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Distributional Effects of the Wealth Tax under a Lifetime-Dynastic Income Concept

Abstract

Recent books by Thomas Piketty (Piketty, 2014) and Anthony Atkinson (Atkinson, 2015) have brought the annual wealth tax back on the policy agenda. Both authors suggest using the annual wealth tax to supplement the redistributional effects of the income tax, assigning it a role as a redistributional backstop mechanism. However, when measured against annual income, the wealth tax is often not delivering the expected effects – a large share of the tax burden falls on people with low income. We argue that instead of using yearly income, one should measure wealth tax burdens with respect to individual lifetime income in family dynasties. Using rich Norwegian administrative data, we describe how a lifetime-dynastic income concept can be established. Under our preferred income concept, the wealth tax shows advantageous distributional effects – it represents a clear redistributional supplement to the income tax and is overall progressive in income.

JEL-Codes: D310, H240.

Keywords: wealth tax, redistribution, life-cycle income, dynastic income.

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1 Introduction

There is an ongoing debate across the world about how big the tax contribution of the wealthy should be and whether it should be increased. Over the past few decades, until the financial crisis, recurrent taxes on net wealth were in decline in many countries. Austria, Denmark, Finland, Germany, Luxembourg, and Sweden had all repealed such taxes (Förster et al., 2014). Some of the few countries that still keep a tax on net wealth are France, Norway, the Netherlands, Spain and Switzerland (at the cantonal level). More recently, though, several countries have either introduced or seriously debated such taxes.

Wealth taxation is often associated with negative effects on capital accumulation and with problematic compliance issues. But there are some important proponents of this type of taxation. In the monumental books of Thomas Piketty (Piketty, 2014) and Anthony Atkinson (Atkinson, 2015) it is suggested that the annual wealth tax should be used in order to facilitate more redistribution through the tax system.[1] For example, Atkinson argues: "Among the reasons for considering an annual wealth tax more favorable in the UK today than forty years ago are the much higher income inequality."

However, favorable descriptions of the redistributional properties of the wealth tax are not often found in the literature. As the annual wealth tax often is interpreted as a complement to the capital income taxation, the most commonly used approach is to present descriptions of distributional effects of the wealth tax against annual income. The main message of the present study is that this practice provides inadequate information. Instead we assert that the assessment of the distributional properties of the wealth tax should be carried out in terms of effects on lifetime income of members of the family dynasty. A main contribution of the paper is to provide descriptions of how the annual wealth tax is distributed over lifetime-dynastic income, and how these depictions deviate from results obtained when using the conventional yearly snapshot income concept.

We find that the Norwegian wealth tax (which is akin to a tax on financial wealth only) has a distributional U-shape in annual income, as its burden falls disproportionately more on tax payers with very low income and very high income. Thus, in such depictions, the wealth tax is not seen as delivering the anticipated distributional effects, and similar findings may have contributed to the recent decline of this type of taxation in Europe. Analysis of the distributional effects of the wealth

[1] See pp. 528−530 in Piketty (2014) and pp. 199−200 in Atkinson (2015). According to Piketty (2014), an annual wealth tax can be realized by coordinated policy initiatives, for instance by countries of the European union.

tax brings to the surface the deficiencies of using the yearly snapshot income in studies of distributions of tax burdens. For example, the capital owner may be positioned at the low end of the annual income distribution, due to temporary business losses (a "bad year"). Then taxation of wealth could be seen as an unacceptable burden for the asset owner when the assets do not generate sufficient income in a single year to enable the owner to pay an annual wealth tax on the capital (Boadway et al., 2010). As expected, when instead ranking tax payers according to their lifetime income, the wealth tax becomes more progressive and has a greater redistributional effect. However, the relatively higher tax burden found at the low end of the distribution is partly retained when addressing lifetime income. This is explained by the wealth tax penalizing owners of unproductive assets, and the presence of persistent heterogeneity in returns.

Furthermore, ignoring intergenerational links may be misleading in a wealth tax distributional context. As many parents transfer resources to their children throughout their lifespan, the measured distributional effect of the wealth taxation is sensitive to at what point over the life cycle parents transfer resources to their children, as pointed out by Atkinson and Harrison (1978). Parents may transfer wealth to their children at an early stage of life, suggesting that wealth taxation falls on people with low ability-to-pay. Correspondingly, the parents, who presumably have a higher position in the income ranking, now pay less or no wealth tax. This raises questions concerning the choice of economic unit in analyses of income inequality and distributional effects of tax policies. When we use the family dynasty as the unit of analysis, potential inheritances are internalized in the income measure.

We find that due to the relatively high degree of intergenerational mobility in Norway, overall inequality in dynastic/lifetime income is lower than in lifetime income. Further, wealth tax progressivity and the contribution of the wealth tax to redistribution, under the the extension to lifetime income in dynasties, are not so far from what we see for lifetime income alone. However, the presence of persistent heterogeneity in returns, which we believe partly explains the relatively high burden at the lowest levels of lifetime income, is weakened when aggregating income over persons with different abilities. Thus, in terms of dynastic income, the progressivity of the wealth tax is strictly increasing.

Measures of income based on these methodological refinements are obtained by having access to data for the whole Norwegian population over 19 years, from 1993 to 2011. These data are used to estimate models of the income generating process over the life cycle, when letting labor and capital income be explained separately. The parameter estimates, for age, education, type of education, gender, etc., are in turn used to predict lifetime income for a large sample of Norwegians, restricted to one adult person from each household, aged between 25 and 80 in 2011, who has been observed for at least eight years in the data. Further, the dynasty as the unit of analysis is obtained by aggregating income across dynasties when exploiting that the data includes intergenerational IDs, which means that both parents and children can be linked to the individual.

The paper is organized as follows. In Section 2 we describe the distribution of the Norwegian annual wealth tax in the benchmark case – wealth tax burdens measured against the distribution of annual income. Section 3 presents the empirical framework for establishing individual lifetime income, and distributional effects of the annual wealth tax when using lifetime income is compared to results derived by the standard annual income framework. Further, in Section 4, a method to establish lifetime income in dynasties is introduced, and the effect of this methodological extension is discussed. Results of robustness tests are shown in Section 5, whereas Section 6 concludes the paper.

2 Limitations of annual income as a measure of well-being

Throughout the paper we use the actual wealth tax levied on Norwegian households in 2011 (since 2011 the tax exempt level has been increased and the statutory tax rate lowered). We believe this is a good example of a relevant wealth tax scheme. The wealth tax schedule of 2011 implies that wealth above 700,000 Norwegian kroner (NOK) is taxed by a rate of 1.1 percent. In 2011, 700,000 NOK was roughly equal to 90,000 EUR or 125,000 USD.[2] By international standards this threshold is rather low, which is also reflected in the empirical illustrations. The general rule is that different assets are valued by market values, but there are important exemptions: for example, the value of owner occupied housing is set to 25 percent of market value, and secondary housing to 40 percent.[3]

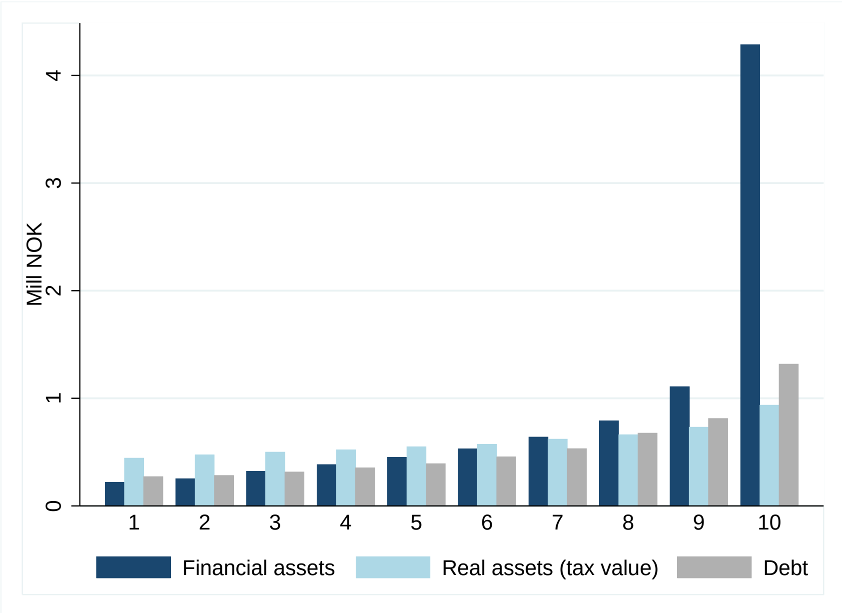
Figure 1 shows the composition of wealth in different deciles of gross income. For most households the tax value of housing and total debt balances out – or at least the net value rarely reaches the threshold limit – so that the Norwegian wealth tax is in effect comparable to a tax on financial assets only.[4]

[2]In 2011, 1 Euro = 7.79 NOK, and 1 USD = 5.61 NOK.

[3]It should also be noted that there are practical valuation challenges that likely influence measures. For example, non-incorporated businesses are undervalued in most cases. See Alvaredo and Saez (2009) on effects of exemption of stocks for owner-managers in the Spanish wealth tax schedule.

[4]As an experiment, we have run our analysis on different hypothetical wealth tax systems and found that the results of the actual wealth tax system are close to identical to a system based on a financial wealth tax only.

Figure 1. Wealth portfolio composition by deciles of gross income 2011



Note: The entire adult population in 2011 (age 18 and older), sorted by individual gross income.

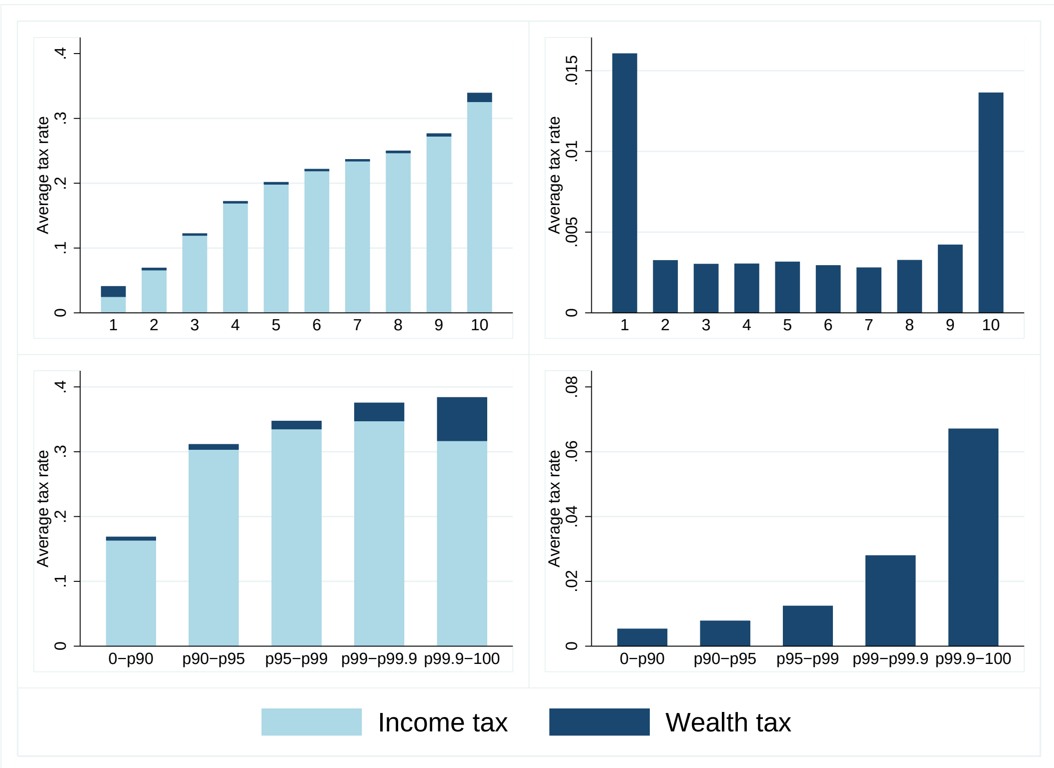
The resurgence of the annual wealth tax as a policy instrument, as promoted by Piketty (2014) and Atkinson (2015), is primarily explained by its role as backstop distributional mechanism. Taxation of wealth is usually treated as supplementing the capital income taxation, see Boadway et al. (2010) and Keen (2015).[5] Thus, as long as there is a comprehensive taxation of capital, there is should be no need for additional tax on wealth, as taxation of wealth transfers (inheritance tax) or annual taxation of net wealth. However, there is considerable downward pressure on taxation of capital, illustrated by the introduction of dual income tax schedules in the small open economies of the Nordic countries, Norway included. Boadway et al.

[5] In this perspective it is worth noting that well-known results suggesting that capital should not be taxed at all, as Atkinson and Stiglitz (1976), Chamley (1986), and Judd (1985), have recently been challenged. For example, several contributions categorized under "new dynamic public finance" have questioned the "no-tax-on-capital" result, see Kocherlakota (2005), Albanesi and Sleet (2006), and Golosov et al. (2013). Guvenen et al. (2017) is particularly relevant, given the present context, as welfare gains from switching from capital income tax to wealth tax are discussed. Of course, a (high) tax on capital is not necessarily included in the preferred tax mix in the tax literature; for example, Auerbach and Hassett (2015) argue that a broader consumption tax base is more efficient in hitting existing sources to wealth. It is also worth noting that taxation of some of the items included in the tax base of the annual wealth tax are found to be among the least growth constraining, see Arnold et al. (2011). Finally, there is also a greater awareness of negative externalities coming from wealth accumulation and control of resources on fewer hands, which the annual wealth tax may counteract, as emphasized by Kopczuk (2013). For example, saving behavior of the wealthy is consistent with an interpretation of wealth as a source of utility in its own right (Carroll, 2000). However, power and status may be seen as ad hoc motives, and taxation on such grounds may not be easily defended (Boadway et al., 2010; Jacobs, 2013).

(2010) argue that in a dual income tax system, wealth taxation may be used as an additional policy instrument to achieve redistributive objectives. Further, as clearly illustrated by recent discussions of reform to the Norwegian schedule (Ministry of Finance, 2015), when there is a link between the corporate tax rate and the personal capital income taxation (as maintained in the Norwegian system), one may find additional downward pressure on the capital income taxation.[6] Moreover, if, as in the Norwegian case, there is no tax on wealth transfers (the inheritance tax was abolished in 2014), the annual wealth tax may be used to achieve redistribution in the tax schedule, a so-called "redistributional backstop" mechanism. Atkinson (2015), in particular, argues along these lines.

However, it may fail delivering the expected favorable distributional effects. The distribution of the Norwegian wealth tax according to the schedule of 2011 illustrates that the burden of the wealth tax is not necessarily borne only by high-income individuals alone, see Figure 2. We use administrative income tax return data in the present study, which means that Figure 2 is based on information for the whole (adult) population.[7]

Figure 2. Average tax as a fraction of average income, by quantiles of gross income 2011



[6] Fueled by a "race to the bottom" in terms of the corporate income tax.

[7] We shall return to more information about the data in Section 3.

We see from the top diagrams in Figure 2 that the largest shares of the wealth tax are borne by individuals with high and low income,[8] in decile 1 and decile 10, whereas the rest of the tax burden is relatively uniformly distributed on deciles 2 to 9. The figure illustrates that a substantial wealth tax burden falls on the lowest income decile, when burdens are measured relative to annual gross income. When addressing the distribution within decile 10 in further detail, as in the two lower diagrams in Figure 2, a more favorable distributional depiction emerges. The top permille (consisting of 3856 individuals) actually pays less income tax as a fraction of their gross income than the rest of the top percentile, and the wealth tax seems to act as a backstop mechanism that only just ensures that the overall personal tax schedule (income tax + wealth tax) is progressive at the very top. We also note that wealth tax shares in general are small, which is due to exemption and valuation rules. Less than 4 percent of the total tax revenue of income and wealth taxation on individuals came from the wealth tax in 2011.

Figure 3. Annual gross income and financial wealth in 2011, by age

Accumulated wealth has a different lifetime profile than gross income, see Figure 3. It follows that an old-age pensioner may be in a wealth tax position and at the same time receive a relatively low pension income. This is one reason for the wealth tax burden falling on low incomes. Another group at the low end of the income distribution, paying wealth tax, consists of individuals with temporarily low income, due to some transitory component, such as luck. Others are able to avoid

[8] To measure wealth tax and income tax burdens against gross income follows standard procedures of Norwegian governmental descriptions.

the tax by tax planning. Some of the wealthiest people in Norway, consistently report no or very low incomes over a longer time periods,[9] and accordingly, do not pay income tax, but only wealth tax. Thus, in this perspective the wealth tax works as a redistributional backstop mechanism.

Let us take a closer look at the why the wealth tax may not be as redistributive as expected. By definition, if there are no labor earnings, the average wealth tax is constant across capital income as long as a) the assets in the wealth tax base are the same as the assets that generates capital income, and b) the rate of return is constant across individuals. If the rate of return is heterogeneous, the average wealth tax is actually regressive in capital income. As already noted, wealth tax distributional effects are often described in terms of effects on gross income distributions, thus employing annual gross income as indicator of individual well-being or ability-to-pay. In such a perspective, the average wealth tax for individual i at age t can be seen as

$$awtr_{it} = \frac{\tau_w W_{it}}{r_t W_{it} + E_{it}}, \tag{1}$$

where τ_w is the wealth tax rate, W_{it} is wealth at age t, E_{it} is labor income earnings, and r_t is the average rate of return on investments. For the sake of argument, consider the case with no earnings, $E = 0$. Then the average wealth tax rate can be seen as: $awtr_{it} = \tau_w / r_t$, i.e., as long as the rate of return is the same for all individuals, the average wealth tax rate is the same for all, irrespective of wealth level and wealth distribution. In other words, when the wealth tax is proportional to wealth and the rate of return is homogeneous, the wealth tax rate will be constant and equal for all. Next, if the rate of return, r_{it}, differs between individuals, say, that some individuals are more productive than others, then the average tax rate will be low for productive owners, as the denominator in (1) increases. Alternatively, the rate of return may differ because of the composition of assets, so that owners of unproductive capital will have a higher tax burden than owners of productive capital. Generally, the average wealth tax rate declines with the individual rate of return, and for those with a rate of return close to zero, the wealth tax rate becomes infinitely high.[10] As seen in Equation (1), adding earnings, $E_{it} > 0$, makes the result

[9] One may question how this is possible. In the Norwegian tax system, it means being paid in terms of capital income, but having deductions, for example from losses, to reduce taxable income down towards zero.

[10] Furthermore, since productive entrepreneurs experience that their wealth grows (after-tax return is positive), and the unproductive may see a net reduction in their wealth (if the wealth tax paid is larger than capital income), the wealth tax increases inequality in wealth. On the other hand, taxation of wealth can be characterized as efficient, in the sense that it creates an incentive for reallocation of wealth from unproductive to productive entrepreneurs, as denoted by Guvenen et al. (2017).

less clear, but if labor income is correlated to capital income, the result still holds. The regressivity of the wealth tax in capital income increases at the top end of the distribution if productive assets or assets with high returns are undervalued in the wealth tax. This is a typical problem for shares in unlisted companies.

The present study points to lifetime income as a better measure of the capacity to pay the wealth tax. In fact, one may argue that annual income is a poor measure of ability-to-pay in general, and therefore gives a misleading picture of the distributional effects involved in taxation, as argued by Friedman (1962), Poterba (1989), Slemrod (1992), and Metcalf (1994).[11] Using lifetime income instead of annual income would solve the problem with life-cycle effects and the problem of transitory low returns – whether it is due to luck or tax planning. Since the tax base, wealth, reflects the long run ability to accumulate savings and returns, it is reasonable that the taxation is measured against the individual's long run income capacity.

However, using lifetime income instead of annual income does not solve the issue of the wealth tax being regressive in capital income if there is persistence in heterogeneous returns. Several authors have shown that persistent heterogeneity in the returns to wealth is the key to explain the long right tail in the wealth distribution, see Quadrini (2000), Benhabib et al. (2011), and Benhabib and Bisin (2016). Fagereng et al. (2016), using the same Norwegian register data as in this study, show not only that returns are heterogeneous, but also that they have a persistent component, both within and across generations.

Given that there is strong evidence of family inter-dependencies, reaching beyond the nuclear family, a more complete picture of the distribution of resources in a society is obtained when using the dynasty as the unit of analysis. Thus, we employ an income concept phrased as "dynastic income". Lifetime income may be closely associated with power or status, something than can be concentrated within families if certain endowments are inherited across generations. In other words, we take the argument that current income is a poor measure of well-being one step further, and argue that individual income may hide the pivotal role of the family dynasty as an engine for providing welfare. Several authors, as Becker and Tomes (1979), Piketty (2000), Mare (2011), and Kanbur and Stiglitz (2015) suggest applying a multigenerational (dynastic) view of inequality.

Becker and Tomes (1979) express the possible benefits of belonging to the

[11]Discussions of the correct definition of income dates back to the classical work of Schanz, Hicks and Simon, the so-called Schanz-Hicks-Simon income concept. The focus is then on the consumption possibilities obtained by income. Other authors argue that one should address distributive justice from completely different angles, see Sen (1997) and Kaplow and Shavell (2002) for different views.

family dynasty as "endowments of capital that are determined by the reputation and 'connections' of their families, the contribution to the ability, race, and other characteristics of children from the genetic constitutions of their families, and the learning, skills, goals, and other 'family commodities' acquired through belonging to a particular family culture." (p. 1158). If these traits are strongly transmitted across generations, and if they are valued by labor markets over time, then there will also be an intergenerational association of incomes. At the same time, if there is significant demographic diversity across countries then we should not be surprised that there is an upward slope to the so-called "Great Gatsby Curve",[12] plotting the (positive) relationship between inequality and intergenerational social immobility in countries, even if all societies are equally meritocratic. Roemer (2012) and Becker et al. (2015) articulate this interpretation.

However, it is not clear how extension to "dynasty-income" works in terms of income distributions. This income concept would remove the potential measurement error following from intergenerational transfers of income as it would internalize any intergenerational transfers of wealth Atkinson and Harrison (1978). Of course, ability (or rate of return) may vary both within a generation (across siblings) and across generations (from parent to child). It is not uncommon that children of very successful entrepreneurs are not able to obtain the same rate of return as their parents. In the latter case, dynastic income will be lower than lifetime income of the parent, which implies that the wealth tax may be seen as less redistributive in terms of income in the dynasty than with respect to individual lifetime income. On the other hand, if there are strong correlations in ability across generations, causing some dynasties to have an overall higher rate of return on their wealth than other families, we would expect to see high inequality in dynastic income. One cannot rule out that there are privileges, for example coming from a business monopoly, that result in strong persistence in both income and wealth over generations. In the next sections we shall discuss what the data tell us about these relationships.

3 Lifetime income

3.1 Income data over a longer time period

There are several studies discussing tax policy issues by utilizing information about income over a longer time period. For example, there are studies which use income data for an extended range of time directly, as in Slemrod (1992), Altshuler and

[12] A concept introduced by Alan Krueger in a speech in the capacity as the Chairman of the Council of Economic Advisors in 2012.

Schwartz (1996), Poterba and Weisbenner (2001), Bengtsson et al. (2016), Bach et al. (2014), Heim et al. (2014), and Fullerton and Rao (2016), whereas others utilize the data to estimate economic models, which in turn are engaged to simulate effects of tax policy changes. In the first group of approaches one finds estimation of dynamic income process models, see review in MaCurdy (2007), whereas the latter group includes estimation and application of dynamic structural life cycle models, as in Keane and Wolpin (1994). In the following we shall use micro data to estimate and extrapolate (or simulate) individual lifetime income profiles, based on estimates from reduced form estimations. Fullerton and Rogers (1991, 1993) are examples of previous studies close to the approach chosen here.

Data on income over the life cycle are rare. Here we use register data on income and wealth for the whole Norwegian population for 19 consecutive years, from 1993 to 2011, see Statistics Norway (2012).[13] Data are collected from annual tax records and other administrative registers, such as the one administered by the Norwegian Labor and Welfare Administration. The data set also contains information on education, level and type, from the National Education Registry. It adds to the quality of these data that in Norway almost all incomes and financial assets are third-party reported. Employers, banks, brokers, insurance companies and other financial intermediaries are obliged to send, both to the individual and to the tax authority, information on earnings, the value of assets, and other type of information essential for the calculation of taxes. Consequently, the data set contains precise information about various income sources, wealth and taxes paid (including the tax paid on wealth). Importantly, given our ambition to establish dynasties, detailed information on household family identifiers are included, enabling us to link the person to his or her grown children and parents.

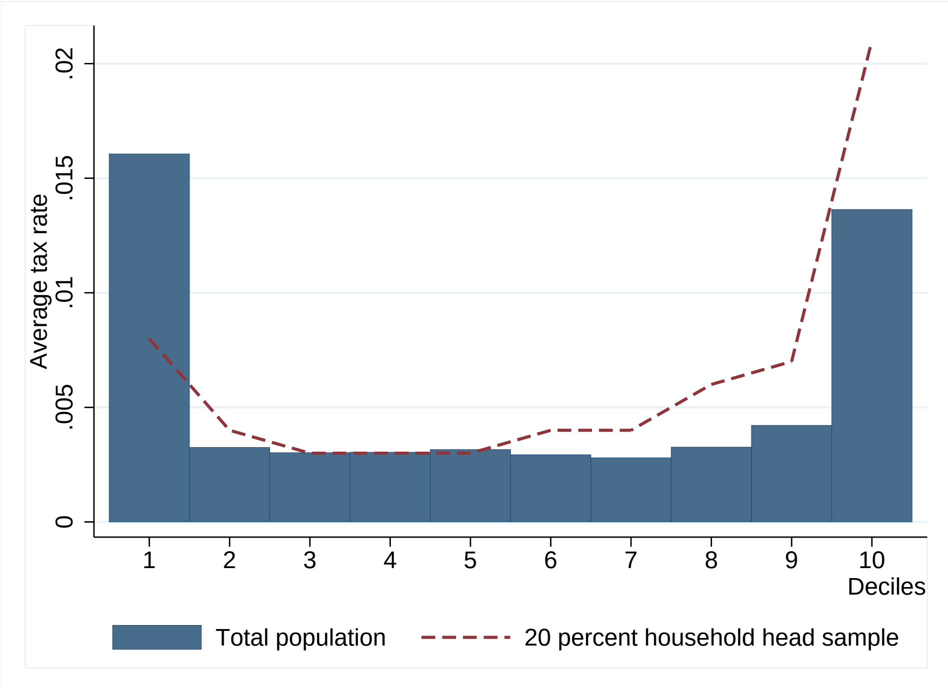
For practical reasons, we employ a data set based on a representative 10-percent sample of the Norwegian population. The sample is restricted to household heads older than 25 years and younger than 80 years in 2011, and for whom we have information for at least 8 years.[14] Figure 4 illustrates how the data selections affect the depiction of the distribution of the annual wealth tax, comparing distributions for full sample (similar to the sample used to produce Figure 2) and the restricted sample. Dropping students and the very old, plus restricting to household heads observed for a minimum of 8 years, results in a sample with overall higher income and wealth compared to the total population. Moreover, as many individuals who pay wealth tax with zero or very little income are removed by the sample restrictions,

[13] Aaberge and Mogstad (2015) use Norwegian data for the whole individual lifespan; however, restricted to observations on labor income only, not on capital income and wealth.

[14] Household heads may both be male and female – the distribution is about 50/50 in the sample.

the wealth tax rate in the lowest decile is lower in the 10-percent sample than in the full data set.

Figure 4. Wealth tax as share of annual gross income against annual income in deciles. Total population versus 10-percent household head sample



Note: The bars in this figure correspond to the bars in the top diagrams of Figure 2.

When extending the empirical approach to a dynastic framework, a new sample is established, due to restrictions on the access to information on family linkages. For practical reasons, a "dynasty head" is assigned, defined as the father of the middle generation, to be used as a focal point for the intergenerational linkages. Thus, this means that yet another sample is established for the dynasty extension. More details about the data set used to discuss implications of dynastic income distributions are provided in Section 4.1.

3.2 Obtaining measure of lifetime income

In order to construct lifetime income, we estimate separate models for labor income[15] and capital income, using fixed characteristics of the individual as explanatory variables: age, gender, and education. Thereafter we adjust individual levels by adding individual fixed effects, and finally we extrapolate the model over the entire adult lifespan. For the capital income model we allow for differentiated estimates, dependent on different parts of the capital income distribution.

[15]Labor income includes all labor related incomes, including pensions and other transfers dependent on past labor income, such as unemployment benefits and sickness benefits.

Income is not normally distributed, which is commonly dealt with by log-transforming the dependent variable. However, transforming the dependent variable by taking the natural logarithm complicates predictions. Moreover, in order to calculate the annual wealth tax as a fraction of lifetime income, we prefer predictions of lifetime income in levels. Given this, we shall estimate multiplicative models directly by using Poisson regression.[16] More precisely, we regress labor income, Y_{it}^L, on age and a second degree polynomial in age, both interacted with fixed individual characteristics, such as gender and education, which are also fully interacted with each other, so that the age profiles are as flexible as possible,

$$Y_{it}^L = \exp\left(\alpha + \beta'\mathbf{X}_{it} + \delta_t \sum_{t=1993}^{2010} D_t + u_{it}\right), \tag{2}$$

where

$$\beta'\mathbf{X}_{it} = \beta_1 a_{it} + \beta_2 a_{it}^2 + \beta_3 e_i + \beta_4 s_i + \beta_5 a_{it} e_i + \beta_6 a_{it} s_i + \beta_7 a_{it}^2 e_i + \beta_8 a_{it}^2 s_i + \beta_9 e_i s_i,$$

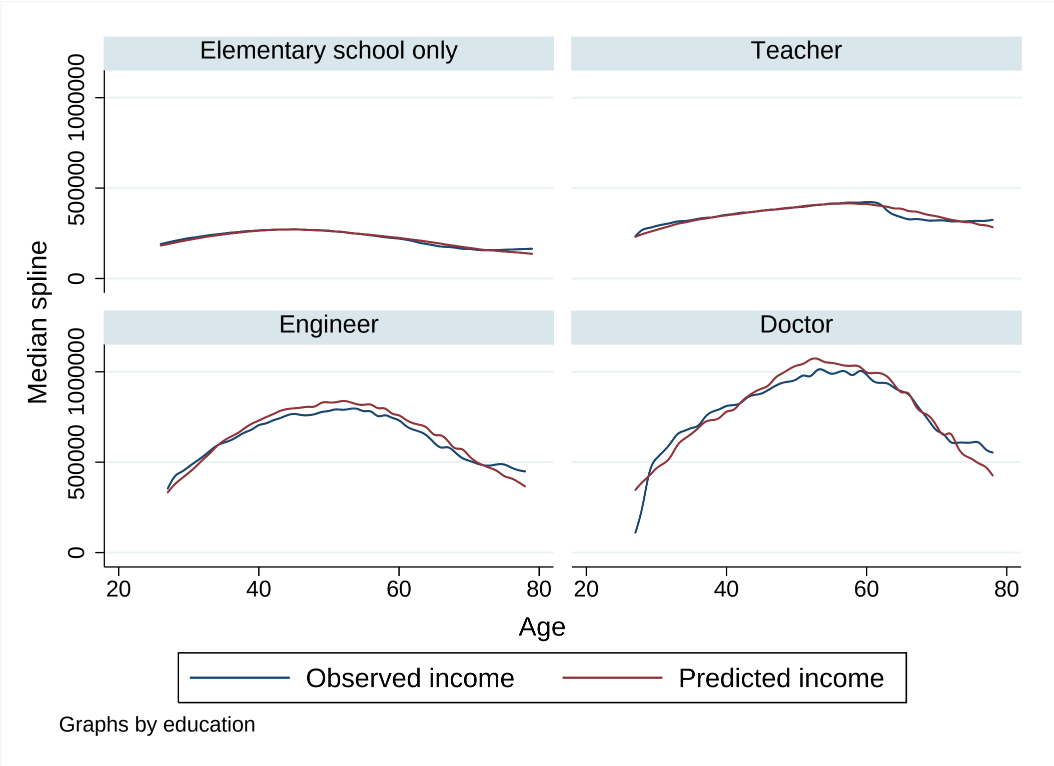
and a is age, a^2 is age squared, s is gender, e is a variable describing the combination of length and field of education, $\{\beta_1, \beta_2, ..., \beta_9\}$ and δ_t are parameters, α is a constant, and u_{it} is the i.i.d. error term. A detailed classification of 50 educations (combinations of length and fields), established by Kirkebøen (2010), is used, and we also control for general income growth by including year dummies, D_t, where 2011 is the reference year.

Note that this life cycle model is expressed only in observables that are assumed fixed over the individual's life span and that the coefficients are assumed shared by all individuals. Essentially, the approach implies that gender-specific concave income profiles for each type of education over the life cycle are estimated. Figure 5 shows observed and predicted age-profiles for four selected educations: elementary school only, teacher with bachelor or master degree, engineer, and degree in medicine.

Even though the model may provide reasonable approximations to conditional means, as seen in Figure 5, it may predict poorly for a given individual. Therefore, we would like to allow for some individual variation. There may be individual variations in level, slope and curvature of the lifetime income-profile. However, since we are interpolating incomes outside the observed ages of each person, imposing individual-specific slopes and curvature may exaggerate patterns that are only weakly identified over a period of minimum 8 years. Hence, we choose to adjust only for

[16] The variance-covariance matrix of the estimates is obtained by the Huber/White/Sandwich linearized estimator. This estimator of the variance-covariance matrix does not assume $E(Y_i) = Var(Y_i)$, which is standard in Poisson regression, see Santos Silva and Tenreyro (2006).

Figure 5. Observed and predicted age-income profiles for selected educations, labor income



differences in levels. This is done by utilizing the panel data structure, and applying a fixed effect regression of income on the predicted part from the model above. This gives us an estimate of the individual fixed effect. Calibration over the whole life cycle is then done by extrapolating age over the range $a \in [26, 79]$, and using the model (2) to predict labor income, given the fixed characteristics, gender, education, and the term $\hat{\theta_i^L}$, and given that we use Poisson regression in the estimation,

$$\hat{Y_{ia}^L} = \exp\left(\hat{\alpha} + \hat{\beta}'\mathbf{X}_{ia}\right) + \hat{\theta_i^L} \qquad a \in [26, 79]\,.$$

Capital income is even more skewed than labor income, and follows a different pattern over the life cycle. In the capital income model, different quintiles of the capital income distribution are estimated separately, thus, letting parameters vary with the level of income. Since we observe each individual for a minimum of 8 years, we have chosen to first identify each person's position in the capital income distribution by age and year in the observation period. Next, we assign the overall lifetime position by using the mode position, i.e., the position in the distribution observed most frequently over the period of minimum 8 years and maximum 19 years.

Inspection of the data shows that capital income, Y_{it}^{K}, is best fitted by a 5th degree polynomial in age over the life cycle, for each quintile, q.[17] Furthermore, we find differences between males and females, whereas level of education has little predictive power. The polynomial in age is therefore allowed to vary with gender. The capital income model can then be seen as,

$$Y_{qit}^{K} = \kappa + \gamma \mathbf{Z}_{qit} + \lambda_t \sum_{t=1993}^{2010} D_t + \upsilon_{qit} \qquad \text{for each } q \in [1,2,3,4,5],$$

where

$$\gamma \mathbf{Z}_{qit} = \left(\gamma_1 a_{qit} + \gamma_2 a_{qit}^2 + \gamma_3 a_{qit}^3 + \gamma_4 a_{qit}^4 + \gamma_5 a_{qit}^5\right) s_i + \gamma_6 s_{qi},$$

and $\{\gamma_1, \gamma_2, ..., \gamma_6\}$ are parameters, κ is a constant, υ_{qit} is the i.i.d. error term and $q \in [1,2,3,4,5]$ defines the mode capital income quintile of the individual. We control for annual variation by including year dummies, D_t. As for labor income, we extrapolate the estimated relationship over the entire age span and add individual fixed effects.

Table 1. Descriptive statistics for annual income and lifetime income. 10-percent household head sample

	Gross income		Labor income		Capital income	
	Annual	Lifetime	Annual	Lifetime	Annual	Lifetime
Mean	430	428	423	400	28	28
Std	520	373	335	222	387	363
Gini coefficient	.34	.28	.31	.26	.91	.83
Atkinson index	.25	.14	.16	.11	.95	.81
P90/P10	4.3	3.4	4.0	3.2	788	45

Note: Based on information on 228,276 individuals. Annual income in thousand NOK in 2011, and average lifetime income in thousand NOK, measured at the 2011-level. The Atkinson index is reported for the inequality aversion parameter (e) set to 1.

Table 1 reports summary characteristics of the resulting predictions of lifetime income, and compare them to similar information based on annual income. The averages of the two income distributions are close, which is expected since individual residuals are used in obtaining lifetime income levels. In accordance with numerous previous studies, we see a reduction in income inequality when moving from the yearly snapshot to lifetime income distributions.[18]

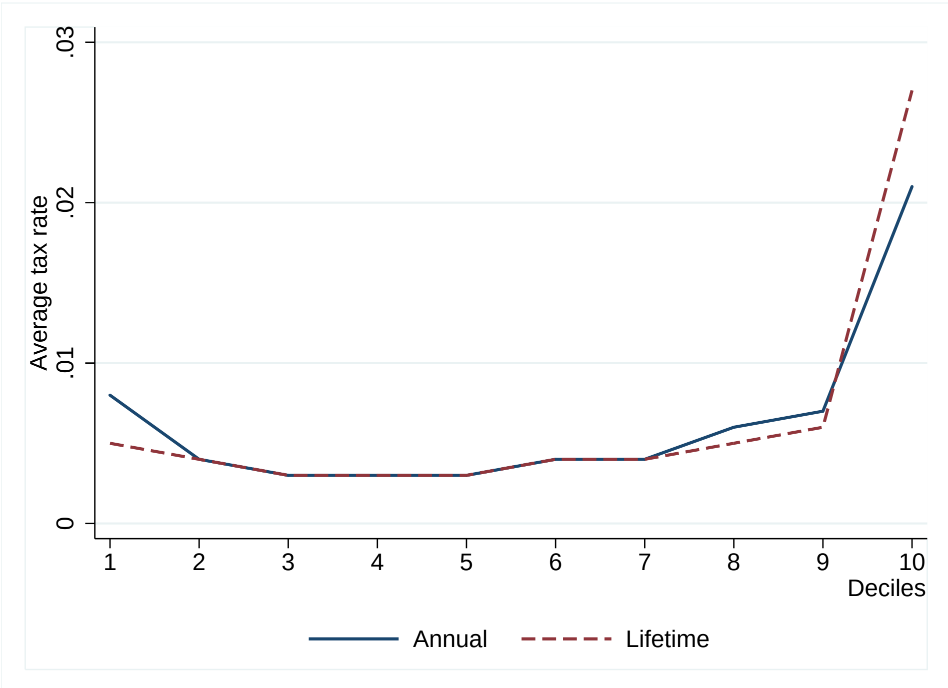
[17] Capital income follows closely the level of financial assets over the life cycle. An alternative would be to model financial assets, and subsequently derive capital income as a function of financial assets. However, as already discussed, even though capital income is a function of the capital stock, the rate of return is not necessarily the same for all ages and for all levels of assets; for example, the average return depends on the composition of assets.

[18] It is well established that income mobility has an equalizing effect on the inequality between

3.3 Distribution of the wealth tax on annual and lifetime income

Figure 6 shows wealth tax shares by deciles of annual and lifetime income, when lifetime income is recalculated into a 2011-level equivalent. As expected, the figure shows that the wealth tax share is lower in the first decile of lifetime income than in the first decile of annual income, although the tax share is still somewhat higher in the lowest decile than in the second and third lowest deciles for the lifetime income concept too. At the top of the distribution, however, we see a stronger relationship between the wealth tax and high income for lifetime income than for annual income.

Figure 6. Wealth tax as share of annual gross income against annual and lifetime income in deciles. 10-percent household head sample



There are several factors contributing to Figure 6 providing a more redistributionally favorable depiction of the annual wealth tax. Mobility in annual income implies that we do not necessarily observe the same persons in the top decile of the annual income distribution and in the top decile of the lifetime income distribution. For example, some capital owners who have temporarily low income, for example due to losses, can be placed at the high end of the income distribution in a lifetime perspective. Further, regression to the mean increases the mean incomes in the lowest part of the distribution and lowers the mean in the top part of the distribution,

individuals, and lifetime income therefore exhibits less inequality than the annual snapshot, see Björklund (1993) and Creedy et al. (2013).

as also reflected by the estimates of inequality in Table 1. Given that we measure the wealth tax burden as share of income, a lower wealth tax share in the first decile of lifetime income is therefore a combination of both higher income and lower wealth tax, the latter caused by the reshuffling of individuals in the transition from annual income to lifetime income.

Table 2. Distribution of the wealth tax by annual and lifetime income. 10-percent household head sample

Annual income	Wealth tax in NOK	Share paying	Average wealth tax rate	Average income tax rate
0–p10	963	0.15	0.009	0.05
p10–p50	1,379	0.20	0.005	0.17
p50–p90	2,737	0.21	0.005	0.26
p90–p95	7,052	0.30	0.008	0.31
p95–p99	14,196	0.38	0.012	0.34
p99–p99.9	85,556	0.59	0.036	0.34
p99.9–p100	645,564	0.89	0.065	0.30

Lifetime income	Wealth tax in NOK	Share paying	Average wealth tax rate	Average income tax rate
0–p10	753	0.14	0.005	0.11
p10–p50	1,087	0.17	0.005	0.20
p50–p90	2,301	0.22	0.005	0.27
p90–p95	6,458	0.33	0.009	0.35
p95–p99	13,930	0.42	0.014	0.39
p99–p99.9	79,354	0.68	0.044	0.39
p99.9–p100	1,060,384	0.92	0.129	0.20

Note: Based on information on 228,276 individuals. Annual income in thousand NOK in 2011 and average lifetime income in thousand NOK, measured at the 2011-level.

At the high end of the income distribution, the average denominator in the wealth tax over income fraction, is lower than for annual income, but a higher share of individuals pays wealth tax. The latter is described in Table 2. Table 2 provides additional information about the top end of the income distribution, also attending to the internal distribution of income and wealth tax payments within the tenth decile, sorting incomes by increasingly smaller fractions of top incomes. In the table, the first column shows the wealth tax in NOK, the second column the fraction paying wealth tax, and the third and fourth columns report the wealth tax and income tax shares (measured against income), respectively.

When looking at the distribution within the top decile, the role of the wealth tax as a supplement to the income tax is seen as more advantageous in terms of lifetime income than according to annual income. With reference to the discussion in Section 2, where we established that there often will be a close correspondence between the numerator and the denominator of Equation (1), the results in Table 2 indicate that the wealth accumulation rate is higher than the rate of return to investments at the very top of the income distribution. We may speculate that unrealized capital gains is a main explanation, as these are becoming increasingly more important as we move closer to the very top of the income distribution.

To further explore the impact of using different income concepts, we present estimates of progressivity of the wealth tax and wealth tax redistributional effects for different income concepts. We employ the Reynolds-Smolensky index for redistributional effects (Reynolds and Smolensky, 1977), which is defined as the difference between the Gini coefficient of pre-tax income and the Gini coefficient of post-tax income, thus, comparing income inequality with and without the wealth tax part. Further, we provide estimates for the Kakwani tax progressivity index (Kakwani, 1977), measured as the difference between the concentration coefficient of the tax paid (when ranked by pre-tax income) and the Gini coefficient of pre-tax income.

Table 3. Estimates of tax progressivity and redistributional effects of the wealth tax, annual and lifetime income. 10-percent household head sample

	Annual income	Lifetime income
Pre-tax income inequality (Gini)	0.341	0.283
Post-tax income inequality (Gini)	0.340	0.280
Average wealth tax rate	0.009	0.010
Reynolds-Smolensky index	0.001	0.003
Kakwani progressivity index	0.274	0.404

We find that the wealth tax is both more progressive and more tax redistributive (Reynolds-Smolensky redistribution) according to lifetime income than with respect to annual income, see Table 3. Thus, these results also express that employing lifetime income rankings (instead of rankings according to annual income) provides more favorable wealth tax distributional effects.

4 The dynasty as the unit of analysis

4.1 Description of the dynasty data set

Next, we extend the empirical framework to account for income across members of the family dynasty. As already discussed, obvious arguments for this extension in the present context is that, the observed distributional effects of wealth taxation is sensitive to at what time parents transfer resources to the next generation and that the dynasty, accounting for intergenerational associations, is an appropriate concept in studies of income inequality in general, as also argued by Becker and Tomes (1979), Piketty (2000), Mare (2011), and Kanbur and Stiglitz (2015).

This part of the analysis is based on exploiting individual information from the Norwegian population register. The population register contains information of all Norwegians holding a Norwegian personal identification, and is used here to link the person to his parents and grown children. There are several intergenerational lines within the dynasty, dependent on which persons that are linked. To obtain a manageable empirical framework, the strategy here is based on letting males born between 1933 and 1957 take the role as the "head of the dynasty". These males are then linked to their fathers, their children, or both. Only dynasties with relatively simple lines of descendancy were selected, which is achieved by requiring that the head of the dynasty and his father have registered children with only one partner. As in the preceding part of the analysis, it is required that each individual is observed during a minimum of 8 of the 19 years that we have observations for. When also restricting to dynasties where the dynasty head was observed in 2011, we end up with observations of approximately 160,000 dynasties.

Table 4. Descriptive statistics for different data sets

	Full dynasty sample	Dynasty head	10-percent sample
Gross income	514	478	451
Labor income	482	440	423
Capital income	32	38	28
Age	55	67	53
Male	.78	1	.50
Wealth tax	5.8	7.2	4.3
Financial wealth	724	856	743
No of observations	403,196	156,735	226,276

Note: Measured in thousand NOK in 2011.

Table 4 shows how the dynasty data set compares to the previously used 10-percent sample, i.e., reflecting implications of restricting to a sample based on the "head" of dynasties. The individuals in the dynasty data differ from the representative population sample (10-percent sample in Table 4) by being on average older, richer and consisting of more males.[19] This follows from the way the data set is constructed, focusing on male dynasty heads born between 1933 and 1957.

[19] The "Full dynasty sample" is the sample before restricting to gender, year of birth and intergenerational links.

4.2 Dynastic income

Lifetime income of members of the dynasty is obtained by using the same estimated coefficients derived by the imputation of labor income and capital income, as described in Section 3. There are significant birth/cohort differences in the level of lifetime income. With reference to the empirical approach seen so far, differences are manifest in the individual deviations from predicted levels, $\hat{\theta}_i$, along with other individual-specific characteristics, affecting the overall income level. As income of a dynasty is simply the average lifetime incomes of the members of the dynasty, and as the members belong to different generations, we first normalize lifetime incomes to comparable levels, irrespective of birth cohort. We obtain the cohort-specific levels by regressing lifetime income, $\hat{Y_i^{LT}}$, on dummies for cohort, D_i^c, as

$$\hat{Y_i^{LT}} = \exp\left(\eta + \delta_c D_i^c + \nu_i\right),$$

where δ_c and η are parameters and ν_i is the error term. The 1948-52 birth cohort is used as reference level. Lifetime incomes are then adjusted according to the percentage deviation from the reference cohort, and finally we obtain estimates of dynasty income, $\hat{Y^D}$, based on the average lifetime income of members of the dynasty, seen as:

$$\hat{Y^D} = \frac{1}{M}\sum_{m=1}^{M}\left(\left(1-\delta_c\right)\hat{Y_m^{LT}}\right),$$

where M is the number of dynasty members (either two or three). Table 5 shows how the dynasty income distribution compares to the distributions of annual income and lifetime income, in terms of aggregate measures.

Table 5. Descriptive statistics for annual, lifetime and dynastic income. Dynasty head sample

	Annual income	Lifetime income	Dynastic income
Mean	478	431	428
Std	599	515	444
Gini coefficient	.33	.30	.26
Atkinson index ($\varepsilon = 1$)	.18	.15	.11
P90/P10	3.4	3.0	2.7

Note: Based on information on 156,735 individuals. Annual income in thousand NOK in 2011, and average lifetime income in thousand NOK, measured at 2011-levels.

As discussed in Section 2, there are reasons to expect that the there are income and wealth accumulation in dynasties, generated by several channels of transmission, including genes, family culture, and money transfers. These factors are discussed by a large body of literature, addressing intergenerational relationships, often focusing on intergenerational earnings correlations, see the survey in Björklund and Jäntti (2009). However, as seen in Table 5, we find that income inequality inequality is reduced when moving from lifetime income to lifetime income in the dynasty. This suggests that there is a relatively high level of intergenerational income mobility in Norway, which is also found in other studies, see Bratsberg et al. (2007) and Nilsen et al. (2012).[20]

Intergenerational links are conventionally measured by the coefficient from a linear regression of log child lifetime income on log father lifetime income. When using this methodology on the data available for the present study, we obtain a parameter estimate of 0.217, corresponding to a Spearman rank correlation of 0.254. The rank correlation increases to 0.269 if we consider only sons (not daughters). Furthermore, if we split income into labor and capital income, the intergenerational elasticity is 0.167 for labor income and 0.415 for capital income.[21] The high level of intergenerational mobility in combination with relatively low income inequality (Gini coefficient for annual income is 0.34, according to Table 5), means that Norway is positioned at the (low) left hand side of the "Great Gatsby curve". Norway and other Scandinavian countries exhibit a combination of low inequality and high levels of mobility across generations.[22]

4.3 Lifetime-dynastic income and the wealth tax

Figure 7 shows the distribution of the wealth tax according to all three income concepts: annual income, lifetime income, and dynastic income. It shows that the role of the wealth tax as a distributional backstop mechanism is somewhat improved under the lifetime-dynastic specification, but that the pattern is relatively close to what is seen for lifetime income (alone). Recall that since we use the dynasty data set across all income specifications, the results for annual income and lifetime income differ somewhat to what we have seen so far.[23]

We note that at the bottom of the distribution, the higher wealth tax share in the lowest decile, as found when ranked according to annual income, has disappeared for the lifetime-dynastic income ranking.

[20] Bratsberg et al. (2007) also contrast results for Norway to evidence from other countries.

[21] The corresponding Spearman rank correlation is 0.231 for labor income and 0.285 for capital income. Rank correlation estimates are less subject to attenuation bias in income than elasticities. However, since our lifetime income measure is extrapolated from a selected period of the life cycle, there may still be a problem with life cycle bias in the measure.

[22] See Corak (2013) on mobility and inequality in an international perspective.

[23] However, going from annual to lifetime income for the dynasty changes the wealth tax burden in a largely similar way to what we found in Figure 6, with a reduction of the burden in the lowest decile and an increase at the top.

Table 6. Distribution of the wealth tax by annual, lifetime and dynastic income. Dynasty head sample

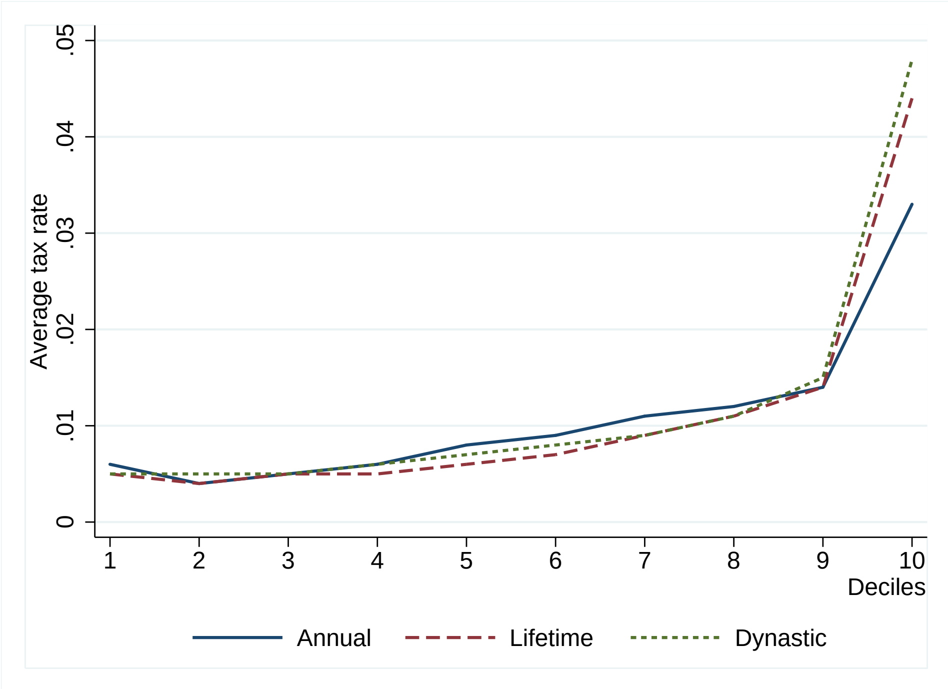
Annual income	Wealth tax in NOK	Fraction paying	Average wealth tax rate	Average income tax rate
0–p10	1038	0.13	0.007	0.07
p10–p50	1827	0.28	0.006	0.16
p50–p90	6125	0.43	0.011	0.25
p90–p95	16767	0.57	0.019	0.31
p95–p99	26456	0.64	0.022	0.33
p99–p99.9	129363	0.85	0.045	0.32
p99.9–p100	1059690	0.96	0.083	0.27

Lifetime income	Wealth tax in NOK	Fraction paying	Average wealth tax rate	Average income tax rate
0–p10	829	0.13	0.005	0.17
p10–p50	1584	0.25	0.005	0.21
p50–p90	4821	0.44	0.010	0.29
p90–p95	14930	0.65	0.020	0.35
p95–p99	26545	0.73	0.027	0.35
p99–p99.9	162189	0.91	0.060	0.25
p99.9–p100	1442485	0.94	0.125	0.16

Dynastic income	Wealth tax in NOK	Fraction paying	Average wealth tax rate	Average income tax rate
0–p10	868	0.14	0.005	0.19
p10–p50	1860	0.26	0.006	0.23
p50–p90	5248	0.44	0.011	0.28
p90–p95	14541	0.62	0.021	0.32
p95–p99	25386	0.70	0.029	0.34
p99–p99.9	151726	0.86	0.074	0.30
p99.9–p100	1341978	0.90	0.160	0.19

Note: Based on information on 156,735 individuals. Annual incomes in thousand NOK in 2011, and average lifetime incomes in thousand NOK, measured at the 2011-level.

Figure 7. Wealth tax as share of annual gross income against annual, lifetime and lifetime-dynastic income in deciles. Dynasty head sample



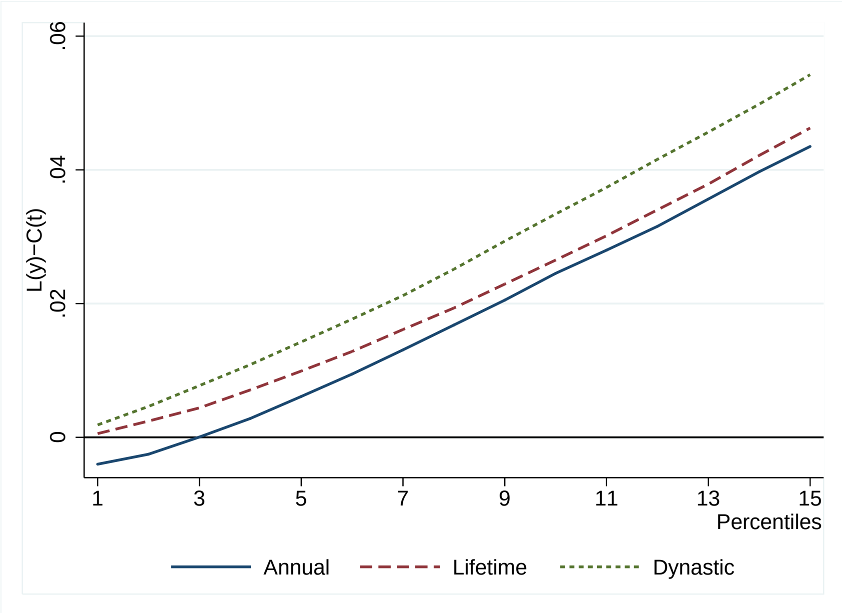
In Table 6 we further zoom in on effects at the top end of the income distribution. The table shows that the share of the top percentile paying wealth tax is not much influenced by the choice of income concept. However, the wealth tax rate at the top 5 percent is highest according to lifetime-dynastic income.

Table 7. Progressivity and redistributional effects by annual, lifetime and dynastic income. Dynasty head sample

	Annual	Lifetime	Dynastic
Pre-tax income inequality (Gini)	0.327	0.300	0.256
Post-tax income inequality (Gini)	0.323	0.294	0.249
Average wealth tax rate	0.016	0.018	0.018
Reynolds-Smolensky index	0.004	0.007	0.007
Kakwani progressivity index	0.335	0.419	0.432

Correspondingly, we find rather similar results with respect to tax progressivity and redistribution for lifetime-dynastic income as derived for lifetime income only. Looking at the overall redistributional and tax progressivity indices in Table 7, we note that there is no change in the redistributional effect of going from a lifetime income concept to a dynastic income concept. Also, there is a smaller increase in progressivity going from lifetime to dynastic income than moving from annual

Figure 8. The difference between the Lorenz curve and the wealth tax concentration curve. Dynasty head sample



Note: The difference between the curves when ranked by annual gross income, lifetime and dynastic income, respectively.

to dynastic income. This is confirmed by Figure 8, where we plot the difference between the respective Lorenz curves and the tax concentration curves at the lower end of the distribution ($L(y) - C(t)$). Although the regressivity of the wealth tax at the low end for annual income is less visible for the selected sample that is the basis for our dynastic income concept, we note that according lifetime income and lifetime-dynastic income, the wealth tax is progressive over the entire distribution and that the dynastic income concept contributes to enhancing tax progressivity. Thus, the tax progressivity is now strictly increasing.

5 Robustness tests: selected cohorts and long income histories

The present analysis rests on obtaining lifetime income measures via predictions, based on models for a broad group of individuals. As the measures of predicted income are derived from rather simplistic models, it would be interesting to see if results hold when we compare predicted lifetime income to actual (observed) income for selected cohorts. This can be done in (at least) two ways. One is to use the comprehensive gross income concept and compare results according to simulated income to average income over the whole period 1993-2011. This would provide results based on a smaller sample of the population, as we restrict to persons who are observed in all 19 years we have observations for. But even though a period of

19 years is extensive, it covers a smaller part of the lifetime. Thus, an alternative approach is to narrow the income concept to labor income, for which we have longer income histories available. As predicted income both consists of a labor income part and a capital income part, it is straightforward to make comparisons for labor income only. Labor income histories are observed for a maximum of 44 years in 2011, thus covering almost all years in work for individuals who are 60-65 years old in 2011.

First, we consider households in which the household head is observed in all 19 years of the panel. We restrict to individuals who are between 50 and 54 years old in 2011, which implies that we focus on observations for individuals who are observed over their prime working ages, i.e, between 30 and 54. Average income over the time range is obtained by using wage deflated annual income, which means that average income corresponds to the income level of 2011 (or the imputed lifetime income).

Results of the sensitivity tests are presented in Appendix A. In Table A.1 and Table A.2 we compare results obtained from the 19-year panel to what we found for (imputed) lifetime income for the same individuals. Table A.2 shows that results are close, both in terms of the wealth tax paid (in NOK) and with respect to the share that pays wealth tax. Compared to the distribution by annual income (for this sample), both with respect to observed income and predicted lifetime, there is less wealth tax paid in the lowest part of the distribution. At the other end of the income distribution, there are higher wealth tax burdens according to both predicted and observed income.

Secondly, we utilize that longer income series are available for certain cohorts when restricting to labor incomes. In Table A.3 in the Appendix we compare average income of 44 years of labor income to imputed labor for cohorts born 1946-1951. Descriptive statistics for both measures of income are compared to annual income. Further, Table A.4 shows that using the labor income series, instead of annual labor income, results in a somewhat more progressive depiction of the wealth tax burden. Most importantly, these results suggest that the imputation method for labor income works well, which we interpret as supportive of the empirical method used. Although this validation must be characterized as limited, at least, we assert that the framework is not rejected by this evidence.

6 Summary

Anthony Atkinson and Thomas Piketty are prominent economists who call for a revival of the annual wealth tax as a tool for redistribution. They both suggest the wealth tax to supplement the personal income tax in the redistribution of income.

These calls come at a time when this type of taxation has been in decline. The initial conjecture here is that its discredit can be explained by the observed lack of ability to serve as a forceful distributional backstop mechanism. Hence, the present paper discusses to what extent this comes from the standard procedure of measuring the distribution of the tax burden against annual income.

We show that, by construction, it is difficult to obtain a wealth tax rate that is progressive in annual gross income, in particular in the presence of heterogeneity in rates of return. Descriptions of the distribution of the wealth tax by the conventional method, against annual income, confirm this. However, when using imputed lifetime income as the measure of well-being, we find improved redistributional effects of the wealth tax. However, probably because of persistence in the heterogeneity in rates of return, the wealth tax still lacks progressive properties in the lower end of the distribution. When extending the analysis to lifetime income in the dynasty, we find that the distributional effects of the wealth tax are relatively close to the depiction by lifetime income. This last result can be explained by the relatively high level of intergenerational mobility in Norway. But importantly, when measured in terms of dynastic income, the wealth tax progressivity is strictly increasing.

Of course, there may be several reasons for not letting a wealth tax schedule be part of the taxation of individuals. However, the argument that the wealth tax suffers from deficient redistributional qualities is not verified here – rather the contrary, the evidence presented here suggests that the wealth tax do represent a valuable redistributional supplement to the income tax.

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Appendix A Results of sensitivity tests

Table A.1. Descriptive statistics for annual income, average income in panel and (imputed) lifetime income

	Annual income (2011)	Panel average income (1993-2011)	Lifetime income
Mean	496	465	428
Std	509	466	384
Gini coefficient	.32	.30	.28
Atkinson index($\varepsilon = 1$)	.22	.17	.13
P90/P10	4.0	3.7	3.3

Note: Restricted data set: household head present in all 19 years, 50-54 years old in 2011. The number of observations is 23,424 individuals. Panel average calculated on wage deflated incomes.

Table A.2. Distribution of the wealth tax by annual, panel average and lifetime income

Annual income				
	Wealth tax	Share paying	Wealth tax rate	Inctax rate
0-p10	1,304	0.13	.010	.087
p10-p50	1,075	0.15	.003	.211
p50-p90	2,462	0.21	.004	.275
p90-p95	9,276	0.37	.010	.327
p95-p99	15,556	0.41	.012	.350
p99-p99.9	63,600	0.65	.024	.349
p99.9-p100	605,825	0.91	.063	.311
Panel average income				
	Wealth tax	Share paying	Wealth tax rate	Inc tax rate
0-p10	725	0.13	.005	.200
p10-p50	936	0.15	.003	.241
p50-p90	2,197	0.21	.004	.287
p90-p95	8,094	0.37	.010	.349
p95-p99	16,919	0.46	.015	.387
p99-p99.9	82,173	0.71	.038	.378
p99.9-p100	643,846	0.81	.080	.177
Lifetime income				
	Wealth tax	Share paying	Wealth tax rate	Inc tax rate
0-p10	705	0.13	.005	.151
p10-p50	955	0.15	.003	.248
p50-p90	2,287	0.21	.005	.316
p90-p95	8,000	0.36	.011	.392
p95-p99	16,388	0.45	.016	.445
p99-p99.9	79,696	0.68	.043	.441
p99.9-p100	653,514	0.81	.095	.220

Note: Restricted data set: household head present in all 19 years, 50–54 years old in 2011. The number of observations is 23,424 individuals. Panel average calculated on wage deflated incomes.

Table A.3. Descriptive statistics for labor income. Annual labor income, 44-year average labor income, and lifetime labor income

	Annual labor income (2011)	44-year average labor income	Imputed lifetime labor income
Mean	393	412	414
Std	253	186	242
Gini coefficient	.28	.24	.22
Atkinson index($\varepsilon = 1$)	.13	.13	.09
P90/P10	3.2	3.3	2.6

Note: Restricted data set, household heads 60-65 years old in 2011. The number of observations is 12,110 individuals. Historical average calculated on wage deflated incomes.

Table A.4. Distribution of the wealth tax by annual labor income, 44-year average labor income, and lifetime labor income

Annual labor income				
	Wealth tax	Fraction paying	Wealth tax rate	Inc tax rate
0–p10	4,282	.26	.031	.107
p10–p50	2,753	.28	.010	.171
p50–p90	4,741	.35	.011	.267
p90–p95	12,052	.44	.017	.322
p95–p99	24,091	.51	.025	.384
p99–p99.9	97,341	.54	.064	.448
p99.9–p100	251,362	.91	.065	.348
44-year average labor income				
	Wealth tax	Fraction paying	Wealth tax rate	Inc tax rate
0–p10	2,443	.23	.016	.176
p10–p50	2,352	.28	.007	.200
p50–p90	4,142	.34	.008	.230
p90–p95	13,382	.49	.020	.337
p95–p99	29,049	.56	.037	.366
p99–p99.9	86,790	.70	.080	.470
p99.9–p100	578,365	.92	.196	.368
Lifetime labor income				
	Wealth tax	Fraction paying	Wealth tax rate	Inc tax rate
0–p10	1,102	.21	.006	.092
p10–p50	1,591	.25	.005	.174
p50–p90	3,611	.36	.008	.246
p90–p95	8,105	.52	.012	.334
p95–p99	26,283	.65	.032	.409
p99–p99.9	94,612	.73	.081	.398
p99.9–p100	624,162	.92	.165	.242

Note: Restricted data set: household heads 60–65 years old in 2011. The number of observations is 12,110 individuals. Historical average calculated on wage deflated incomes.