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Abstract

Modern welfare states provide social protection benefits not only directly through the public sector but also through the private sector in conjunction with governmental engagement, e.g., by mandating employment-based provisions and giving tax breaks for voluntary transactions. Countries with sufficient social support provided largely via the private sector are called hidden welfare states. Integrating such private social expenditures, this paper estimates the overall distributive impacts of social protection systems in OECD countries, using the SOCX data base. Taking into account measurement biases in income inequality indices and reverse causality stemming from policy formation decisions, it found that the overall distributive impact decreases as the provision of social support relies more on the private sector and has no statistical difference from zero in some hidden welfare states.

Keywords: Private social expenditure, Hidden welfare state, Income redistribution, Dynamic panel model

JEL classification numbers: H53, I38, P51

1 Introduction

Modern welfare states rely more or less on the provision of social support through private sector to achieve social welfare goals. For example, they mandate or encourage employers to provide employees with such social protection services as health care plans, private pensions, sickness pay, and family cash benefits. They also try to induce individual households to purchase those services at markets. We often observe tax advantages given to such private provision of social protection at the employment and household levels.

The size of social protection provided through the private sector is fairly large for several advanced nations. Howard (1993) first emphasized the importance of government-engaged private provision of social protection, focusing on the vast uses of tax expenditures for social purposes in the U.S. The U.S. has been conventionally perceived as one of the smallest welfare states among developed nations. This is because we look only at direct spending on social benefits by the public sector. Taking into account tax expenditures for social purposes and government-engaged private provision of social benefits, we will find that the U.S. is a welfare state with a sizable provision of social protection almost as large as the traditional welfare states in Scandinavia and Continental Europe. This finding led Howard (1993) to refer to the U.S. as the *hidden welfare state*. A series of Adema and his coauthors' work substantiated this argument by establishing the notion of *private social expenditure*, which captures the government-engaged private provision of social protection benefits. They quantified the magnitudes of private social expenditures for several OECD countries and initiated the adjustments of social benefits made necessary by the effect of the tax system.[1)]

[1)] See Adema et al. (1996), Adema and Einerhand (1998), Adema and Ladaique (2009), and

Once social benefits are partly provided through the private sector, providing greater social support is one thing and achieving more equal income distribution is another. The larger provision of social protection does not necessarily achieve a more equal distribution of income, in particular when the system relies on private provision, regardless of how guided it is by governmental intervention. In the sociology and political science literature, a close interplay between the distributive impacts and design features of a social protection system has been extensively discussed.[2)] Although most discussions have been limited to design issues in the public domain, such as targeting versus universalism and flat-rate benefits versus earnings-related ones, they should also encompass the problem regarding private arrangements in the provision of social protection.

Recently, demographic aging and globalization of the economy have been pressing governments in some advanced nations, e.g., Japan, to engage in fiscal adjustments as one of urgent policy challenges. Increasing reliance on private provision of social protection may be the inevitable decision in the near future for them. From this point of view, the distributive impacts of private arrangements in social protection provision is an issue that has received much attention across the advanced nations as fiscal burdens from the public provision of social support increase owing to those drastically-changing social and economic environments.

It is, therefore, of paramount importance from positive and normative grounds to investigate how large distributive impacts are caused by the public-private mix in the social protection system. However, even in the economics literature, no quantita-

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Adema, Fron, and Ladaique(2011).

[2)] See Espring-Andersen (1990), Castles and Mitchell (1992), Howard (1993), and Korpi and Palme (1998) among others. The design issues having been argued are over the size and scope of public programs, such as targeting versus universalism and flat-rate benefits versus earnings-related ones.

tive method has been applied to gauge them except a few rudimentary cross-country regression analyses, in contrast to the extensive analyses conducted on the distributive impacts of taxes and public cash transfers.[3)] This is probably due to the lack of cross-country data sets about the private provision of social protection durable enough to conduct a rigorous quantitative analysis.

Fortunately, the recent OECD *Social Expenditure database* (SOCX) seems to have accumulated information requisite for more advanced empirical analysis. Constructing a panel data set based on this database, we will attempt to quantitatively measure the distributive impacts of social protection systems in OECD countries. In this attempt we will address some econometric issues such as the model specification, measurement bias in income inequality indices, and reverse causality related to policy formation.

Our estimation reveals that the distributive impact of a social protection system is reduced to quite a large extent by its private arrangements of social support. We find that in some countries such as the U.S., Switzerland, Iceland, Netherlands, Korea, Canada, and the U.K., the impacts are too small to have statistical significance. This finding is in sharp contrast to the papers, such as Whiteford (2008), that emphasize public cash benefits as the most important factor that reduces inequality. Because their distributive impacts are mitigated or almost nullified by private arrangements, we should highlight the role of household taxes and contributions to public social programs in easing income inequality.

The paper is organized as follows. Section 2 explains how the private arrangements of social protection affect our conventional view of the size of the welfare sates, following a series of Adema's work and Howard's (1993) *Hidden Welfare State*

[3)] See Immervoll et al. (2006), Whiteford (2008), Niehues (2010), and Fuest et al. (2010) among others.

argument. It also introduces the net concept of social expenditure, which adjusts the effects of tax system on the gross concept of social expenditure, a measure conventionally used to gauge the size of a welfare state. Section 3 reviews past studies, Castles and Obinger (2007), Caminada and Goudswaard (2005), Goudswaard and Caminada (2009), that attempted to quantify the distributive impact of private provision of social protection using the same database as ours. We will note deficiencies in their analysis related to a potential bias in the measurement of income inequality and reverse causality stemming from policy formation.

Section 4 explains our panel data set and empirical strategy. We will estimate both the static and dynamic fixed-effect models. The system GMM technique pioneered by Arellano and Bond (1991) is used for the latter. To emphasize the issue of model specification, we will estimate a model similar to Goudswaard and Caminada's (2009) on our own data set as a preliminary analysis and show that their results lose robustness if we add an interaction term between public and private social expenditure to the model. We will then propose another specification consisting of the net total social expenditure (the sum of tax-adjusted public and private social expenditures), the ratio between the net public and net private social expenditures, and their interaction term. We will argue that this specification squares more with the discussions in section 3.

Section 5 discusses our empirical results. We will first use the Gini index and show that the net total social expenditure has a negative (equality-enhancing) coefficient, and its interaction term with the ratio between the net public and private social expenditures has a positive (inequality-enhancing) coefficient, both of which are statistically significant. The results do not qualitatively change if we estimate a dynamic panel model with the system GMM technique. Neither do they change

if we alternatively take either of the ratio of average income between the top and bottom 20% of the households and the decile dispersion ratio as the measure of income inequality. Making use of these estimation results, we will predict how much income inequality is reduced by a social protection system consisting of both public and private provision. We find that when we use the Gini index, there are some countries for which we cannot reject at 95% statistical significance a null hypothesis that the social protection system has no distributive effect. A similar pattern of predictions is observed when we use the other inequality indices. Section 6 concludes this paper. Tables and figures are collected in the appendix.

2 Private social expenditures and hidden welfare states

2.1 Private arrangement of social protection

Welfare states have traditionally relied more or less on the private sector, i.e., markets, as an alternative to the government to provide social protections for citizens. The extent of such private arrangements varies considerably across countries. Relying on the private provision of social protection does not necessarily mean *laissez-faire*. Rather, the governments employ a variety of direct and indirect interventionist policy tools to enhance social protection. These tools include mandating employment-based provisions of various social protection services and giving tax advantages to several types of them.

Nonetheless, as we measure the amount of social protection effort exerted by each welfare state, which we call *social expenditure*, it is necessary to exclude purely private spending that contains no *ex ante* element of redistribution. Let us clarify

the concept first. According to the OECD *Social Expenditure database* (SOCX), which is the only available comprehensive source of information about public and private provision of social protection, social expenditures are defined as the benefits provided by public and private institutions that address social purposes and involve interpersonal redistribution or compulsory participation.[4)]

Expenditure programs are thus considered social if participation is compulsory or if entitlements involve interpersonal redistribution of resources (Adema and Whiteford, 2010, p.125). In-kind services, the largest category of which is health services, are included as far as they are considered for social purposes. On the other hand, benefits from private pension plans are not categorized into social expenditure if they are designed actuarially fair at individual levels and hence expected to entail no redistribution factors *ex ante*. Intra-family provision of social support is not counted as social expenditure either.

It is of little substance to delimit the provision of social protection between public and private if we are concerned only about how much aggregate social protection benefit is provided in a welfare state. The SOCX database reflects this idea in that it distinguishes between them solely based on whether a public or private institution controls the relevant financial flows. In terms of the impacts on income distribution, however, private provision should exhibit significant differences from public provision. This may be in part because private provision includes arrangements of social protection conducted on the basis of voluntary transaction in the markets or negotiation between employers and employees in the work place.

The concept of private social expenditure requires a more detailed explanation

[4)]The SOCX database groups benefits with a social purpose in nine policy areas: old-age, survivors, incapacity-related benefits, health, family, active labor market policies, unemployment, housing, and other social policy areas (Adema and Ladaique, 2009, pp.16–20).

because it does not seem very familiar even to public finance economists. Private social expenditures can be categorized into two types, mandatory and voluntary. Following Adema and Whiteford (2010, pp.124–125), mandatory private social expenditures include legally stipulated employment-related incapacity-related cash transfers, such as sickness, disability and occupational injury benefits, mandatory employer-provided retirement allowances (severance payments toward retirement) and pensions derived from mandatory (individual and/or employer) contributions. On the other hand, voluntary private social expenditures include social services provided by NGOs, employer-provided (perhaps on basis of a collective agreement) income support during child-related leave or sickness, and pensions derived from employer contributions or fiscally advantaged individual contributions.

According to Adema et al. (2011), the largest component of private social expenditure overall is old-age pensions, which account for some 68% on OECD average in 2007. However, exceptional is the U.S., where, as well known, a large part of health care benefits are provided on the basis of employment. In fact, more than half of private social expenditure is related to health spending in the U.S. Further, following the categorization above, its most part belonged to the voluntary private social expenditure before the Affordable Care Act stipulated the employer mandate, legally requiring employers with more than 50 full-time equivalent employees to provide health care insurance to their workers.[5)]

[5)] See Adema and Whiteford (2010) for a concise summary of discussions about public and private social expenditure. For more detailed discussions, see Adema et al. (1996), Adema and Einerhand (1998), Adema and Ladaique (2009), and Adema, Fron, and Ladaique(2011).

2.2 Gross and net social expenditures

Another innovation that the SOCX database proposes in measuring the amount of social protection effort by a welfare state is the effects of the tax system. In some countries, the public sector uses the tax system to claw back a fairly large part of the benefits that it once paid out to the citizens, e.g. by including them into the income tax base or by making the recipients pay indirect taxes when they consume out of the benefit income. On the other hand, there are some countries where the government gives tax advantages and subsidies to publicly or privately provided social protection. A typical case is the employer contributions to occupational heath insurance, which are treated as tax-exempt for both employers and employees. The child tax allowances provided for families raising children also serve the same role as giving them direct cash benefits.

To accurately measure the amount of resources devoted to the provision of social protection over all citizens in a welfare state, it is necessary to adjust these effects produced by the tax system. The *net* concept in the measurement of social expenditure addresses such adjustments toward the *gross* concept that has been conventionally used to measure the size of a welfare state. The net social expenditure is calculated by subtracting the benefits clawed back to the public sector from the gross social expenditure and adding tax breaks and subsidies prepared for social purposes.[6)]

[6)] As known well, it is debatable which tax breaks should be treated as tax expenditures, because the judgement depends on the desirable model of tax system. For example, the SOCX database does not take account of tax breaks for pensions. For more detailed discussions about the treatment of taxes in the measurement of social expenditure, see Adema and Ladique(2009, pp.30– 44).

2.3 Hidden welfare states

Based on the most recent SOCX database, Table 1 depicts gross public, net public, and net private social expenditures as percentages of GDP for OECD countries. Because the net social expenditures adjust the amounts of indirect taxes paid out of benefit incomes, it is considered more appropriate to relate them to GDP at factor costs, instead of GDP at market prices, for the purpose of viewing them relative to the size of aggregate economic activities.[7)]

Column (A) shows gross public social expenditures (measured in a percentage of GDP at market prices), in which Scandinavian and Continental European countries are ranked at the top position and the Anglo-Saxon countries are generally at the bottom. Column (B) converts gross public social expenditures into net public social expenditures (measured in a percentage of GDP at factor costs). We see that countries positioned higher in column (A) tend to claw back the larger portion of gross benefits by the use of the tax system. Column (C) lists net private social expenditures (measured in a percentage of GDP at factor costs). While the numbers are smaller than those in column (B), we observe a wide variety across nations in Column (C). Column (C)/(B) then reveals that countries ranked around and below the middle at Column (A) tend to rely more on the net private social expenditure than on the net public one in the provision of social protection.

Column (B)+(C) indicates net total social expenditures, the sum of net public and net private social expenditures. As we argued previously, this is the measure of aggregate social protection effort exerted by each welfare state that we will focus our analysis on in this paper.

Comparing (A) with (B)+(C) reveals how much international diversity in gross

[7)] This point has been emphasized by Adema and Ladaique (2009, p.45) among others.

public social expenditure shrinks when we view it in terms of net total social expenditure. Some countries ranked low in terms of gross public social expenditure are ranked high or in medium positions in terms of net total social expenditure. The epitome is the Unites States. As Howard (1993) referred to it as a *Hidden Welfare State*, the United States is the third largest welfare state among the listed OECD countries in terms of net total social expenditure, while being the 6th from the bottom in gross public social expenditure. We also find the coefficient of variation to decrease from 0.23 in terms of gross public social expenditure to 0.19 in net total social expenditure.

As argued previously, the distinction between public and private social expenditures is almost irrelevant as far as aggregate social benefits are concerned. They entail diverse consequences on income distribution, however. Presumably, the financing of private social expenditures is considered less redistributive than that of pubic social expenditure. The distribution of social benefits across households also seems less income-equalizing when they are provided privately. This is in part because private arrangements are based on voluntary transactions or agreements in a narrower social group related to employment even when they are mandatory. From the point of *ex ante* economic incentives, private provision of social support may even aggravate the inequality of income before taxes and public cash transfers.

3 Literature review and preliminary considerations

3.1 Previous studies

As Ameda, Fron, and Ladaique (2011, p.22) report, some countries have increased the role of private social benefits and some have decreased it. Currently, when many advanced countries are facing with fiscal adjustment driven by demographic aging and global competition, the private provision of social protection is one of the options that will serve this purpose. Its distributive impact is thus definitely an important policy issue. Nonetheless, few studies have investigated it quantitatively in part because the SOCX database did not accumulate sufficient information on private social expenditures until recently that researchers were finally able to perform rigorous empirical investigation. To our knowledge, Castles and Obinger (2007), Caminada and Goudswaard (2005), Goudswaard and Caminada (2009) are the only exceptions that quantified the distributive impact of a social protection system using both net public and net private social expenditures. In the rest of this paper, we will articulate the distinction between gross and net if we consider it necessary to do so, but otherwise we will omit these prefixes to avoid repeating somewhat cumbersome terminologies. The three categories of net social expenditure are hereafter referred to simply as public, private, and total social expenditure. Let us now briefly review only the parts of those papers that are closely related to our analysis.

Castles and Obinger (2007) examined correlations between the three categories of social expenditure and income inequality indices such as poverty rate and Gini index respectively. According to the results, public social expenditure is negatively associated with income inequality and private social expenditure is positively associ-

ated, although the latter is not statistically significant. Total social expenditure also shows a negative correlation with Gini index, which is not statistically significant, either. Of course, these correlations do not imply causality.

Caminada and Goudswaard (2005) conducted a cross-sectional OLS analysis, estimating the following simple regression equation:

$$Gini_i = \beta_1 \, NetPub_i + \beta_2 \, NetPriv_i + \mu + \varepsilon_i, \tag{1}$$

where $NetPub_i$ and $NetPriv_i$ are respectively country i's net public and net private social expenditure, μ is a constant, and ε_i an idiosyncratic error term. $Gini_i$ stands for the post-redistribution Gini index of income inequality, which is calculated from the distribution of *disposable* income.[8] The sample consists of only 16 countries, and no control variable is used in the estimation. The results show that $\hat{\beta}_1 < 0$ and $\hat{\beta}_2 > 0$ and they are statistically significant.[9] They also conducted estimation with only net total social expenditure used as an independent variable and obtained a negative, statistically insignificant coefficient.

Although in the same spirit as Caminada and Goudswaard (2005), Goudswaard and Caminada (2009) conducted a somewhat different estimation on a sample consisting of 25 countries. They took the difference between pre- and post-redistribution Gini indices as the dependent variable and investigated the contribution to inequality reduction by each category of social expenditure. The results show that public social expenditure has a positive (inequality-reducing) and significant impact, and private expenditure has a negative (inequality-increasing) significant impact, similar to the results in their previous paper. However, in this paper, they also found that total social expenditure has a positive (inequality-reducing) and significant impact.

[8] They also conducted the same model using other income inequality indices such as Decile ratio and Atkinson indices and obtained similar results.

[9] A coefficient with '^' indicates its estimated value.

3.2 Sources of endogeneity

Private provision of social protection exacerbates income inequality. This is a common message that the three previous studies deliver to us. However, their estimation employed no control variables that possibly correlate with both income distribution and social expenditures. Their absence makes the consistency of estimation questionable although it is more likely intended to avoid losing the degree of freedom.[10)] A minimum set of regressors to reduce endogeneity should include variables that can control economic trends and demographic structures.[11)]

We will also have to pay attention to the following two other possible sources of endogeneity. The first is an innate bias in income inequality indices, noted by Adema and Whiteford (2010). This bias occurs because the standard definition of each household's disposal (after-tax) income treats contributions to public and private social programs asymmetrically. In the calculation of disposable income, the former is subtracted from market income while the latter is not, as the former is treated as taxes and the latter as savings. But if contributions to public programs are linked to future benefits, such asymmetric treatment eventually makes income distribution look more unequal in countries relying more on private social expenditure.

Employer contributions complicate the direction of distortion, however, because the problem of shifting toward employees' wages arises. Employer contributions are prevalent even in countries with large public social expenditures, and the total split ratios between employers and employees vary greatly across countries. As a result, it is *a priori* ambiguous how much and in which direction more reliance on the private

[10)] The sample size in Goudswaard and Caminada (2009) is 25 at most.

[11)] We may also need to control the tax progressivity if it fluctuates over time and correlates with social expenditures. But in our dynamic panel approach, where we introduce a lagged income inequality index as a dependent variable, the distortionary effect of tax progressivity on estimation may be minimized.

provision of social support distorts income inequality indices.

The second is the reverse causality driven by endogenous policy choice; past income inequality may affect social policy formation today. Political interaction between income inequality and social policy design has been discussed extensively in the literature, although no paper has addressed government-guided private provision of social support. Nonetheless, Korpi and Palme (1998) and Conde-Ruiz and Profeta (2007) are very suggestive about the reverse causality related to our analysis. Korpi and Palme (1998) is well known in sociology for *the Paradox of Redistribution*. It argues that a more targeted program achieves a smaller size of redistribution because it obtains less sufficient political support. Conde-Ruiz and Profeta (2007) developed a rigorous voting model of public pensions and showed that a society with more unequal income distribution tends to choose a more targeted, *Beveridgean*, program supported by a coalition of the rich and the poor. The rich prefers higher returns from private pension programs, while the poor want larger benefits from a targeted public program. These papers suggest a reverse causality germane to our analysis: A society with more equal income distribution tends to choose a larger size of social protection system that relies less on private social expenditure.

4 Data and empirical strategy

4.1 Data

We constructed our unbalanced panel data set of 26 countries with 5 periods spanning from 1990 to 2014 solely based on the OECD.Stat data base, including the SOCX database for social expenditures. Each period consists of consecutive 5 years, and we take the simple averages for each period because the data of income inequal-

ity and net social expenditures are not available every year. We chose 1990 as the start of our data set because the data on net social expenditure before 1990 look premature and are available only for a very limited number of countries. Our pick of 26 countries is the 25 countries used in Goudswaard and Caminada (2009) plus Spain; Spain is added because its data consist of three consecutive periods. In fact, the dynamic panel data approach we will conduct later requires each country to have data for at least three consecutive periods in order to formulate the moment conditions used for the system GMM analysis, while the fixed-effect estimation minimally requires two consecutive periods. But to make the estimation results comparable between these two analyses, we will use the same data set for both analyses.[12)]

Table 2 displays the summary statistics of our key variables.

We will use three different inequality indices listed in the table, *Gini*, *Ineq8020*, and *Ineq9010*, all of which are based on the distribution of disposable, or after-tax, income adjusted by the equivalent scale of each household. Needless to say, *Gini* is the Gini index of income inequality, which we centupled to facilitate presentation of the estimation results. *Ineq8020* means the ratio of the average income of the top 20% to the bottom 20%. *Ineq9010* is the decile dispersion ratio, representing the ratio of the lower bound among the top 10% highest income to the upper bound among the bottom 10% lowest income. *NetPub*, *NetPriv*, and *NetTotal* indicate the net public social expenditure, net private social expenditure, and net total social expenditure, respectively.[13)] They are measured as percentages of GDP at factor

[12)] Chili, Estonia, Greece, Hungary, Israel, Mexico, Slovenia, Turkey, Latvia are excluded because their data are available only for less than three periods. We also excluded Mexico because its net private social expenditure is recorded negative in a period. In our data set, Korea, Poland, Switzerland are the counties whose available data are only for two periods.

[13)] We calculated net private social expenditure by subtracting net public social expenditure from net total social expenditure in the SOCX database.

costs.[14] *PrivPubRatio* is the ratio of net private social expenditure to net public social expenditure, i.e. *NetPriv*/*NetPub*, scaled in percentage terms. Countries with a ratio higher than 20% in some periods are Canada, Iceland, Japan, Korea, Netherlands, the U.K., and the U.S., while those with a ratio lower than 5% in some periods are the Czech Republic, Finland, Italy, Luxembourg, New Zealand, Poland, Slovak Republic, and Spain. Because of our relatively small sample size, we will use only three control variables in our main empirical analysis, *Ageing*, *Unemp*, and *GDPph*, which are the ratio between populations aged over 65 and those from 20 to 64 (scaled in percentage), unemployment rate (scaled in percentage), and GDP per capita (measured in 1000 US dollars at constant prices and PPPs), respectively.

4.2 Preliminary regression analysis

Before explaining the details of our estimation strategy, let us estimate a model similar to the one employed in Camidana and Goudswaard (2005) on our panel data set as a preliminary analysis. This analysis is meant to show the possibility of the model misspecification in their analysis and emphasize the importance of introducing into the model the interplay between public and private social expenditures.

We will first estimate a simple fixed-effect model in the spirit of Camidana and Goudswaard (2005),

$$INEQ_{it} = \beta_1 NetPub_{it} + \beta_2 NetPriv_{it} + \boldsymbol{X}_{it}'\boldsymbol{\gamma} + \mu_i + \mu_t + \varepsilon_{it}, \tag{2}$$

[14] The data of net social expenditures in the SOCX database are all reported in percentages of GDP at market prices to facilitate comparison with gross public social expenditures. But as emphasized by Adema and Ladaique (2009, p.45) among others, it is more appropriate to relate them to GDP at factor costs because the net concept of social expenditure adjusts the payments of indirect taxes. We converted them to percentages of GDP at factor costs using the data of gross value added at basic prices (excluding FISIM) reported in the OECD national account statistics. We also conducted the same regression analyses as we will develop below by using the net social expenditure indicators measured as percentages of GDP at market prices and verified that the results did not change qualitatively.

where $INEQ_{it}$ is an income inequality index, μ_i a country-fixed effect, μ_t a time-fixed effect, $\boldsymbol{X}_{it}$ a vector of control variables, $\boldsymbol{\gamma}$ the corresponding vector of their coefficients, and ε_{it} an idiosyncratic error term. We use the same sample of countries as Camidana and Goudswaad (2005) used, excluding only Spain from our own data set.[15] Here, we employ *Depend* and *Unemp* as control variables for estimation results that elucidate our point. Time fixed effects are introduced for periods from 1995 to 2000 (μ_2) and from 2005 to 2010 (μ_4). Adding μ_2 intends to capture the special impact of the New Economy and μ_4 does the same for the Great Recession.

The results are summarized in Table 3.

First, observe case (i), where *Gini* is used as $INEQ_{it}$. The result shows that public social expenditure enhances income equality but private expenditure aggravates it. The estimated impacts are both statistically significant as in Camidana and Goudswaard (2005). The signs of the coefficients estimated for the control variables except *Unemp* square with what we expect, although not necessarily statistically significant.

These results may appear reasonable. However, the specification in (2) itself pays no attention to institutional arrangements in a social protection system, assuming that public and private social expenditures are separable in their distributional impacts, having common and constant coefficients across countries.

Let us now add the product of *NetPub* and *NetPriv* as a new independent variable. This is perhaps the most convenient way to capture the interplay between

[15] Couriously, when we included Spain in the data set and estimated the same equation, we could not have the similar results reported in this section. This may be another sign that the model employed here is misspecified.

public and private social expenditures. The model to estimate is now

$$INEQ_{it} = \beta_1 NetPub_{it} + \beta_2 NetPriv_{it} + \beta_3 (NetPub \times NetPriv)_{it}$$
$$+ \boldsymbol{X}'_{it}\boldsymbol{\gamma} + \mu_i + \mu_t + \varepsilon_{it}. \tag{3}$$

Observe case (ii) in Table 3, where *Gini* is used as $INEQ_{it}$. Once we introduce the interaction term, *NetPriv* is insignificant while the interaction term itself is significant. This suggests that regression models like (2) are misspecified. The positive coefficient of the interaction term implies that the private social expenditure aggravates income inequality as before. But, more importantly, it shows that the income-equalizing effect of public social expenditure decreases with the size of private social expenditure.

When we use *Ineq8020* and *Ineq9010* instead as $INEQ_{it}$, introduction of the interaction term convinces us of a misspecification in (2) as much, showing different patterns of changes in the estimation results. In the case of using *Ineq8020*, comparing the results between cases (iii) and (iv) reveals that not only the interaction term exhibits a significant impact but so does *NetPriv* in spite of being insignificant without it. In the case of using *Ineq9010*, on the other hand, the results in (v) and (vi) demonstrate that *NetPriv* continues to be insignificant while the interaction term turns out significant.

4.3 Empirical strategy and hypotheses

Comparing the estimation results between models (2) and (3) vindicates that repercussions between public and private provisions play a key role in understanding the distributive impacts of a social protection system. However, the use of the interaction term as in (3) is only a convenient way to capture such effects without considering the economic meaning in this particular context. It does not seem

straightforward to understand the economic mechanism that the interaction term suggests. Nor does it seem clear to what extent the use of the interaction term squares with the view proposed by the SOCX database; for example, the social protection effort by a welfare state should be measured by its net total social expenditure. In addition, estimating a model like (3) may still suffer from a lack of consistency due to the endogeneity problems of the potential bias in income inequality indices and the reverse causality discussed above.

4.3.1 The fixed-effect model

From these points of view, we will propose the following model. The key regressors consist of the net total social expenditure, the ratio between the net public and private social expenditures, and their interaction term.

$$\begin{aligned} INEQ_{it} = \beta_1 NetTotal_{it} + \beta_2 PrivPubRatio_{it} + \beta_3 (NetTotal \times PrivPubRatio)_{it} \\ + \boldsymbol{X}'_{it}\boldsymbol{\gamma} + \mu_i + \mu_t + \varepsilon_{it}. \end{aligned} \tag{4}$$

Admittedly, this is another convenient specification to quantify the distributive impact of a social protection system. While the interaction term is meant to pay attention to its institutional arrangements, none of the details are specified there. Nonetheless, as compared to (3), it allows us the following straightforward interpretations of the combined distributive effects of public and private social expenditures. First, the use of *NetTotal* conforms to the SOCX database's spirit of not discriminating between public and private provisions of social protection at the aggregate expenditure level. We expect $\beta_1 < 0$. Second, interacting with *PrivPubRatio*, *NetTotal* captures the difference between public and private social expenditures in the marginal impact on income inequality. As we expect $\beta_3 > 0$, a larger net total social expenditure reduces income inequality as it relies more on public provision.

Third, as an isolated independent variable, *PrivPubRatio* is introduced to minimize the estimation bias possibly caused by the distorted measurement of income inequality indices. The sign of β_2 is *a priori* ambiguous as we have argued before, however, because the direction of the bias is complicated by the shifting of employer contributions.

To be noted, the impacts of a social protection system on income inequality we are estimating below include something that is attributable to the changes in *ex ante* incentives for economic behavior. Households choose their work efforts and savings in response to a given array of expected social supports, affecting in turn the distribution of market income realized before redistribution by taxes and public cash transfers takes place. Methodologically, this feature of our analysis contrasts with the previous studies focusing only on *ex post* redistributive impacts of household taxes and public cash transfers, such as Immervoll (2006), Whiteford (2008), Fuest et al. (2010). These studies employed an accounting approach that allows us to pay attention only to how taxes and public transfers change income inequality taking as given the inequality of income distribution realized before redistribution policy is carried out.[16)]

4.3.2 The dynamic panel approach

Our empirical strategy also needs to address the endogeneity issue caused by reverse causality. Our claim is that a society with less equal income distribution tends to choose the smaller public social expenditure and the larger private one. Considering this possibility, our three relevant independent variables in (4) are all potentially endogenous. It thus seems almost impossible to determine a set of outside instruments

[16)] Niehues (2010) used the same econometric approach as ours, though she addressed only the distributive impacts of governmental transfers.

that we can plausibly argue have no correlations with the error term.

A more practical way to minimize the reverse causality bias is to employ a dynamic panel approach. We will amend the model by introducing a lagged dependent variable as another regressor:

$$\begin{aligned} INEQ_{it} = \alpha INEQ_{i,t-1} + \beta_1 NetTotal_{it} + \beta_2 PrivPubRatio_{it} \\ +\beta_3 (NetTotal \times PrivPubRatio)_{it} + \boldsymbol{X}'_{it}\boldsymbol{\gamma} + \mu_i + \mu_t + \varepsilon_{it}, \end{aligned} \tag{5}$$

where we assume that the idiosyncratic error term, ε_{it}, is serially uncorrelated.

The idea behind this specification is as follows. The greater income inequality in the past affects the current choice of social expenditures in a way that makes the size of redistribution smaller, ending up with a smaller reduction in income inequality today. Thus, some persistence remains in income inequality. To be specific to our model, such an effect by $INEQ_{i,t-1}$ is shrouded under ε_{it} in the model of (4), making ε_{it} potentially correlate with $NetTotal_{it}$, $PrivPubRatio_{it}$, and the interaction term. To avoid this damage on the consistency of estimation, we control $INEQ_{i,t-1}$ as another regressor in (5). Owing to persistence in income inequality, we expect that $0 < \alpha < 1$ will be estimated.[17)]

Technically, with a lagged dependent variable introduced, the fixed-effect estimator is no longer consistent and we will apply the system GMM technique to address this problem, following Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998).[18)]

The estimation procedure is as follows. By taking the first differences of (5), we can eliminate country-fixed effects from the model and reduce the regression

[17)] The lagged independent variable is also expected to partly capture the distributive effect of taxes and minimize the bias in estimation associated with them.

[18)] Calderón and Chong (2009) and Niehues (2010) also use dynamic panel models to deal with endogeneity issues possibly caused by reverse causality related to policy formation.

equation to

$$\Delta INEQ_{it} = \alpha \Delta INEQ_{i,t-1} + \beta_1 \Delta NetTotal_{it} + \beta_2 \Delta PrivPubRatio_{it}$$
$$+\beta_3 \Delta (NetTotal \times PrivPubRatio)_{it} + \Delta \boldsymbol{X}'_{it} \boldsymbol{\gamma} + \Delta \mu_t + \Delta \varepsilon_{it}. \quad (6)$$

Because $\Delta INEQ_{i,t-1}$ and $\Delta \varepsilon_{it}$ correlate here, we then need to instrument the former. Possibly, the other key variables, $NetTotal_{it}$ and $PrivPubRatio_{it}$, may also correlate with ε_{it}. To address these endgeneity issues, we take advantage of the following moment conditions:

$$E(Gini_{i,t-s} \Delta \varepsilon_{it}) = 0 \quad \text{for} \quad s \geq 2 \quad (7)$$

and

$$E(\Delta Gini_{i,t-1} \varepsilon_{it}) = 0, \quad (8)$$

which are implied respectively by (6) and (5) under the assumption that the idiosyncratic errors are serially uncorrelated. Similar moment conditions are available for other endogenous variables[19)]. Because the instruments outnumbers the regressors very well, this specification is overidentified and we employ the one-step GMM estimator for identification.

To verify if the assumption of serially-uncorrelated errors is valid, we use the A-B (Arellano-Bond) test. Because $Cov(\Delta \varepsilon_{it} \Delta \varepsilon_{i,t-s}) \neq 0$ only for $s = 1$ under the assumption, the A-B (Arellano-Bond) test sets out the null hypothesis as $Cov(\Delta \varepsilon_{it} \Delta \varepsilon_{i,t-s}) = 0$ and checks the statistically significant rejection only at $s = 1$ by using the fitted residuals. We will also use the Sargan test to check the validity of overidentifying instruments.[20)]

[19)] We take into account the endogeneity of our three key variables, $NetTotal_{it}$, $PrivPubRatio_{it}$, and their interaction term, and use their lagged variables as instruments.

[20)] Regarding the concern about the inefficiency of system GMM estimation with a small sample like ours, Soto (2009) reports Monte Carlo simulation results showing that the system GMM estimator outperforms all the other estimators. Hayakawa (2007) also numerically showed that the system GMM estimator is less biased than the other GMM estimators with a small sample.

5 Estimation results and implications for income redistribution

5.1 Estimation results

We first estimate the fixed-effect model specified in (4), using *Gini* as the dependent variable. The result is displayed on the left hand side in Table 4. It shows that while *NetTotal* has a negative and significant coefficient as we have hypothesized, its interaction term with *PrivPubRatio* is insignificant, contrary to our hypothesis. This seems to be, however, due to the influence caused by reverse causality. Adding $Gini_{i,t-1}$ as another regressor and estimating the dynamic panel model specified like (5) by the system GMM technique changes the results quite dramatically as we see on the right hand side in Table 4.

Let us look at the results of specification tests first. We observe that only estimation (iii) passes the A-B test if we relax the level of statistical significance to 90% for the sake of the small sample size, whereas every estimation clears the Sargan test of the overidentifying restriction.[21)]

Accordingly, we will examine the result of the dynamic panel analysis, focusing on estimation (iii). First, as expected, the coefficient of $Gini_{i,t-1}$ is positive, stationary, and statistically significant. Our interpretation for such persistence found in income inequality is that it occurs as a result of reverse causality related to its repercussion from the policy choice. Second, the key independent variables, $NetTotal_{it}$, $PrivPubRatio_{it}$, and their interaction term are all significant, showing signs consis-

[21)] Our data set includes countries having data available for just two periods, but exclusion of those countries did not affect the estimation results qualitatively. Neither did the use of social expenditure variables measured as percentages of GDP at market prices instead of GDP at factor costs for the dynamic panel analysis. The latter rather gave better performance to the fixed-effect estimation than is displayed in Table 4.

tent with our previous discussions in contrast to the fixed-effect estimation results in Table 4. The positive coefficient for the interaction term means that given the total social expenditure, switching public provision of social protection toward private one exacerbates income inequality, the magnitude of which becomes larger in a country providing a larger social expenditure in total. As we have argued, on the other hand, $PrivPubRatio_{it}$ is set to capture a bias in the measurement of income inequality attributable to the different treatment of contributions between public and private provision of social protection and to the extent of shifting of employer contributions toward wages. Its negative coefficient suggests that employer contributions to social protection tend to be shifted more to the affluent group of households in the society when it is privately provided.

When we use *Ineq8020* as the dependent variable, the fixed-effect estimation yields statistically significant coefficients for the key three variables in a pattern similar to the one obtained by the dynamic panel analysis, as we can seen in Table 5. In the dynamic panel analysis, only estimation (iii) passes both the A-B and the Sargan tests. The sign pattern of estimated coefficients for our key regressors there are the same as it is in the case of *Gini*, except that $PrivPubRatio_{it}$ is not significant. Because the potential bias related to this variable may go in either direction, the insignificance does not reduces the validity of the result.

When we regress *Ineq9010* instead, the dynamic panel analysis fails to yield coefficients for the three key variables in a pattern consistent with our hypothesis, passing the A-B tests at the 90% significance level, while the fixed-effect estimation is successful in doing so. Specifically, the interaction term is no longer significant in every estimation of (i), (iii), and (iv) in the dynamic panel analysis though passing the A-B test. This result seems reasonable. Both households with income at the

bottom 10% and income at the top 10% are considered to be in a *infra*marginal position under the range of protection provided by a social protection system, and thus it seems less likely that a marginal change in the public-private mix of the system affects their income much.

5.1.1 Predictions on total impacts

We will now examine the total impact of the social protection system on the Gini index for each country and its distribution across countries. The total impact refers to the predicted value of $\hat{\beta}_1 NetTotal + \hat{\beta}_3 PrivPubRatio \times NetTotal$.[22] We will apply the result of estimation (iii) in the dynamic panel analysis in Table 4 to the data for our most recent period, 2010–14, and calculate the total impacts.[23]

The circles in Figure 1 plot the predicted values, taking the size of the gross public social expenditure (%, in GDP at market prices) on the horizontal axis.[24] This figure illustrates how misleading it is to relate the conventional measure for the size of the welfare state to its redistributive effort. Admittedly, a country with a larger gross public social expenditure appears to be associated with a larger reduction in income inequality. However, the reductions in income inequality vary even among countries whose gross public social expenditures differ little.

It is the effects of private social expenditure and tax expenditure for social purposes that drive such a disparity in total impact observed across countries with similar levels of gross public social expenditure. In particular, the former entails

[22] As we have mentioned, $\hat{\beta}_2 PrivPubRatio$ is supposed to capture the potential bias in the measurement of income inequality attributable to payment of contributions and is thus unrelated to the total impact.

[23] Estimation (iii) allows us to compare the results between the fixed-effect analysis and the dynamic panel analysis because only it survives the Arellano-Bond specification test in our dynamic panel analysis with the Gini index, as we will see in the next subsection.

[24] Country id codes are given in Appendix A and in Table 7.

a large effect. The circles in Figure 2 take *PribPubRatio* on the horizontal axis to depict the same scattered collection of total impacts as in Figure 1. Clearly, a country with a higher *PrivPubRatio* is associated with a smaller size of total impact, meaning that its social protection system equalizes income distribution less. Owing to this effect, as depicted in Table 1, countries having wide differences in the amount of gross public expenditure achieve almost as much total impact on the Gini index.

Let us examine the details of predictions on total impacts. As both figures show, the U.S. (country id code 34) and Switzerland (31) are the only countries that have positive point estimates for the total impact, while it is too hasty to judge that their social protection systems aggravate income inequality. As Table 7 shows, we cannot reject at 95% statistical significance the null hypothesis that the predicted total impact for each does not differ from zero. Nonetheless, although the U.S. is called a hidden welfare state as Howard (1993) indicated from the perspective of net total social expenditure, it does not deserve the appellation in terms of the distributive contribution that its social protection system achieves.

The predictions in Table 7, which lists countries in order of the size of private social expenditure, also reveal that the U.S. and Switzerland are not the sole countries for which we cannot reject the same null hypothesis at 95% statistical significance. Denmark (7), Japan (18), Canada (4), the U.K. (33), Korea (19), Netherlands (22), and Iceland (14) belong to the same class of countries as the U.S. and Switzerland. As we see in Table 7, they are the countries whose *PrivPubRatio*s exceed 0.12.

The alternative use of *Ineq8020* does not qualitatively change the pattern of the distribution of total impacts across nations from what we have seen in Figures 1 and 2. Nonetheless, if we refer to Table 7, we note a difference in the case where *Ineq8020* is used; Denmark and Japan no longer belong to the group of countries

for which we cannot reject at 95% statistical significance that the social protection system has no impact on income inequality. Why a greater number of countries appear to have statistically significant total impacts when we use *Ineq8020* instead of *Gini* is that a change in *Ineq8020* does not reflect inequality-aggravating impacts that a marginal change in the public-private mix of a social protection system brings to households in the middle class with incomes between the bottom 20% and the top 20%.

These results have the following implications.

First, the provision of sufficient social protection and the equalization of income distribution will not square as consistent social objectives if the private sector is to play a major role in the former. If a society needs to rely more on the private provision, reinforcing redistribution through the tax system, focusing especially on the middle class, will become a more integral part of a public policy geared toward equal distribution of income.

Second, what income inequality index to use is crucial in evaluating the distributive impact of a social protection system in particular when we define it by combining government-engaged private provision of social benefits with the traditional public provision. Because the income inequality among middle-class households is affected most by marginally changing the public-private mix of a social protection system, the use of an income inequality measure such *Ineq8020* and *Ineq9010*, instead of *Gini*, tends to overestimate the income-equalizing impact of a social protection system.

6 Concluding remarks

Government-engaged private provision has played an increasingly important role in social protection in certain advanced nations, and it may play an even larger one in the near future. Overlooking it may lead us to a misguided understanding about the distributive consequences overall. Once the concept of the welfare state is extended to encompass such private arrangements, its larger role in social protection does not mean its greater efforts toward equal income distribution. Private provision of social protection undermines the redistributive function of a welfare state and may call for progressive household taxes and contributions to public social programs to achieve its goal for equal income distribution.

Regarding our analysis, a caveat should be placed on the distributive role of in-kind benefits. Because the income inequality measures we used here are all based on cash income while social expenditures include in-kind benefits, the total impacts predicted here may underestimate the distributive effects of a social protection system. It is also an important extension of our analysis to break down the distributive impacts of a social protection system into different income classes, instead of estimating its total impact on income inequality measures. Unfortunately, those analyses seem to be beyond our reach due to limited data availability.

An agenda for further research would include how the distributive impact of a social protection system has changed over time in each country. As part of this study, we estimated the total impacts on income inequality for the five different periods and traced them over time for respective countries as long as possible. However, at a glance, the movements did not seem to show any common pattern. Our model specification allows us to decompose the time-varying total impacts of a social protection system into the effects brought by the changes in the net total expenditure

and those in the ratio between private and public social expenditures. We found that the former either increases or at least stays constant over the periods for most of the countries but the latter shows various movements across countries. These are considered to reflect different political responses to the social and economic experiences over these two decades, for example, globalization, economic shocks, and demographic changes, and further investigation on this issue is needed.

Appendix A: country id code

1. Australia, 2. Austria, 3. Belgium, 4. Canada, 6. Czech Republic, 7. Denmark, 9. Finland, 10. France, 11. Germany, 14. Iceland, 15. Ireland, 17. Italy, 18. Japan, 19. Korea, 20. Luxembourg, 22. Netherlands, 23. New Zealand, 24. Norway, 25. Poland, 26. Portugal, 27. Slovak Republic, 29. Spain, 30. Sweden, 31. Switzerland, 33. United Kingdom, 34. United States.

Appendix B: tables and figures

Table 1: Public and Private Social Expenditures（2013, % ）

Country	Gross Public (A)	Net Public (B)	Net Private (C)	Net Total (B)+(C)	(C)/(B)
France	31.5	31.2	3.6	34.8	0.12
Finland	29.5	27.1	0.9	28.0	0.03
Belgium	29.3	28.7	1.7	30.4	0.06
Denmark	29.0	26.0	3.3	29.4	0.13
Italy	28.6	26.8	1.2	28.0	0.05
Austria	27.6	25.3	1.6	26.9	0.06
Sweden	27.4	25.9	2.8	28.7	0.11
Spain	26.3	25.8	0.3	26.0	0.01
Portugal	25.5	25.4	2.1	27.4	0.08
Germany	24.8	25.6	1.8	27.4	0.07
Luxembourg	23.2	20.0	0.9	21.0	0.05
Japan	23.1	22.3	3.3	25.6	0.15
Netherlands	22.9	22.3	6.1	28.4	0.27
United Kingdom	21.9	22.9	5.1	28.0	0.22
Norway	21.8	20.1	1.5	21.5	0.07
Czech Republic	20.3	20.9	0.5	21.4	0.02
Ireland	20.2	20.2	1.3	21.6	0.06
New Zealand	19.3	18.6	0.4	19.0	0.02
Switzerland	19.2	17.4	5.2	22.6	0.30
United States	18.8	20.5	9.3	29.8	0.46
Australia	18.1	19.1	2.1	21.2	0.11
Slovak Republic	18.1	18.3	0.8	19.1	0.05
Canada	16.9	17.6	3.8	21.4	0.21
Iceland	16.6	16.5	4.9	21.5	0.30
Korea	9.3	10.3	2.3	12.6	0.22

Source: OECD, SOCX Database (2016); Gross Public Expenditure is measured in a percentage of GDP at market prices and Net Private Expenditure and Net Total expenditure are in a percentage of GDP at factor costs. For the member countries unlisted in this table, either the data for this year are not available or they seem to have deficiencies rendering the net private expenditures zero or negative.

Table 2: Summary statistics

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Gini	29.334	4.029	20.9	38.6	102
Ineq8020	4.643	1.096	2.9	8.1	101
Ineq9010	3.737	0.807	2.5	6.133	101
NetPub	20.545	4.671	4.397	31.169	99
NetPriv	2.514	1.951	0.038	9.138	99
NetTotal	23.058	4.766	6.946	34.366	99
PrivPubRatio	0.137	0.126	0.002	0.58	99
Ageing	24.195	4.773	8.918	40.915	130
Unemp	7.375	3.738	1.58	23.315	130
GDPph	35.616	12.59	9.75	87.626	129

Table 3: Preliminary Regression Analysis

INEQ	*Gini*		*Ineq8020*		*Ineq9010*	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
NetPub	-0.3745^{**}	-0.5858^{***}	-0.0705^{**}	-0.1439^{***}	-0.0584^{**}	-0.1033^{***}
	(0.1603)	(0.1909)	(0.0309)	(0.0384)	(0.0210)	(0.0286)
NetPriv	0.9020^{*}	-1.0124	0.2237	-0.4415^{*}	0.1207	-0.2857
	(0.5167)	(0.8654)	(0.1406)	(0.2261)	(0.0983)	(0.1717)
NetPub		0.0811^{**}		0.0283^{**}		0.0173^{**}
$\times$*NetPriv*		(0.0370)		(0.0113)		(0.0083)
Ageing	0.2018^{**}	0.2087^{**}	0.0455^{**}	0.0478^{***}	0.0483^{***}	0.0498^{***}
	(0.0840)	(0.0847)	(0.0170)	(0.0168)	(0.0105)	(0.0099)
Unemp	-0.0434	-0.0488	-0.0064	-0.0086	-0.0036	-0.0049
	(0.1208)	(0.1209)	(0.0337)	(0.0326)	(0.0243)	(0.0235)
μ_2	-1.0077^{***}	-0.8589^{**}	-0.2176^{***}	-0.1641^{**}	-0.1025	-0.0699
	(0.3564)	(0.3498)	(0.0777)	(0.0716)	(0.0676)	(0.0630)
μ_4	0.3137	0.3018	0.0650	0.0612	0.0378	0.0355
	(0.2263)	(0.2293)	(0.0570)	(0.0565)	(0.0351)	(0.0340)
N	90	90	89	89	89	89
R^2	0.368	0.408	0.327	0.421	0.351	0.421

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: The case of *Gini*: Fixed-Effect and Dynamic Panel Analyses

	Fixed Effect				Dynamic Panel			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
NetTotal	-0.2925^{**}	-0.3288^{***}	-0.3025^{***}	-0.3378^{***}	-0.3053^{**}	-0.3171^{**}	-0.2840^{**}	-0.2818^{*}
	(0.1068)	(0.1162)	(0.1074)	(0.1174)	(0.1303)	(0.1349)	(0.1403)	(0.1494)
PrivPubRatio	-8.3582	-5.3985	-8.8262	-5.8608	-17.0967^{**}	-17.1277^{**}	-13.8141^{*}	-13.2571
	(12.5981)	(12.5975)	(12.4744)	(12.5635)	(7.3217)	(7.9130)	(8.3687)	(9.0429)
PrivPubRatio	0.6965	0.6969	0.7343	0.7324	1.0871^{***}	1.1231^{***}	0.9964^{**}	1.0085^{**}
$\times$*NetTotal*	(0.4769)	(0.4721)	(0.4672)	(0.4634)	(0.3871)	(0.3974)	(0.4274)	(0.4445)
Ageing	0.1218^{*}	0.1181^{*}	0.1311^{**}	0.1268^{**}	0.1585^{**}	0.1590^{**}	0.1549^{**}	0.1500^{**}
	(0.0613)	(0.0597)	(0.0627)	(0.0610)	(0.0739)	(0.0723)	(0.0760)	(0.0748)
Unemp	0.0413	0.0728	0.0513	0.0819	0.1220	0.1275	0.1627^{*}	0.1646^{*}
	(0.1059)	(0.1123)	(0.1113)	(0.1174)	(0.0988)	(0.0991)	(0.0962)	(0.0981)
GDPph	0.1454^{**}	0.1152^{**}	0.1353^{**}	0.1060^{**}	-0.0613	-0.0778^{*}	-0.0784^{*}	-0.0986^{*}
	(0.0554)	(0.0501)	(0.0550)	(0.0486)	(0.0432)	(0.0443)	(0.0470)	(0.0515)
μ_2		-0.7662^{**}		-0.7601^{**}		-0.4373		-0.4765
		(0.2834)		(0.2862)		(0.4382)		(0.4538)
μ_4			0.1823	0.1709			0.5125	0.5232^{*}
			(0.1970)	(0.1897)			(0.3202)	(0.3143)
$Gini_{t-1}$					0.6939^{***}	0.6716^{***}	0.6708^{***}	0.6443^{***}
					(0.0653)	(0.0612)	(0.0590)	(0.0564)
N	93	93	93	93	79	79	79	79
R^2	0.332	0.366	0.337	0.370				
# of instruments					57	58	58	59
A-B (1st-order)					0.1633	0.1819	0.0909	0.1422
A-B (2nd-order)					0.0828	0.1390	0.2787	0.2237
Sargan test					0.4151	0.4060	0.4537	0.3813

Robust standard errors are in parentheses. The dynamic panel analysis uses the one-step GMM estimator.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: The case of *Ineq8020*: Fixed-Effect and Dynamic Panel Analyses

	Fixed Effect				Dynamic Panel			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
NetTotal	-0.0773^{***}	-0.0828^{***}	-0.0792^{***}	-0.0846^{***}	-0.0994^{**}	-0.1184^{***}	-0.0938^{**}	-0.1098^{***}
	(0.0206)	(0.0206)	(0.0213)	(0.0215)	(0.0388)	(0.0377)	(0.0422)	(0.0401)
PrivPubRatio	-6.7640^{*}	-6.1542	-6.8428^{*}	-6.2343	-5.4956^{*}	-6.6622^{**}	-4.6995	-5.7167^{**}
	(3.6876)	(3.8797)	(3.6678)	(3.8705)	(2.9022)	(2.8832)	(2.9918)	(2.8201)
PrivPubRatio	0.3559^{**}	0.3456^{**}	0.3623^{**}	0.3519^{**}	0.3377^{**}	0.4073^{***}	0.3183^{**}	0.3800^{**}
$\times$*NetTotal*	(0.1627)	(0.1648)	(0.1623)	(0.1646)	(0.1508)	(0.1480)	(0.1571)	(0.1479)
Ageing	0.0249^{*}	0.0250^{*}	0.0267^{*}	0.0267^{*}	0.0388^{*}	0.0443^{**}	0.0377	0.0421^{*}
	(0.0137)	(0.0134)	(0.0145)	(0.0143)	(0.0226)	(0.0216)	(0.0241)	(0.0233)
Unemp	0.0164	0.0215	0.0182	0.0232	0.0592^{**}	0.0647^{***}	0.0720^{***}	0.0764^{***}
	(0.0296)	(0.0307)	(0.0312)	(0.0323)	(0.0255)	(0.0249)	(0.0271)	(0.0270)
GDPph	0.0319^{***}	0.0266^{**}	0.0300^{***}	0.0248^{**}	0.0001	-0.0058	-0.0034	-0.0093
	(0.0105)	(0.0096)	(0.0103)	(0.0095)	(0.0098)	(0.0081)	(0.0103)	(0.0091)
μ_2		-0.1220		-0.1213		-0.1497		-0.1460
		(0.0742)		(0.0743)		(0.1273)		(0.1279)
μ_4			0.0347	0.0338			0.1523^{**}	0.1506^{**}
			(0.0530)	(0.0519)			(0.0735)	(0.0730)
$Ineq8020_{t-1}$					0.7343^{***}	0.6904^{***}	0.7149^{***}	0.6734^{***}
					(0.0945)	(0.0839)	(0.0917)	(0.0857)
N	92	92	92	92	77	77	77	77
R^2	0.368	0.383	0.371	0.386				
# of instruments					54	55	55	56
A-B (1st-order)					0.1795	0.1684	0.0891	0.1318
A-B (2nd-order)					0.1098	0.1463	0.1787	0.1627
Sargan test					0.2825	0.3461	0.3681	0.3976

Robust standard errors are in parentheses. The dynamic panel analysis uses the one-step GMM estimator.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: The case of *Ineq9010*: Fixed-Effect and Dynamic Panel Analyses

	Fixed Effect				Dynamic Panel			
	(i)	(ii)	(iii)	(iv)	(i)	(ii)	(iii)	(iv)
NetTotal	-0.0669^{***}	-0.0690^{***}	-0.0682^{***}	-0.0702^{***}	-0.0646^{***}	-0.0755^{***}	-0.0617^{**}	-0.0717^{***}
	(0.0173)	(0.0175)	(0.0179)	(0.0183)	(0.0219)	(0.0221)	(0.0253)	(0.0233)
PrivPubRatio	-4.8400^{*}	-4.6062	-4.8951^{*}	-4.6630^{*}	-1.6317	-2.1559	-0.8799	-1.3374
	(2.6273)	(2.7391)	(2.6116)	(2.7279)	(2.4129)	(2.4986)	(2.4810)	(2.4533)
PrivPubRatio	0.2437^{**}	0.2398^{*}	0.2482^{**}	0.2442^{**}	0.1517	0.1835^{*}	0.1346	0.1632
$\times$*NetTotal*	(0.1149)	(0.1170)	(0.1149)	(0.1172)	(0.1065)	(0.1104)	(0.1143)	(0.1110)
Ageing	0.0355^{***}	0.0355^{***}	0.0367^{***}	0.0367^{***}	0.0304^{**}	0.0345^{***}	0.0344^{**}	0.0384^{***}
	(0.0105)	(0.0105)	(0.0112)	(0.0112)	(0.0135)	(0.0126)	(0.0154)	(0.0147)
Unemp	0.0152	0.0172	0.0165	0.0184	0.0454^{***}	0.0487^{***}	0.0537^{***}	0.0566^{***}
	(0.0225)	(0.0233)	(0.0236)	(0.0245)	(0.0165)	(0.0155)	(0.0186)	(0.0177)
GDPph	0.0173^{**}	0.0152^{**}	0.0160^{*}	0.0140^{*}	0.0032	0.0015	-0.0000	-0.0017
	(0.0078)	(0.0073)	(0.0079)	(0.0076)	(0.0061)	(0.0067)	(0.0067)	(0.0071)
μ_2		-0.0468		-0.0463		-0.0527		-0.0489
		(0.0674)		(0.0675)		(0.0936)		(0.0937)
μ_4			0.0237	0.0233			0.1240^{***}	0.1239^{***}
			(0.0328)	(0.0326)			(0.0457)	(0.0466)
$Ineq9010_{t-1}$					0.7397^{***}	0.7107^{***}	0.7059^{***}	0.6781^{***}
					(0.1034)	(0.0831)	(0.1037)	(0.0884)
N	92	92	92	92	77	77	77	77
R^2	0.387	0.392	0.390	0.394				
# of instruments					54	55	55	56
A-B (1st-order)					0.0949	0.1039	0.0500	0.0780
A-B (2nd-order)					0.1411	0.1683	0.1950	0.1873
Sargan test					0.2578	0.2676	0.2998	0.3047

Robust standard errors are in parentheses. The dynamic panel analysis uses the one-step GMM estimator.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Total Impacts on Gini: Dyanmic Panel Analysis

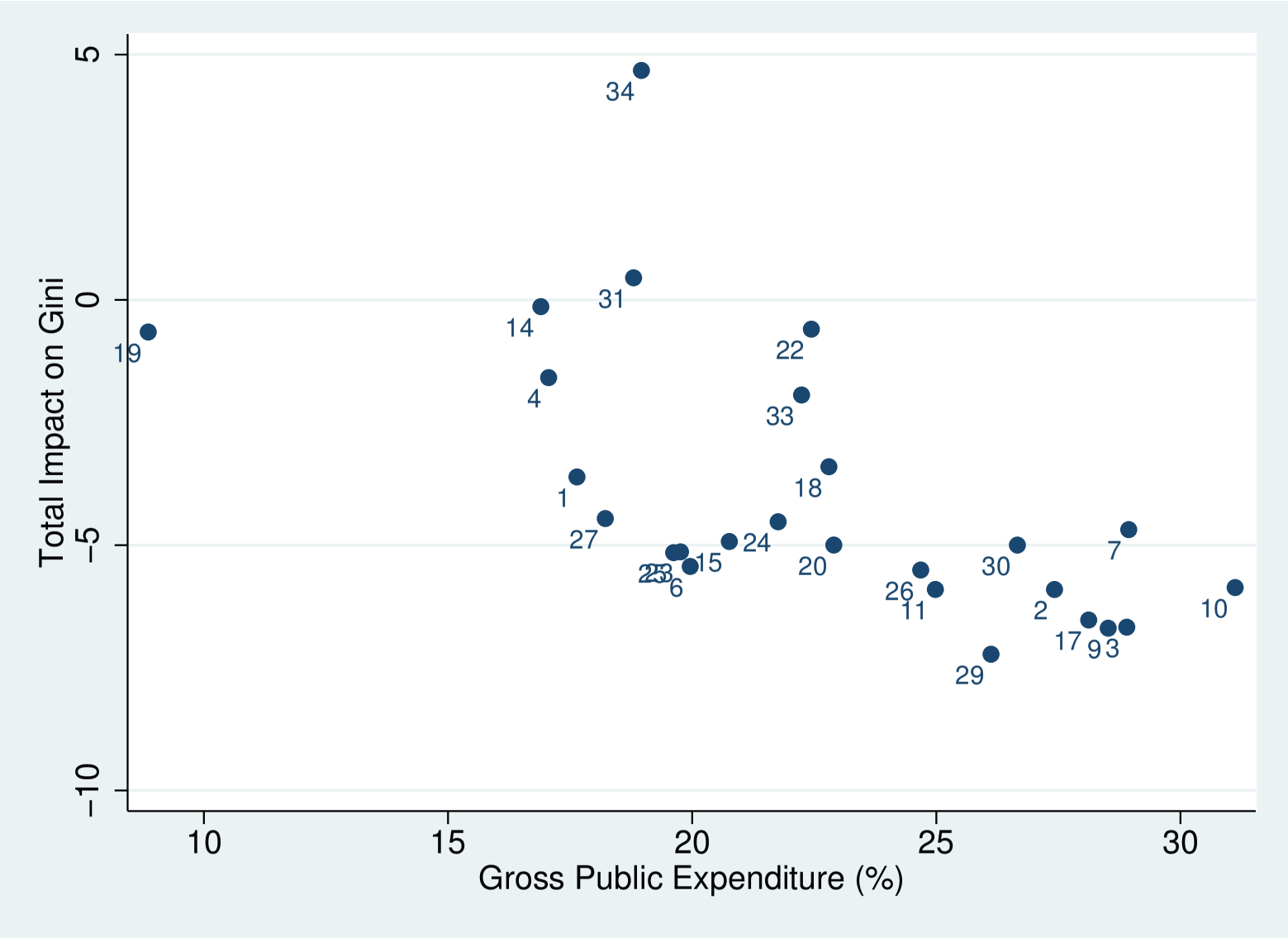

Figure 2: Total Impacts on Gini: Dynamic Panel Analysis

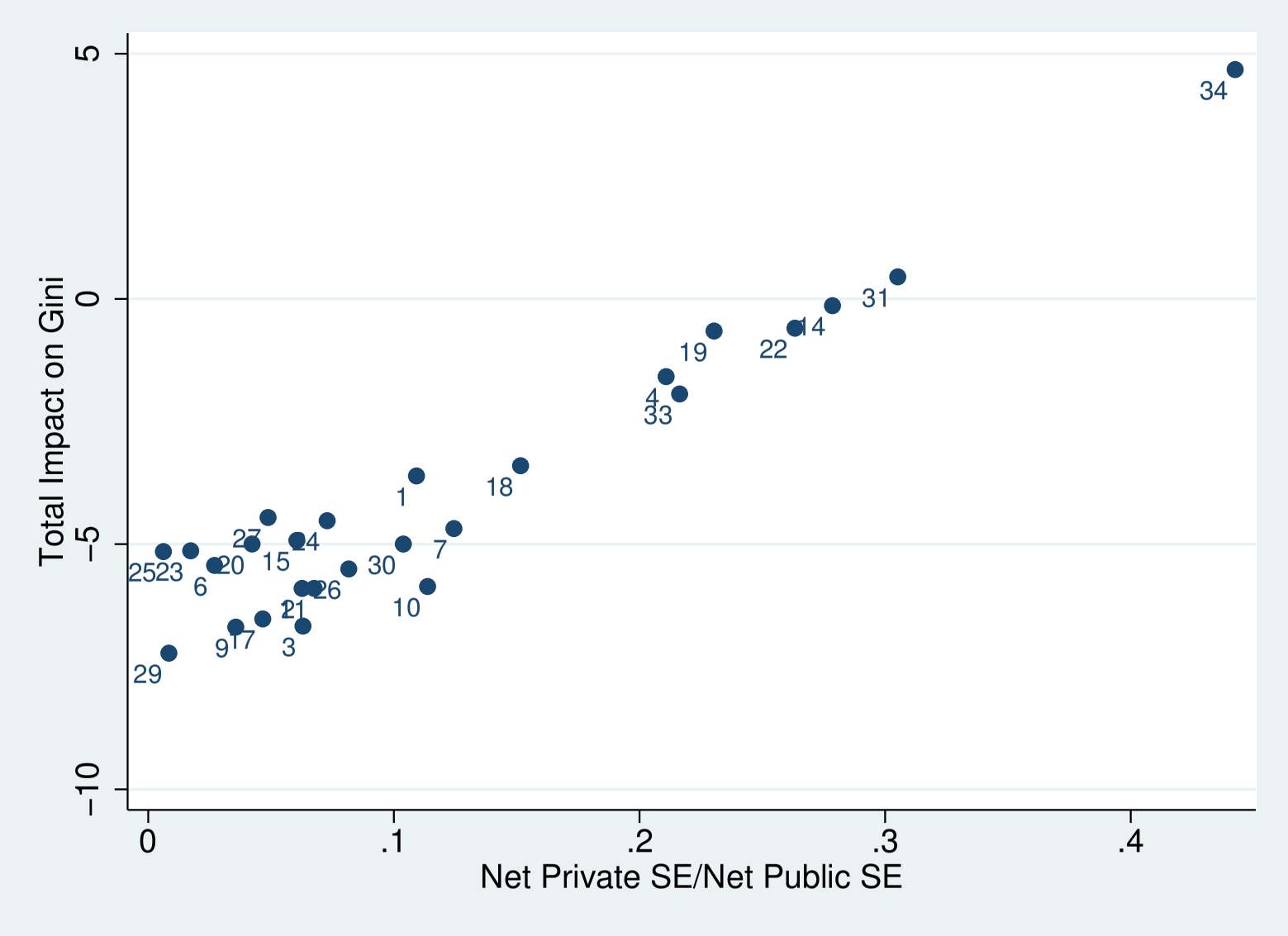

Table 7: Predicted Total Impacts (Dynamic Panel Analysis)

Country (id code)	*PrivPub*	*Gini*		*Ineq8020*	
	Ratio	Total Impact	Std. Err.	Total Impact	Std. Err.
Poland(25)	0.006	-5.153^{**}	(2.560)	-1.704^{**}	(0.767)
Spain(29)	0.008	-7.224^{**}	(3.596)	-2.389^{**}	(0.824)
New Zealand(23)	0.017	-5.136^{**}	(2.580)	-1.701^{**}	(0.768)
Czech Republic(6)	0.027	-5.434^{**}	(2.758)	-1.801^{**}	(0.817)
Finland(9)	0.036	-6.692^{*}	(3.431)	-2.221^{**}	(1.012)
Luxembourg(20)	0.042	-4.998^{*}	(2.584)	-1.661^{**}	(0.759)
Italy(17)	0.047	-6.526^{*}	(3.394)	-2.170^{**}	(0.995)
Slovak Republic(27)	0.049	-4.457^{*}	(2.325)	-1.483^{**}	(0.681)
Ireland(15)	0.061	-4.925^{*}	(2.614)	-1.642^{**}	(0.760)
Austria(2)	0.063	-5.904^{*}	(3.144)	-1.969^{**}	(0.913)
Belgium(3)	0.063	-6.672^{*}	(3.555)	-2.225^{**}	(1.033)
Germany(11)	0.068	-5.903^{*}	(3.169)	-1.970^{**}	(0.918)
Norway(24)	0.073	-4.524^{*}	(2.451)	-1.511^{**}	(0.708)
Portugal(26)	0.082	-5.506^{*}	(3.033)	-1.843^{**}	(0.872)
Sweden(30)	0.104	-4.998^{*}	(2.893)	-1.683^{**}	(0.824)
Australia(1)	0.109	-3.610^{*}	(2.119)	-1.217^{**}	(0.602)
France(10)	0.114	-5.864^{*}	(3.485)	-1.980^{**}	(0.988)
Denmark(7)	0.124	-4.684	(2.875)	-1.587^{*}	(0.813)
Japan(18)	0.152	-3.402	(2.318)	-1.166^{*}	(0.654)
Canada(4)	0.211	-1.585	(1.662)	-0.573	(0.490)
UK(33)	0.216	-1.939	(2.170)	-0.707	(0.645)
Korea(19)	0.230	-0.655	(0.897)	-0.247	(0.273)
Netherlands(22)	0.263	-0.598	(1.980)	-0.277	(0.648)
Iceland(14)	0.279	-0.138	(1.532)	-0.111	(0.520)
Switzerland(31)	0.305	0.450	(1.604)	0.074	(0.579)
USA(34)	0.443	4.676	(2.934)	1.401	(1.217)

The predictions are based on the result of estimation (iii) in each case.
Robust standard errors are given in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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