise, 1990). Option value model builds on the lifetime utility maximization problem, whereas the pension wealth is a purely monetary measure. Still, both types of approaches take into account that postponing retirement affects the level of pensions and that the pensions are received for shorter time.

Pension wealth is the discounted stream of future pension benefits until aged 100:

$$PW(r) = \sum_{s=r}^{100} \beta^{s-r} \pi_s B(r) \quad (3)$$

where B is the annual pension (public and private) received after the retirement at age r . Incomes are discounted using discount factor β and age-dependent survival probabilities π_s . From the **equation (3)** it is easy to see that delaying retirement by one year affects the pension wealth in two ways: 1) Individual receives pensions one year less and 2) the level of pension changes. In total the effect of postponing retirement can be either positive or negative depending on which one of the effects is larger. The relative change in pension wealth when retirement is postponed by one period (typically a year) can be used to measure the financial incentives to postpone retirement, formally:

$$\Delta \ln(PW(r)) = \ln(PW(r+1)) - \ln(PW(r))$$

In theory the larger the increase in pension wealth when retirement is postponed is the less likely individual should retire and vice versa for the current level of pension wealth. The third essay of this thesis uses the level of pension wealth and the relative change in pension wealth when retirement is postponed by one year to measure the financial incentives to retire.

One period change in pension wealth is not the only incentive measure used in the literature. Another purely financial measure for the retirement incentives is the peak-value of pension wealth (used e.g. in Coile and Gruber 2007). In contrast to one year change in pension wealth, the peak-value compares the highest possible pension wealth with the current year pension wealth. It is therefore a more forward-looking measure, but it does not take into account how long it would take to achieve the optimal retirement age. In addition to these two, pensions or the replacement rate, for instance, could also be used to measure incentives.

As mentioned, another approach to model retirement incentives is the option value (Stock and Wise, 1990). In option value model individuals calculate their indirect utilities for all possible retirement dates. The retirement year that has the highest lifetime utility is the individual's optimal retirement year. As with the peak

value of pension wealth, this is then compared with the utilities received for every other retirement date and the larger the difference is the larger increase in utility can be received by changing the retirement year. The usage of this measure, however, needs additional assumptions, for instance, about the preferences of individuals and their risk behaviour.

1.2.2 Empirical findings

Starting from the extensive margin and according to recent a survey by Lundberg and Norell (2020), the elasticity of participation with respect to net-of participation tax-rate at the population-level is likely below 0.36. Whereas their preferred estimate is between 0.1 and 0.2. The evidence from Finland is in the range of their preferred estimate as Jäntti et al. (2015) finds the elasticity to be 0.17. Literature has also found that there is heterogeneity in the responses to financial incentives (see e.g. Meghir and Phillips (2010) for an extensive review). Typically, women, for instance, have higher elasticities than men. Furthermore, Kosonen (2014) found that mothers taking care of small children in Finland have the participation elasticity of 0.8.

At the intensive margin, the variable of interest is either the elasticity of taxable income or the elasticity of working hours with respect to net of (effective) marginal tax-rate. Recently Neisser (2017) conducted a meta-analysis for ETI estimates and found that the estimates vary from 0 to 1 with a substantial mass around 0.3. In line with these results, Saez et al. (2012) argue that the best available estimates for long-run elasticity are between 0.12 and 0.4. In line with these findings Matikka (2018) estimates the elasticity of 0.21 using Finnish data. Estimates for the elasticity of working hours are at the similar level. Literature surveys by Chetty et al. (2011, 2013) conclude of using the Hicksian elasticity of 0.25 for the extensive margin and 0.3 for the intensive margin. Still, the literature is not unanimous regarding the actual levels of the elasticities. Elasticities estimated using macro data are typically higher and according to Keane and Rogerson (2012) the total labour supply elasticity (including both margins) is between 1 and 2.

In the context of retirement, the financial incentives are found to decrease the risk of retirement (see e.g. Coile and Gruber, 2007, and Hanel, 2010). However, financial incentives are not the only relevant factor affecting individual retirement behaviour. Earlier literature has found, for instance, that ill-health increases the likelihood of retirement (van Rijn et al., 2014; Leinonen et al., 2016) and the statutory ages for old-age retirement have an important role in retirement (Manoli and Weber, 2016; Seibold, 2021).

One issue with the analysis of labour supply decision is that the time horizon of the incentive calculations matter. Typically, the incentives are calculated at the short (one year) term. However, in many countries there is some sort of insurance based unemployment system which typically has limited duration (Jara et al., 2020). Indi-

vidual's income level will fall when the right to these benefits expires. In addition, individual's earnings typically increases while working and individual may take this into account when deciding to start working. Therefore, the financial incentives may vary depending on the time horizon. Recently, the literature has put some emphasis on this issue. Bartels and Pestel (2016) analyse the short (one year) and long term (three year) PTRs in Germany and find that the short term PTRs are substantially larger than the long term PTRs. Therefore, the magnitude of the behavioural responses may vary depending on the time horizon. Optimally the time frame used should express the views of the individual, but this is in general impossible to conduct.

Usually, the international comparison of financial incentives to work is done using hypothetical household tools (see e.g. OECD, 2016 and Hufkens et al., 2019) which base on example families. Only a few international comparisons of the financial incentives to work are done with the actual data. Jara et al. (2020) has perhaps the most comprehensive and up to date international comparison of the financial incentives to work. They use the EUROMOD microsimulation model (Sutherland and Figari, 2013) to calculate the financial incentives to work for EU-27 (including the UK and excluding Croatia) countries. The financial incentives are calculated for employed individuals using three measures: 1) Short-term PTR, 2) Long-term PTR and 3) EMTR. On average the figures for Finland are 70.6%, 56.0% and 45.6%, which are all among the highest values. Those are also somewhat in line with calculations conducted with the Statistics Finland's SISU microsimulation model (Kotamäki and Ollonqvist, 2018; Ollonqvist et al., 2021). This indicates that in Finland the financial incentives to work are one of the lowest in the EU. However, due to the limitations of EUROMOD and the modelling choices, these results should be viewed with caution as they may not fully extend to cover unemployed individuals.

Following the example of Brewer et al. (2013), Kotamäki and Ollonqvist (2018) analysed extensively the determinants of participation tax-rate and what factors explain the variation in the financial incentives to work at the extensive margin. Their main findings are shown in **Table 1**, where the PTR is decomposed to the contributions of different parts of tax-benefit system. The PTRs are also divided into four different intervals to better show if some parts of the tax-benefit system are more associated with high or low values of PTRs. The calculations are conducted using the SISU microsimulation (Statistics Finland, 2020b) model with the legislation of the year 2017 and a data of 800 000 individuals from year 2014. The calculation of PTRs follows the same procedure as in the second essay, but they focus solely on unemployed individuals.⁸

On average the PTR is 63.6% and almost 90% of the individuals have PTR be-

⁸Individual is categorized as unemployed if she has during a year received at least for one day any unemployment benefit or home care allowance.

tween 40% and 80%. Still, around 9% of the unemployed individuals have high PTRs (over 80%). Taxation contributes the most in PTRs (around 27 pp.) and the contribution is rather uniform across different levels of PTRs. The second largest contribution is accounted to unemployment insurance benefits (18.5 pp.) and the third largest contribution to other unemployment benefits (7.5 pp.). Interestingly the contribution of different parts of the benefit system varies depending on the level of PTR. Unemployment benefits, social income support and the general housing allowance are not at all associated with the low PTRs but make large contribution to the high levels of PTRs. Social income support, for instance, has an average contribution of 1.9 pp., 0.1 pp. contribution to the very low PTRs and 8.5 pp. contribution to the very high PTRs. The opposite can be seen with the child home care allowance, which is clearly associated with the low levels of PTRs. Kotamäki and Ollonqvist (2018) also found that PTRs vary substantially, especially, according to the number of the children and the type of the unemployment benefit explains the largest share (around 27%) of the existing variation in PTRs.

Table 1. Participation tax rates decomposition by PTR band (Kotamäki and Ollonqvist, 2018)

	PTR band				Average
	20-40	40-60	60-80	>80	
Taxation					
(1) Social insurance contributions	5.9	6	6.1	6.2	6
(2) Taxation without credits and deductions	26.3	27.3	26.9	25.4	26.9
(3) Credits and deductions	-6.2	-5.6	-5.9	-6.9	-5.9
Benefits					
(4) Unemployment benefits without UI benefits	0	0.9	11.2	14.7	7.5
(5) Unemployment insurance benefits	0.8	14.2	20.8	24.9	18.5
(6) Child home care allowance	6.1	3.4	1.4	2.4	2.3
(7) Day care fees	2.6	3.8	2.2	4.8	3
(8) General housing allowance	0.3	1.6	4	6.2	3.2
(9) Social income support	0.1	0.4	2	8.5	1.9
Total	35.3	50.8	69.5	86.3	63.6
Share of individuals	0.9%	38.0%	51.8%	9.3%	

The results outlined above indicate that the financial incentives matter for the choice of employment. In addition, the first essay finds that employment status is a major determinant of income inequality in Finland. Therefore, by strengthening financial incentives to work governments may encourage people to work more and the larger employment will then improve the fiscal sustainability and most likely reduce income inequality (when ignoring the first order effects of the tax-benefit changes).⁹ However, the modest elasticities found in the literature indicate that the labour supply responses are probably only modest. Furthermore, even with the full employment income inequality in Finland measured with the Gini coefficient would be only 1.5 pp. smaller than it truly is (Kärkkäinen and Tervola, 2018), which is less than the public discussion would have suggested.¹⁰ Encouragement to enter the labour market or increases in the efficiency may, naturally, have other positive effects as well, especially in the long run. For instance, entering the labour market also affects the future earnings profile of the individual, which in turn potentially decrease the income inequality. Furthermore, the more efficiently the economy works the more there is also to redistribute.

Strengthening the financial incentives to work (measured by PTR or EMTR) is, especially politically, a difficult task, since the efficiency can only be improved in the expense of either income inequality or fiscal sustainability. To make the politicians' decision even harder, it should be remembered that there probably does not exist an optimal level of inequality and some inequality is needed for well functioning economy.

To strengthen the financial incentives to work the government can, for instance, decrease taxation, provide (or extend) in-work benefits/tax-credits or cut means-tested benefits.¹¹ According to the **Table 1** decreases, in taxes would decrease PTRs for the majority of the unemployed individuals. It would also strengthen the incentives at the intensive margin as well. It is, however, fiscally expensive and would decrease PTRs also for those with already small PTRs. In addition, this would probably increase the income inequality since individuals with high incomes would pay less taxes.

By cutting benefits the strengthening of financial incentives to work could be better targeted to certain groups. These groups may be, for instance, those which react

⁹Here the focus is on incentives, but governments may also help or encourage individuals to employ with other measures. ALMP (active labour market policy) measures, for instance, can be used to help individuals with low employment ability.

¹⁰Kärkkäinen and Tervola (2018) simulated how much income inequality would change in Finland if all unemployed individuals became employed. The rather small effect on income inequality is at least partly due to fact that large fraction of individuals that are not currently working are not unemployed either (for instance pensioners).

¹¹Changes in non means-tested benefits will not affect the financial incentives to work as the benefit amount does not vary according to employment status or income levels.

more heavily on financial incentives or the ones with the highest PTRs. This would likely improve (at least in the short run) the fiscal sustainability. Still, it is possible that cuts in benefits (for instance the child home care allowance) have negative fiscal effects even in the short run.¹² Moreover, cuts in benefits would increase poverty and income inequality and might put individuals already in a disadvantage position in an even worse position.

The government may also provide in-work benefits or tax-credits to assist working individuals with low income levels. These measures may be used to strengthen financial incentives to work of individuals with low income levels without the need to cut benefits. Therefore, these measures have potentially positive distributional effects. However, while these measures strengthen the incentives at low income levels those tend to weaken the incentives with higher income levels, since the in-work benefits are withdrawn. Furthermore, these schemes may potentially be costly.

In practice the effects of these changes (or other changes in the tax-benefit-system) would be complicated to analyse. It is extremely crucial for policy-makers to have access as detailed information as possible about the effects of the planned policy actions. That is exactly what the second essay aims to provide by illustrating how the behavioural responses can be taken into account in practice by using a static microsimulation model.

In addition, individuals may have heterogeneous responses to financial incentives as well, which needs to be taken into account in designing policies in order to ensure the fair treatment of different individuals. This is the main concern of the third essay, which analyses whether individuals with different health statuses react differently to incentives in the context of retirement. According to the third essay there seems not to be strong and consistent differences in reactions to retirement incentives between different health statuses, but there are reasons to interpret these findings with some caution. It is possible, for instance, that the health measures could still hide substantial heterogeneity between people with different severity of morbidity. In addition, more research on this issue is still needed, as it is very likely that the results found in the context of retirement cannot be extended to cover the whole population or different settings than retirement.

Finally, it should be mentioned that other policies than just the tax-benefit policies can be used to reduce inequality and improve the efficiency. For instance, policies aimed to increase the educational level of individuals may both decrease inequality and increase efficiency at the same time. These policies do not typically provide short run solutions, but are crucial in the long run to cope with the challenges (also other challenges than the inequality) faced in the future.

¹²Cutting the child home care allowance will increase the need for daycare and thus increases the daycare expenditures.

2 Summary of the Essays

2.1 Accounting the role of tax-benefit changes in shaping income inequality: A new method, with application to income inequality in Finland

It is well-known that changes in tax-benefit system (i.e. policy changes) have direct and indirect distributional effects, but less attention is paid to the fact that these changes may also alter the importance of different characteristics in income inequality. The increase in unemployment benefits, for instance, decreases the value of being employed. In this essay I present a new decomposition technique to analyse how the changes in tax-benefit system have affected the importance of individual/household characteristics in income inequality. It is a combination of microsimulation based decomposition (Bargain and Callan, 2010) and a multivariate regression based decomposition (Fields, 2003; Yun, 2006). The new technique can be used with virtually any inequality measure, but the decomposition can be made further with the variance of log of incomes.

The method uses microsimulation techniques to isolate the direct policy effect and the multivariate regression based decomposition to analyse the importance of different characteristics in income inequality with both original and simulated datasets. As Yun (2006) showed, with the variance of log of incomes the change in the contribution of socio-demographic characteristics to income inequality can be decomposed to price- and quantity effects. Price effects account for how the changes in the importance of the characteristic on individual's income have affected the income distribution. Whereas the quantity effects account for how the changes in the distribution of the characteristics have altered the income inequality. In the static setting (without any behavioural responses) policy changes cannot affect the distribution of characteristics and therefore it may only alter the importance of characteristics or the residual. For this reason the proposed technique allows also to analyse how much of the total price effect is explained by the direct policy changes.

The proposed decomposition technique is applied to analyse the trends in income inequality in Finland from 1993 to 2014. Finland is an interesting subject to study, since the inequality rose rapidly during the 1990s but has remained rather constant since 2005. More precisely, the empirical part of the paper has three objectives. First aim is to analyse how much inequality is accounted for different

individual/household characteristics and how tax-benefit changes have altered the importance of these characteristics in income inequality. Second aim is to study whether the price, quantity or residual effects are driving the evolution of inequality. In addition, the role of the policy changes is investigated as well. The final aim is to investigate the channels by which policy changes have altered the income distribution. The analysis is also conducted separately for the periods before and after 2005.

In the analysis the triennial cross-sectional service data of income distribution (collected by Statistics Finland) is used alongside with the Statistics Finland's microsimulation model SISU (Statistics Finland, 2020b). The yearly sample size is around 25 000 individuals in about 10 000 households and it contains vast amount of information about individual/household characteristics and incomes. In the simulations the 2011 data, is used and only the direct policy effects are considered. The analysis is performed using six individual level characteristics (the employment status, age and the level of education according to gender) and two household level characteristics (household type and region).

The price-, quantity-, residual and policy effects all had an important role in the change in income inequality from 1993 to 2014. The price effect made the largest contribution and it explained around 42% of the increase in inequality, whereas the quantity effect explained about 25% of the increase in inequality. This indicates that both the distribution of characteristics and the importance of the characteristics in individuals' income have changed in a way that generates more inequality. Since the 2005 price effects have not generated more inequality, but quantity effects have continued to increase inequality. Around one-third of the total change could not be explained. Furthermore, the largest equalizing effect since the 2005 was due to residual effect.

The policy effect accounted for approximately 28% of the total increase in income inequality. However, since the 2005 policy changes have equalized the income distribution. The policy changes affected mostly (around 2/3) through the price effect and the rest was affecting the income distribution in a way that could not be explained. The most interesting finding was that before 2005 around 2/3 of the total price effect could be explained by the policy changes. After 2005, policy changes were reducing the price effect, but other effects continued to increase the price effect. Around 1/4 of the changes in the residual effect was explained by the policy changes.

2.2 The distributional effects of tax-benefit policies: A reduced form approach with application to Finland

This essay illustrates a transparent procedure to evaluate the distributional effects of the changes in tax-benefit-legislation with behavioural responses. Instead of using structural labour supply model it utilizes externally estimated labour supply elastic-

ities to evaluate the behavioural effects of the tax-benefit changes. The elasticity estimates are drawn from the earlier literature and the behavioural responses are analysed at the intensive and extensive margins. This is the first study in Finland to evaluate the distributional effects of the policy changes also at the intensive margin. Furthermore, it develops further methods for evaluating the effects of policy changes.

The method builds on the model illustrated in Immervoll et al. (2007) and utilizes the Finnish microsimulation model SISU (Statistics Finland, 2020b). The method also builds on the earlier studies that analyse the extensive margin responses in Finland (see Kärkkäinen and Tervola (2018); Kotamäki et al. (2018)). Contrary to Immervoll et al. (2007) the model is applied at the individual level rather than at the group level. Also, differently to earlier Finnish studies the effect of extensive margin is applied by adjusting the unemployment spells rather than randomly assign the individuals moving from employment to unemployment and vice versa. The benefits of this method are the transparency and smaller data requirements and the downside is that the elasticities are drawn from different context. At the extensive margin, the key measure for the incentives is the participation tax-rate (PTR) and the elasticity of participation is used to evaluate the employment effect. The employment effect is measured as a change in person-years. At the intensive margin, the elasticity of taxable income is used to evaluate the labour supply effects and the incentives are measured using effective marginal tax-rate (EMTR).

The method is applied to analyse the recent changes in tax-benefit legislation in Finland that came in to force at the beginning of 2020. The analysed policy changes were rather modest without any major reform. The main changes were the index related adjustments to benefits and taxation and some one-time increases to certain benefits (most notably 50 euro increase to national pensions). Overall the policy changes mildly reduced income inequality and poverty, but also weakened the financial incentives to work. Income inequality measured by the Gini coefficient decreased by around 0.3 percentage-points and poverty rate by 0.6 percentage points. The unemployment, however, increased by 5 500 person-years and the gross labour income decreased by 140 million euro. The direct effects of policy changes explained the almost solely the change in income inequality and behavioural responses had only a small effect on income inequality. Still, the negative fiscal budgetary effect nearly doubled due to behaviour responses. However, the results should be viewed with caution since no Covid-19 related tax-benefit changes or changes in employment could be taken into account in the analysis.

Due to the high uncertainty related to the simulated effects, several robustness checks are conducted. These include operationalization of policy changes, different elasticity values and different additional income in EMTR calculations. In this context, the results for inequality are fairly robust, but larger differences were found on the effects on employment and fiscal budget between different specifications.

2.3 Incentive, Health, and Retirement: Evidence from a Finnish Pension Reform

Ageing population causes challenges to the sustainability of public finances in many countries. To improve the public finances, many countries have implemented pension reforms to extend the working lives (OECD, 2019). A key feature of these reforms has been to provide incentives to postpone retirement. However, whether individuals have heterogeneous reactions to incentives is an enormous question in economics. Therefore, one potential worry with these reforms is that whether only those individuals with relatively good health are able to take advantage of the incentives created. Because health and socio-economic status are positively correlated, the benefits of the reform may be concentrated on those individuals with high levels of income. Therefore, the equity of the tax-benefit system may be compromised and a new kind of equity-efficiency trade-off between health and income inequality may rise.

This essay analyses the potential equity-efficiency trade-off described above, in the context of the Finnish 2005 pension reform. More precisely, the aim of this essay is to study how the incentives and health are connected with retirement. In our context, the connection between health and reactions to incentives may arise for several reasons. Individuals with poor health, for instance, may not be (physically or mentally) capable of taking advantage of the incentives created. It is also possible that the less healthier individuals pay more attention on how beneficial the continuing of working is. For instance, they may need higher compensation for working since due to ill health they receive larger disutility from working compared with the individuals with better health.

The questions are analysed in the context of the Finnish 2005 pension reform, which provided changes to financial incentives, lowered the full retirement age and increased the statutory age for early old-age retirement. The effects of the incentives varied according to multiple dimensions. Typically, the incentives got stronger (weakened) for those with the high (low) finishing salary and the low (high) accrued pension. In addition, the effect of the reform varied according to the age. For example, individuals aged 63 saw an overnight increase of nearly 10% in their pensions and the reform induced so called 'super' accrual for those aged 63 to 68 years old.

In the analysis, we utilize the exogenous variation created by the reform on retirement incentives and use detailed individual level register data of health and retirement. Our measure for the incentives to postpone retirement is the relative change in pension wealth when retirement is delayed by one year. The level of pension wealth is included as well in our analysis. We focus on individuals aged 62 to 68 years old, who are working in the private sector and are not yet retired. We only consider old-age and early old-age retirements, but in the robustness checks we also included retirements due to disability. In the first step the importance of financial incentives on retirement decision is estimated by OLS with the full population while controlling

health. Then in the second step the sample is divided into sub-samples according to different health statuses and analysed whether reactions to incentives differ between the groups.

We find that individuals react to retirement incentives with expected manner: Stronger incentives to continue working decrease the risk of retirement while the larger level of pension wealth increases the risk of retirement. Furthermore, we find that ill health increases the likelihood of retirement.

We also analysed whether the reactions to incentives vary according different health statuses. We find that many types of individuals react to the incentives as expected and do not find significant and consistent differences in reactions to incentives. The only exceptions that we find are the individuals with the sickness absence period (exceeding the waiting period) in the previous year and individuals who had a treatment period for cardio-vascular diseases in the year before. Individuals with sickness absences were found to react less to the incentives while individuals with cardio-vascular diseases were reacting more. However, the statistical significance of the results vary depending on the estimation specification. Furthermore, our results should be viewed with caution since our objective health measures, for instance, might still hide substantial heterogeneity in the severity of the health issues. Nevertheless, our results suggest that there is not necessarily strong trade-off between providing incentives to postpone the retirement and equal treatment of individuals with different health statuses.

In the analysis, several sensitivity checks are considered. The analysis is performed by excluding individuals entitled to national pensions and unemployed individuals. The analyses are conducted, also, by using 2SLS and the one-year relative accrual of pensions to measure incentives. Finally, we do the analysis also by including individuals retired due to disability.

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