

*Erlend E. Bø, Peter J. Lambert, and
Thor O. Thoresen*

Horizontal inequity under a dual income tax system: principles and measurement

Abstract:

Tax systems with separate taxation of wage and capital income, also called dual income tax systems, have gained relevance through the Mirrlees Review. Obviously, such tax systems are exposed to horizontal equity (HE) failures, or horizontal inequity (HI). HE and HI have a firm grip on assessment of fair tax policies, both from an academic point of view and in general public debate. The dual income tax system of Norway was modified by the tax reform of 2006 precisely because the previous schedule failed to deliver equal tax treatment of equals. This paper discusses the meaning and measurement of HI effects of dual income tax systems, and evaluates the development of HI for Norway over the time period 2000–2008 using micro data. A copula-based identification strategy efficiently establishes a framework for evaluations of HI over time. The dual income tax system and the early announcement of its impending revision during the period under examination created measurement problems which we had to account for by defining a new income concept for the empirical strategy. As expected, we find less HI in Norway after the reform of 2006.

Keywords: Dual income tax, Horizontal inequity, Reranking, Copula estimation

JEL classification: D31, D63, H31

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Address: Erlend E. Bø, Statistics Norway, Research Department. E-mail: erlend.bo@ssb.no

Peter J. Lambert, University of Oregon, Eugene, Oregon and Statistics Norway, Oslo, Norway, email: plambert@uoregon.edu

Thor O. Thoresen, Statistics Norway, Research Department. E-mail: thor.olav.thoresen@ssb.no.

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Sammendrag

Skattesystemer med separat beskatning av lønns- og kapitalinntekt, såkalte ”duale” inntektsskattesystemer, har fått fornyet relevans gjennom Mirrless Review, som diskuterer hva som karakteriserer et godt skattesystem i åpne, moderne økonomier. Med sitt tosporede satssystem (ulik skatt på lønn og kapital) kan slike skattesystemer kritiseres for mangelfull horisontal likhet (HE), dvs at skattesystemet innebærer ulik behandling av like skattebetalere, også kalt horisontal ulikhet (HI). For lik inntekt før skatt vil kapitaleieren og lønsmottakeren bli skattlagt forskjellig. HE og HI er viktige konsepter for vurderinger av rettferdighet i skattesystemet, både fra et akademisk synspunkt og i den offentlige debatten. En viktig årsak til at det duale inntektsskattesystemet i Norge ble modifisert gjennom skattereformen i 2006 var problemer som har med horisontal ulikhet å gjøre. Denne artikkelen diskuterer tolkninger og måling av HI-effekter for duale inntektsskattesystemer, og evaluerer utviklingen av HI i Norge i perioden 2000–2008 ved hjelp av mikrodata. En identifikasjonsstrategi basert på såkalt copula-estimering etablerer et rammeverk for evalueringen av HI over tid. Det duale inntektsskattesystemet og forhåndsannonseringen av kommende endringer skaper måleproblemer for perioden vi undersøker. Disse måleproblemene har vi tatt hensyn til ved å definere et nytt inntektskonsept som benyttes i den empiriske evalueringen. Som ventet finner vi mindre HI i Norge etter skattereformen i 2006.

1. Introduction

The “pure version” of a dual income tax system is described by Sørensen (1994) as combining progressive taxation of labor and transfer incomes with proportional tax of income from capital at a level equal to the corporate income tax rate. Dual income systems were introduced in the Nordic countries in the late eighties and early nineties, but other countries have moved in a similar direction in pursuit of the more lenient taxation of capital items; see Sørensen (2005a, p. 778) for details. The dual income tax system itself has gained new relevance through the Mirrlees Review; both Griffith, Hines and Sørensen (2010) and Crawford and Freedman (2010) propose versions of dual income tax schedules as candidates for a future tax system in the UK.

The equal tax treatment of equals, horizontal equity (HE), is often seen as one of the basic commands of tax systems, and correspondingly the departure from HE, horizontal inequity (HI), is generally avoided when designing tax systems. Even though there are reservations expressed about the relevance of the concept of unequal treatment of equals, see Kaplow (1989) and Kaplow and Shavell (2002), the HI notion keeps on holding a firm grip on the assessment of fair tax policies, both from an academic point of view, see recent contributions by Auerbach and Hassett (2002) and Dardanoni and Lambert (2001), and with reference to the general public debate. We argue in this paper that horizontal inequity measurement in the case of a two-rate tax system, such as the dual income tax system, both highlights and pinpoints the concept of HI. The argumentation for differentiated tax schedules raises important measurement issues concerning empirical identification of HI.

In the present paper we discuss HI effects of a dual income tax system by employing micro data to measure the degree of HI in Norway 2000–2008; a period covering the tax reform of 2006. The reform entailed a significant modification of the two-rate system, as it introduced a separate tax on dividends (above a normal rate of return), resulting in a tax system where top marginal tax rates on dividends and wage income are practically the same. It can be argued that the Norwegian tax reform of 1992 was revised in 2006 basically because the post-1992-system failed to deliver equal tax treatment of business owners who have chosen different organizational forms for their business activities, which accentuates the use of HI in the policy debate. Accordingly, we hypothesize that the tax reform has reduced HI.

Given that the aim of this paper is to provide focused information about HI effects of the reform, we shall not discuss vertical effects, rather we shall apply measures of dependence between pre-tax and post tax distributions for each year that are independent of the marginal distributions. This leads us to consider rank correlation measures of association between pre-tax and post-tax distributions, that is, to

the use of a *copula-based identification strategy*. Copula-based techniques for estimations of dependence between univariate distributions, in our case between the pre-tax and post-tax income distributions, give measures of association that are separated from the margins, including familiar rank correlation measures which are invariant with respect to monotonic transformations of the variables. Dardanoni and Lambert (2001) argue that such measures of association enable the comparability of HI in a cross-national setting; here we use them for comparisons over time in the same country. As only ordinal information is exploited, the identification strategy belongs to the part of the HI literature that focuses on the reranking of individuals in the transition from the pre-tax to the post-tax income distribution (often described as a “process” rather than an “outcome” measure of tax system effect). The measures of Atkinson (1980), Jenkins (1988), King (1983) and Plotnick (1981) belong to this strand of the HI literature; in contrast, measures focusing on the tax treatment of groups of equals belong to the so-called “classical” strand of the HI literature, including those of Musgrave (1990), Aronson, Johnson and Lambert (1994) and Duclos and Lambert (2000).

In the reranking line of the HI literature, in King (1983) and in Jenkins (1988) for instance, the “benchmarking” is done by constructing artificial (intermediate) HI-free rankings of post-tax incomes, and contrasting these with the actual post-tax income rankings. The copula-based estimation strategy achieves direct comparability, as Dardanoni and Lambert (2001) show: it follows from the mere definition of copulas as the copula function is independent of the margins. Dardanoni and Lambert present results in terms of a partial dominance relation, which involves checking whether the copula for one regime (a country in their case) is everywhere above or below the copula for another regime (according to 5×5 cumulated transition matrices in their application). Here we shall explore the development of HI over time in Norway, not using Dardanoni and Lambert’s copula dominance criterion but rather, for specific dependence structures, based on members of the Archimedean class of copulas; the Clayton, Frank and Gumbel-Hougaard copulas. The Clayton, Frank and Gumbel-Hougaard copulas exhibit left tail, centered and right tail dependence, respectively (Nelsen, 2006). Thus, in contrast to the closely related HI measurement of King (1983) and Jenkins (1988), where the measurement is based on summary indices of the degree of disassociation between rankings, parameterizations here are based on measures of dependence from the multivariate modeling literature. As copula estimates can straightforwardly be translated into correlation measures, results are presented in terms of two familiar indices of rank correlation, those of Spearman and Kendall.

The starting point for this version of HI measurement is that the pre-tax income ranking is given a separate normative value, which the post-tax ranking is assessed against; this is in contrast to a strictly

utilitarian approach that would not award any ethical value to the pre-tax income ranking: the post-tax utility levels and distribution are the guiding objectives of public policy in that case. However, the definition of pre-tax income is not straightforward, and especially not in the case of a dual income tax. In particular, the fact that the Norwegian tax reform of 2006 was announced several years in advance, introduced incentives to step up dividends prior to the reform, and accordingly to decrease them after the separate tax on dividends was in place. The strong timing effect, see Alstadsæter and Fjærli (2009) and Thoresen et al. (2011) for empirical evidence, creates a measurement problem. In addition to presenting HI estimates according to the standard definition of income, we therefore provide HI estimates for an alternative pre-tax income concept, which is constructed by assigning to the owners their entitlement to after-tax profits of the firm. Correspondingly, taxation (and the post-tax income ranking) after the reform is also influenced by this imputation method to define income: the amount of profits taxed (over the natural rate of return) is much higher under this income concept than according to the standard definition of income.

The paper is organized as follows: in Section 2, we review the relation between horizontal (in)equity and social welfare, as they relate to policy issues surrounding tax reform. In Section 3, we focus on the typical dual income tax system and its horizontal (in)equity characteristics. Section 4 fleshes out some detail on the copula-based identification strategy to be employed in the ensuing empirics and presents empirical results for Norway. Section 5 concludes with discussion of findings and ways forward.

2. Horizontal equity and social welfare

The importance of the concept of HE is disputed. One line of criticism of HE as a criterion for policy assessment has been put forward by advocates of the welfare economic framework. Recently this view has been expressed by contributors to the Mirrlees Review (Banks and Diamond, 2010, p.610): “Since we do not see a really good usable measure, we do not see a good reason to lower social welfare by using horizontal equity as the starting place for policy analysis.” A strict utilitarian would only care about *ex-post* utility in an evaluation of policy, and intermediate measures, such as pre-tax income, would not be given any ethical value. Thus, as argued by Kaplow (1989), HE is in conflict with the social welfare tradition.

The literature offers some perspectives which may be seen as yielding intermediate positions, such as that of Feldstein (1976a; 1976b), for whom horizontal inequity is based on utility rankings (not income rankings) with and without taxes, see also Rosen (1978) and King (1983). However, such analyses can

be criticized for not providing any good argumentation for awarding normative value to the no-tax utility alternative (Banks and Diamond, 2010; Kaplow, 1989).¹

The dismissal of HE as a criterion for policy evaluations is often based on a rejection of income as a suitable measure of taxable capacity, as seen in Banks and Diamond (2010). Whereas Kaplow (1989) focuses on the lack of normative significance for HE, Banks and Diamond denote the problem of finding a “really good usable measure” (p. 610) as similar to the problem of defining the capacity of an income unit to pay tax. Kay (2010), in his comment on Banks and Diamond (2010), emphasizes that measurement challenges do not mean that concepts should be ruled out. Kay refers to a number of characteristics which have crucial positions in everyday-life and yet lack exact meaning, such as beauty and kindness (p. 660). Similarly, HE and HI keep on having key roles in peoples’ assessment of tax policies even though exact meanings of the concepts may be hard to find, as also emphasized by Atkinson (1980).

The key position of HI argumentation in tax policy debate is clearly evidenced in the discussions leading up to the tax reform that we evaluate here. In fact, it is fair to say that it was concerns about HI effects of the preceding tax system which resulted in the 2006 reform. Accordingly, the expert committee proposing the main adjustments of the dual income system to be introduced by the 2006 tax reform suggested: “one should put more emphasis on the horizontal equity considerations” (Ministry of Finance, 2003, p. 30).

Accepting that HE is a norm for tax design, the next question is how to measure HE, or the departures from it which connote HI. HI measures can broadly be divided into two categories, as we already mentioned: the classical and the process measures. Estimates of HI are often based on two main perceptions of tax systems' vertical effects. According to the “classical view” (Musgrave, 1990), vertical redistribution is seen as the *average effect* on relative income differentials, whilst, according to the “no reranking perspective” (Atkinson, 1980; Plotnick, 1981), the vertical contribution is seen in the transformation from the given pre-tax income distribution to the given post-tax income distribution that would not create *procedural unfairness*, in terms of rank reversals. Classically, HI is measured as a subtraction from vertical redistribution, an outcome measure of tax system effect; for process measures, HI is both seen and measured as being “orthogonal” to a tax system’s vertical characteristics.²

¹ Banks and Diamond see no reason that this particular hypothetical alternative should be given normative significance.

² Indeed, in Dardanoni and Lambert (2001) it is made an axiom that the horizontal and vertical stances of a tax system should be independent (axiom 2, pp. 802-3).

3. The dual income tax and horizontal equity

The dual income tax system has gained new relevance through the Mirrlees Review, as already noted. Norway has a “dual income tax” system, enacted in a 1992 tax reform³ which consists of a combination of a low flat tax rate on capital income and progressive tax rates on labor income. The system proliferated throughout the Nordic countries in the early 1990s.⁴ The Norwegian version had a flat 28 percent tax rate levied on all income - from business, capital and labor - coupled with a progressive surtax applicable to labor income and the labor income part of business income. Double taxation of dividends was abolished, as taxpayers receiving dividends were given full credit for taxes paid at the corporate level, and the capital gain tax system exempted gains attributable to retained earnings taxed at the corporate level. These separate schedules for capital and labor income created obvious incentives for taxpayers to recharacterize labor income as capital income. To limit such tax avoidance, the 1992 reform introduced the “split model” for the self-employed and closely-held firms (defined as businesses in which more than two-thirds of the shares were owned by the active owner). Rules were established for dividing business income into capital and labor income, and the resulting imputed wage income was subject to a two-tier surtax. The top marginal tax rates for wage earners and owners of small businesses (the self-employed and owners of closely-held firms) were 48.8 percent and 51.7 percent in 1992.⁵ Between 1992–2004, both the threshold for the second tier of the surtax and the marginal rates increased. The top marginal statutory tax rate for high income wage earners was 55.3 percent in 2004, and the schedule for imputed wage income under the split model had a very complicated structure, implying highly non-convex budget sets, with marginal tax rates moving from 52.2 through 49.3, 28, to 55.3 percent, and then back down to 28 percent again as income increases.

The reform of 2006 emerged as an attempt to create a system that would prevent taxpayers from transforming labor income into capital income to benefit from the lower flat rate applied to the latter. Successful businesses found it advantageous to move out of the split model (with marginal tax rates as high as 55.3 percent), reducing their tax bills by paying themselves shareholder income instead of managerial wages. Sørensen (1994) describes the issue of taxation of income from small enterprises as “the Achilles heel of the system” (page 73), and Thoresen and Alstadsæter (2010) show (with reference to the Norwegian case) that for a particular group of business owners able to adapt, the

³ See Sørensen (1994, 2005a, 2005b), Cnossen (2000), Boadway (2004) and Genser and Reutter (2007) for more on dual income tax systems and Alstadsæter (2007) for more on the Norwegian version.

⁴ The dual income tax was introduced in Sweden in 1991, in Norway in 1992, and in Finland in 1993. The idea originated in Denmark, where it was implemented in 1985.

⁵ The rates for business owners were higher because social insurance contribution rates were higher, 10.7 percent rather than 7.8 percent. However, under the split model, for imputed wage income above NOK434,000 (USD70,000 according to the exchange rate for 1992), the social security tax goes down to 7.8 percent for business owners as well.

income gains from shifts in organizational form have been rather large. Under the 2006 tax reform, the split model was superseded by rules of a more general nature, with dividends taxed at both the corporate and individual levels, in contrast to the 1992 reform which had only corporate level taxation. The current tax is levied on individual dividend incomes above a rate of return allowance, that is, on profits above an administratively set normal risk-free rate of return.⁶ Also, marginal tax rates on wages were cut to narrow the differences between the marginal tax rates on capital income and labor income.

Thus, the HI problems of the Norwegian dual income tax before the 2006 reform come in two modes. Firstly, there is an obvious source of discrimination coming from a differentiated tax system *per se*. However, this argument is weakened by turning the attention towards life-cycle perspectives instead of the traditional one-period viewpoint. For instance, in a life-cycle perspective equal taxation of capital and labor incomes discriminates against “early earners” and “late spenders” and favours investment in human capital compared to financial investments and investments in physical capital (Sørensen, 1994; Genser and Reutter, 2007). Nonetheless, as Sørensen (1994) states, “It would seem difficult to defend the Nordic system of Dual Income Taxation by appeal to accepted standards of taxpayer equity”.

The second HI problem relates to the incentives for income shifting, as discussed above: some owners of small businesses were encouraged to choose incorporation into a widely held corporation, enabling them to reduce their tax bill by paying themselves shareholder income in place of managerial wages. As the opportunities for such tax reducing activities are non-equally distributed in the population, this is an obvious source of HI. In the income data this type of HI will be reflected by variations in tax burdens due to the composition of pre-tax income: the tax burden is reduced for an increased dividend part. The reform of 2006 implied a substantial change in incentives, which may have induced changes in the income composition, whence, as already hinted, we may find it advantageous for assessing HI to also use a modified income concept where firm profits are allocated to the individuals independently of the capital being transferred to individuals (in dividends) or saved in the firm (as retained earnings);⁷ we will return to this issue shortly.

It can be argued that the Norwegian tax reform of 1992 was revised in 2006 basically because the post-1992-system failed to deliver equal tax treatment of business owners who have chosen different

⁶ This revised version of a dual income tax system may be characterized as a “semi-dual” tax system, see OECD (2006, p. 81) for a discussion of terminology.

⁷ However these incentives are not operative for all owners of small business, for instance it depends on the level of capital intensity in the firm, see Thoresen and Alstadsæter (2010) for more details. We may expect organizational choices (before and after the reform) to have limited effect on the overall measures we address here.

organizational forms for their business activities. The introduction of a shareholder income tax in the 2006 Norwegian reform has made it less attractive to shift organizational form for tax reasons. Thus, we hypothesize that the tax schedule after the 2006 reform is horizontally more equitable than the pre-reform system.⁸

However, as the reform was anticipated, it creates a substantial measurement problem. The new tax on individual dividend incomes (above a rate of return allowance) gave incentives to step up dividends prior to the reform.⁹ This caused strong timing effects, as described by Alstadsæter and Fjærli (2009) and Thoresen et al. (2011). In the following we therefore present results for an alternative income concept too. The alternative income concept is obtained simply by multiplying after-tax profit by the individual ownership shares, using a shareholder register that comprises ownership data for all corporations and individual owners. It follows that this imputed return is the income base for the post-reform tax on dividends and that the tax in this respect is latent, see Thoresen et al. (2011) for more details about the methods that are used to approximate the tax on the imputed income.¹⁰ Thus, there are two well-known behavioral effects of tax changes (see Slemrod, 1992; 1995) that this alternative income concept may control for: income shifting (such as organizational shifts, just discussed) and timing effects. To the extent that the association between pre-tax and post-tax income rankings before the reform is affected by the change of income definition, it is expected that we observe less correspondence when imputing firm profits. One moderating factor is that business ownership is very much a high income characteristic in Norway (Lambert and Thoresen, 2009), which means that most business owners are found at the high end of the income distribution, both before and after the adjustments of the income concept. Accordingly, it is expected that the HI effects of the closing of the gap between wage income and dividend taxation by the reform will be more clearly captured by this alternative income concept, since dividend taxation is more pronounced and higher dividend taxation is expected to contribute to higher degree of association between pre-tax and post-tax rankings.

4. The measurement of HI using copulas

Perfect horizontal equity cannot be expected of a dual income tax. Even with no change in the dual income tax schedule, income distribution changes of themselves can have significant effects upon HI.

⁸ Note that the reform was phased in during 2005, which makes 2004 the last pre-reform year.

⁹ Most of the dividends were immediately reshuffled back into the corporations as “new” equity or loans from the owners, and thus represented only formal transactions with the single purpose to convert retained profits into contributed equity or debt, which can be returned tax-exempt to the owners despite the presence of a future dividend tax.

¹⁰ One of the complications is that unused allowances for the individual can be carried forward to be used for future dividend transfers.

If these changes are entangled with a reform of the dual income tax, this makes for additional complication, of course. Dardanoni and Lambert (2001) argue that comparisons of HI characteristics of different tax regimes should be based on measures derived from a copula function of the joint distribution of pre- and post-tax incomes, independently of the tax system's vertical stance (see their Axiom 2, p. 803).

The copula representation of the joint cumulative density function involves a separation of the measure of association and the margins: letting x and n be pre-tax and post-tax income respectively, the joint distribution $H(x, n)$ can be written in the form of a copula:

$$(1) \quad H(x, n) = C(F(x), G(n); \theta),$$

where the copula function, C , takes the margins $F(x)$ and $G(n)$ as arguments but the function itself is independent of these margins, and where θ is a dependence parameter; see for instance Trivedi and Zimmer (2005). Thus, in contrast to some other contributions in the HI literature, such as King (1983) and Jenkins (1988), for instance, where the “benchmarking” is done by constructing artificial (intermediate) HI-free rankings of post-tax incomes to be compared with the actual post-tax income ranking, the copula estimation implies that comparable measures are obtained directly from estimates of copulas. This follows from the monotonicity properties of the copulas.

A large number of copulas has been proposed in the literature, imposing different dependence structures on the data, see the survey by Nelsen (2006). We will apply copulas belonging to the Archimedean class of copulas; the Clayton, Frank and Gumbel-Hougaard copulas. They have the advantage of exhibiting left tail, centered and right tail dependence, respectively. Whereas Dardanoni and Lambert (2001) base the discussion of results on the copula dominance partial ordering, in terms of cumulated transition matrices, results here will be presented in terms of two well-known indices of dependence (in the range $[0, 1]$), Kendall's τ and Spearman's ρ . In contrast to another familiar measure of correlation, Pearson's correlation coefficient, these measures of rank correlation are copula-consistent, i.e. they are invariant to increasing transformations of the variables.

The Appendix contains a description of the data we have used to estimate the copulas. Figure 1 presents copula estimation results¹¹ for the three copulas applied (Clayton, Gumbel-Hougaard, and Frank) in terms of the two rank correlation measures (Kendall's τ and Spearman's ρ), and for two definitions of income; the standard income definition and the imputed firm return alternative (see

¹¹ Estimations are carried out by maximum pseudo likelihood estimation, employing the R package copula, see Yan (2007).

further discussion in Section 3). The conversion of the dependence parameter (θ , see Equation 1) into rank correlation measures is done by employing either closed form formulas (for Kendall's τ) or numerical approximations (for Spearman's ρ), see Kojadinovic and Yan (2010) for more details.¹²

The diagrams of Figure 1 basically show the same picture for both definitions of income: horizontal inequity has been reduced by the reform. Note that 2005 is used to phase in the reform, which means that 2004 represents the last pre-reform year, and 2006 is the first year with a fully revised system in place. Thus, these results strongly suggest that the dual income tax system has become horizontally more equitable after the reform. We see that the reduction in HI is larger for the definition of income which includes all firm returns both before and after the reform. This is to be expected: the effect of one of the instruments to narrow the gap between wage income and dividend taxation - the tax on dividends above a normal return - is more clearly picked up by this income concept as it avoids the dividend drought after the reform.

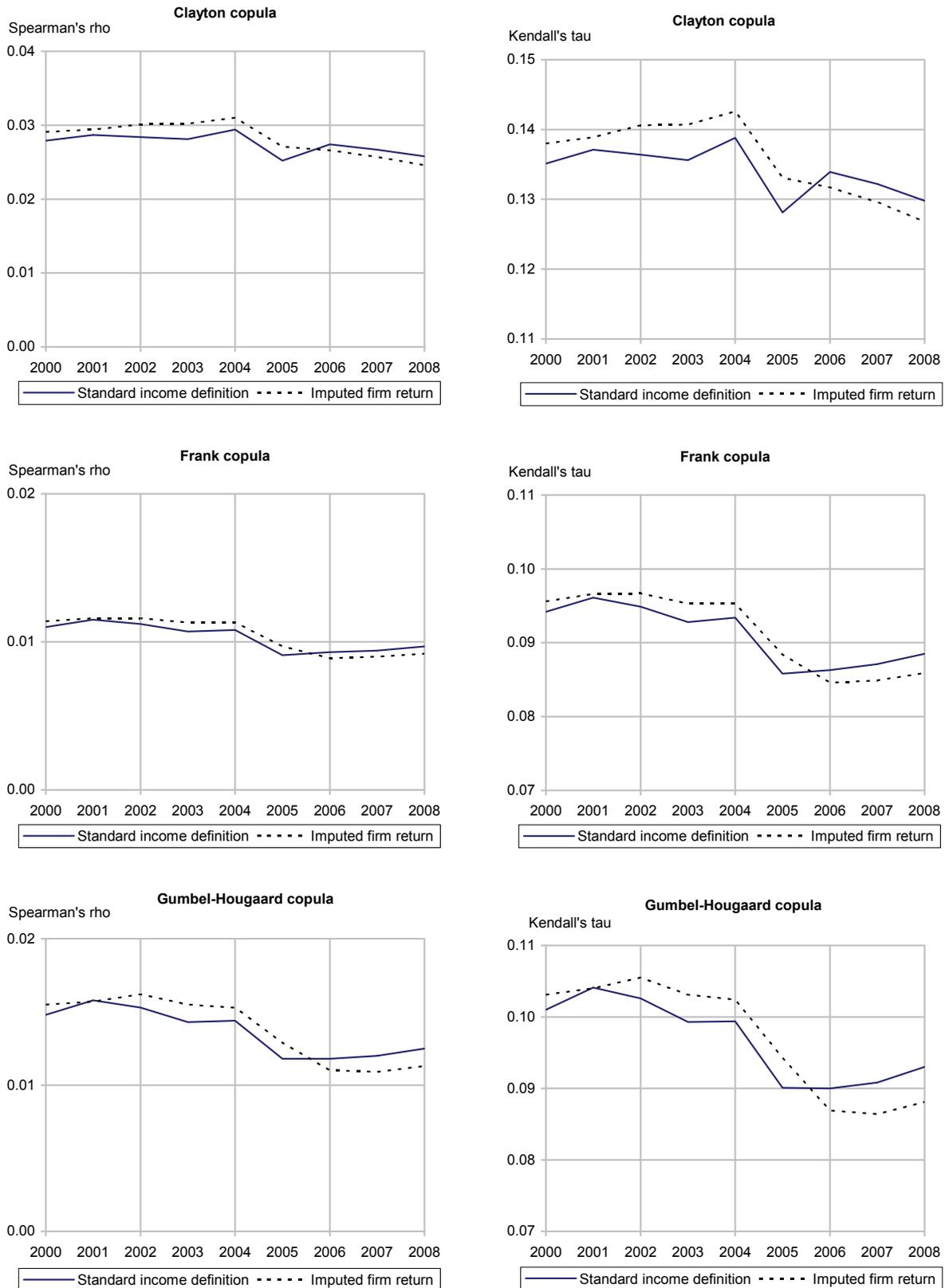
The main result, that the reform has reduced HI, is also independent of which copula is used, i.e., whether the Clayton, Frank or Gumbel-Hougaard copula is used to estimate dependence. However, we see some differences between the results, which reflect that the copulas put different weight on dependencies along the distribution. Although there are differences between how the dependence statistics, Kendall's τ and Spearman's ρ , transfer copula estimates into correlation measures, i.e. there are differences between them in terms of levels of HI reproduced, they basically show the same pattern for the development of HI.

Note that since our data hold income information on the whole population, we do not need to address issues of statistical uncertainty. However, there is model uncertainty, which means that information criteria (such as AIC and BIC) can be used to select among competing models, based on measures of the log-likelihood.¹³

¹² There are no easy analytical ways to find Spearman's ρ for the Clayton and Gumbel copulas, and we use the following estimation procedure: For each type of copula, and for a grid of 81 dependence parameters, we simulate 100 000 observations. For the Gumbel copula, the dependence parameters go from 8 to 12, with intervals of 0.05, for the Clayton copula from 10 to 14 with similarly spaced grid points. These two intervals cover all the parameter values seen in our empirical copula estimations. From these 100 000 observations, the empirical Spearman's ρ is found. We thus have 81 dependence parameters with corresponding observations for Spearman's ρ . These observations are then used to fit a smoothing spline, connecting the value of the copula's dependence parameter with the value of Spearman's ρ . Having determined a continuous relationship between the dependence parameter and Spearman's ρ (in the interval of interest), we can impute the value of Spearman's ρ for the dependence parameters found in our copula estimation. The same procedure is used to estimate both Kendall's τ and Spearman's ρ in the case of the Frank copula. In this case, the interval used in the dependence parameter grid is 0.2.

¹³ The measures of log-likelihood suggest that the Gumbel-Hougaard copula is preferable.

Figure 1. HI estimates for Norway 2000–2008 based on copula estimation: Clayton, Frank and Gumbel-Hougaard copulas



5. Summary

“Equal treatment of equals” or HE is a basic command of tax design, and in this paper we discuss how dual income tax systems can be evaluated in terms of violations of this directive. The reservations about HI expressed in the literature are not fully reflected in the policy debate concerning the design of the dual income tax system of Norway: it is fair to say, though, that the failure of the dual income tax system to deliver HE was an important reason for initiating a revision, resulting in the tax reform of 2006. Thus, this paper argues that the measurement of HI for a dual income tax system is still relevant in a policy context.

We find that the politicians have succeeded in reducing the HI of the Norwegian dual income tax system by the modification of the system in 2006. Given the relevance of dual income tax systems for tax schedule design, policy-makers should be aware of potential HI problems of dual income systems, such as the effects of the rather clear-cut version of a dual income tax prevailing in Norway before 2006.

As for the empirical estimation, it is suggested that practitioners should consider measuring HI by addressing copula-based estimates of dependence, as this estimation technique establishes a framework for over time comparison of HI directly. Moreover, the evaluation of a dual income tax system over a time period which includes a pre-announced tax reform creates measurement challenges that need to be addressed in an empirical evaluation. In the present case we answered this challenge by constructing a new income concept that picked up the HI effect of the reform strikingly well. In order to address fully the HI effects of organizational shifts, which in the Introduction was held up as a major motivation for the present tax reform, we will undoubtedly need longer time series of data after the reform, as some adjustments are expected to be slower. Then we can also assess to what extent the firm owners have found other means to circumvent the new tax on dividends, which may create other sources of HI.

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Appendix: Data descriptions

The primary source of data for this study is the Income Statistics for Households (Statistics Norway, 2010a). These statistics hold register-based information on the whole population, derived primarily from information retrieved from all income tax returns in the Directorate of Taxes' Register of Personal Taxpayers, but also from other administrative registers, such as data from the Labour and Welfare Organisation. The Income Statistics for Households succeeded the Income Statistics for Persons and Families recently, when household data were obtained from registers too, with the establishment of the Ground Parcel, Address and Building Register in 2004 (Statistics Norway, 2009a). Prior to that information about household income was obtained through a sample survey, as households were interviewed about household composition.

The household is often considered as the basic economic unit for decisions and allocations concerning distributional aspects, but for the purpose of this study, covering the time period 2000–2008, the data limitations mean that we only have register-based household information for all Norwegians for the latter part of the time span. As it is preferable to have data for the whole population throughout the period, income at the family level is used as the main measure. However, as argued in Thoresen et al. (2011), results are most likely independent of whether sample survey household data or register-based family data are used.

Note that incomes are measured in “equivalent values”, which means that the nominal values of aggregate income of the household or family have been weighted by an equivalence scale (the square root of the number of household/family members). The representation of each household/family when obtaining summary measures of redistributive effects depends on the number of household/family members; this is often characterized as employing the individual as the unit of analysis. Thus, incomes have been readjusted for interpersonal comparison similarly to what Ebert (1997) denotes as “Method 3”.

A main reason for the preference for register data is their connection to firm data, which is necessary in order to provide measures that control for the timing effects influencing dividend payouts. Information on firm results must be linked to individuals in some way: here this is achieved by connecting information about profits from the Accounting Statistics for Non-Financial Limited Companies (Statistics Norway, 2010b) to individuals, using the Register of Shareholders (Statistics Norway, 2009b) as the bridge between firms and individual owners.