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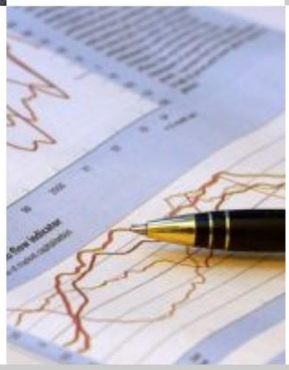
# Fiscal Consolidations And Their Effects On Income Inequality

Conrad Scheibe









UCL School of Slavonic and East European Studies
16 Taviton Street, London WC1H 0BW

www.ucl.ac.uk/ssees/comparative-studies-emerging-economies

Conrad Scheibe

# FISCAL CONSOLIDATIONS AND THEIR EFFECTS ON INCOME INEQUALITY

An empirical analysis of the distributional effects of austerity, using a novel approach to identify consolidation compositions

Master's Thesis (Short version)

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## Abstract

This paper investigates the effects of fiscal consolidations on income inequality. Although fiscal consolidations have become a popular policy instrument and research topic, their effects on income inequality are relatively unexplored. We thus econometrically analyse the evolution of Gini coefficients during and after austerity measures. The paper relies on panel data techniques using a sample of 17 high-income countries during the period of 1978 – 2009. We find that a consolidation (measured by a deliberate improvement of the primary budget balance) significantly increases income inequality. More specifically, an improvement of the primary budget balance by about one percent of GDP is associated with an increase in market income inequality of 0.6% and a smaller increase in net income inequality the following year. In addition, this paper explores the discretionary effect of different consolidation compositions. To do so, we differentiate between consolidations that are either exclusively undertaken through spending cuts, tax increases or a combination of both. Thereby, we show that tax-only consolidations tend to be equality-friendly but also rather small in size while the opposite is true for spending-only and mixed consolidations. These findings point to a more pronounced trade-off between different consolidation policy goals than is currently believed.

## Keywords

**Fiscal consolidation, Fiscal Adjustment, Austerity, Income inequality, Cross-country analysis, Panel data technique**

**Author's e-mail:** c-scheibe@live.de[1]

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# 1 Introduction

The 2007/2008 financial crisis and the subsequent Great Recession imposed devastating effects on the financial sector and the real economy. In turn, many governments saw themselves forced to spend large amounts of money to rescue banks and provide fiscal stimulus to restore economic momentum. As a result, public debt, especially in advanced economies, climbed to all-time highs, cutting their fiscal space significantly. Also, the fiscal deficit in the OECD area peaked unprecedentedly at almost 8% of GDP in 2009, with only minor improvements in the following three years (OECD, 2014). With ageing populations and associated high future public costs, these deficits are seen as unsustainable for many countries. The thus created pressure to stabilise public debt and overhaul public budgets led governments to undertake severe fiscal consolidations. Based on that, a relatively large body of literature has dealt with debt and growth implications caused by fiscal austerity.

However, there is only a rather small body of literature focusing on the inequality effects resulting from fiscal consolidations. This is somewhat surprising since the economic and social repercussions of the Great Recession and the consequent fall in employment rates have resulted in historically high levels of income inequality in many developed countries. Hence, it appears that fiscal consolidations and rises in inequality are at least to some extent interconnected. These questions are particularly interesting since economic inequality has recently received greater academic and public attention. This might also be sparked by the long-term trend of increased inequality in the developed world. Between 1990 and 2012 the Gini coefficient of market income increased more than five percentage points in OECD countries (OECD, 2015a; FES, 2015).

If academics accept that some level of inequality should probably exist in a market economy, there is also an expectation that too much inequality will have perverse effects on markets (Freeman, 2011; Stiglitz, 2012; Piketty, 2014; Krugman, 2015). Indeed, inequality may harm long-term growth through a number of channels around political and economic exclusions (see e.g. Easterly, 2007; Ostry et al., 2011; Stiglitz, 2012). As summarised so aptly by Piketty (2014): “You need some inequality to grow. But extreme inequality is not only useless but can be harmful to growth because it reduces mobility and can lead to political capture of our democratic institutions”. Going further, some scholars argue that high-income inequality may be a partial direct or indirect cause of the crisis, at least in some countries, such as the United States (Fitoussi & Saraceno, 2010; Rajan, 2010; Stiglitz, 2012). Others posit that the recent populist backlash throughout Europe and the United States - both on the right and

the left – against trade, globalisation, and migration could also be explained by some of these mechanisms (Roubini, 2016).

In the light of the renewed attention on this topic, the International Monetary Fund (IMF) restated its position on fiscal consolidation. With their 2010 "Ten Commandments for Fiscal Adjustment in Advanced Economies", they explicitly mentioned the role of inequality (Blanchard & Cotarelli, 2010), acknowledging in particular that an evaluation of any fiscal consolidation policy should not only consider the impact it has on output, employment, and the fiscal balance, but also on the income distribution. Against this backdrop, the question arises, how fiscal consolidations can be designed to cushion the blow for the most vulnerable ones.

The aim of this paper, therefore, is to discuss the general effect of fiscal consolidations on inequality and to differentiate between the discretionary impacts that different consolidation packages have on inequality indicators. Thus, a central contribution of this article is to investigate the importance of the mix of instruments used to achieve fiscal consolidation and to identify which instruments best limit a rise in inequality. Thereby, this paper seeks to find new evidence for the discretionary compositional effects, by using a novel approach to identify consolidations, which are either only based on tax rises, spending cuts or through a combination of both.

To examine income inequality effects associated to fiscal consolidations, this paper builds upon a narrow body of literature that quantitatively assesses these mechanisms. Namely, Woo et al. (2013) and Agnello & Sousa (2012) act as the main inspirations for the deployed regression analyses. In line with these scholars, this paper will apply econometric analyses to assess the impact of different consolidations on the income inequality measurements as illustrated by rises in the Gini coefficients.

The remainder of this paper is structured as follows. First, a literature survey discussing the effects of fiscal consolidations on income inequality is presented. The third section is dedicated to presenting the data, including income inequality trends throughout the last decades. Next, section 4 presents and discusses the econometric findings. Section 5 concludes.

# 2 Literature Survey

The causes of rising income inequality have attracted considerable attention recently. Most studies find that national income per capita, education, trade openness and technological change are among the main levers for differing inequality levels across countries (Acemoglu, 2003; IMF, 2007; Barro, 2008). At the same time, fiscal policy can have a strong impact on income distribution within a society. Especially the design and progressivity of tax systems and spending policies are deemed decisive for income distributions (Chu et al., 2000; Bastagli et al., 2012; IMF, 2014; Dabla-Norris et al., 2015). There is, however, little research investing the impact on inequality of changes in the fiscal stance and in particular on adjustment efforts.

## 2.1 The distributional effect of fiscal consolidations

Most studies investigating the effects of fiscal consolidation on income inequality point to a negative link. Using a panel of 18 industrialized countries Agnello & Sousa (2012) present evidence that inequality generally increases during periods of fiscal consolidation. Ball et al. (2011) find that a consolidation of the primary balance about one percent of GDP lead to an increase in disposable income by 0.6% in the following year. Smeeding et al. (2000) observe that a fiscal consolidation normally leads to increased poverty and thereby rising income gaps. Woo et al. (2013) & the IMF (2012) find that large consolidations (greater than 1.5% of GDP) significantly increase inequality, while smaller ones do not. Moreover, they observe the cumulative inequality effect of consolidations peaking after five to six years and fading just ten years after the start. The IMF (2014) acknowledges that “fiscal consolidation can affect income inequality through its impact on the distribution of both market and disposable income”. The main reasons are seen in the short-run reduction in output and employment, followed by declines in wage shares briefly after a consolidation. Especially when accompanying growth is weak, these effects may be long-lasting and particularly self-reinforcing. This thought is particularly interesting, since - if this vicious circle assumption holds - it supports the idea that consolidation packages should be both growth- and equity-friendly.

Particularly the rise in unemployment, which usually follows a period of fiscal adjustments, is seen as the main trigger for widening income gaps (Leigh et al., 2010; IMF, 2012; Woo et al., 2013). More precisely, Ball et al. (2011) find that a reduction of the primary balance by about one percent of GDP leads to an increase in unemployment of 0.5 percentage points in

the course of two years. The mechanisms behind these effects are believed to stem from both direct income effects, such as the permanent reduction of household income and indirect, structural effects such as the loss of self-confidence and thereby lower chances of getting rehired the longer the unemployment period persists (Blanchard & Summers, 1986; Dao & Loungani, 2010).

Turning to different consolidation strategies, Leigh et al. (2010) observe that spending cuts affect unemployment faster and stronger than tax hikes. Mulas-Granados (2005) finds evidence that spending-based adjustments generally come at the price of higher income inequality. Agnello & Sousa (2012) observe that consolidations mainly relying on spending cuts lead to a substantial widening of income gaps. This effect is found to be amplified if growth is low during the referring period and also with increasing sizes of adjustments. On the contrary, tax hikes are found to have an equalizing effect on income inequality.

However, these findings can be challenged from a theoretical point of view as, for example, higher unemployment benefits may reduce both skilled and unskilled employment. In turn, this would have to lead to rising income inequality (Checchi & García-Peñalosa, 2008) so that spending cuts appear to have a somewhat ambiguous effect on income inequality. Therefore, the focus should rather lie on which instruments - on both the taxation and spending side - are associated with more favourable inequality effects. In this vein, the IMF (2014) states that raising regressive taxes and cutting progressive spending tend to increase income inequality considerably. They conclude that the key to equity-friendly adjustments lies in the progressive mix of different instruments. Yet, they acknowledge that consolidation packages, however progressively designed, may still lead to short-term inequality rises.

With this in mind, Woo et al. (2013) use the ratio of direct to indirect taxes as a proxy for tax progressivity and observe that higher values, as well as higher social spending introduced in the context of general spending cuts, are clearly associated with reducing inequality. They derive that adjustment packages should consider distributional effects to cushion the blow for the most vulnerable ones (which is also confirmed by Chu et al., 2000).

The work of IMF (2012) acknowledges that both spending and revenue side measures have important implications for employment and inequality that are relevant in order to make the consolidation package sustainable. Therefore, they see high degrees of tax progressivity and access to social benefits as pre-requisite to limit the negative effects of adjustment packages. They observe that spending-based consolidations tend to be larger and last longer and have a greater impact on income distribution than revenue based ones. Especially cuts in social benefits are found to be the most painful measure on the spending side. Turning to tax hikes, they observe that consolidations, which rely more on indirect taxes tend to worsen

inequality. The most equity-friendly consolidations are found to be the ones where indirect tax increases were combined with offsetting measures targeted at poor households.

Macroeconomic conditions also seem to matter for the decision on which consolidation instrument to use. Mulas-Granados (2005) observes that governments tend to undertake inequality-enhancing spending cuts, whenever the macroeconomic conditions worsen considerably. Especially GDP growth seems to be lower before expenditure cuts than before revenue increases. Moreover, the same applies to unemployment rates, levels of government debt and deficit as well as inflation rates. This could be interpreted as a higher willingness of the population to accept painful measures when times are perceived to be bad or the economic stability is under severe stress. The choice on which of the targets to follow within consolidations is also found to be influenced by political factors, such as electoral outlooks as well as the ideology of the government in power (Mulas-Granados, 2002, 2003). Schaltegger & Weder (2014) find that consolidations implemented by coalition governments are associated with lower levels of income inequality while the opposite is true for single-party or minority governments.

Woo et al. (2013) stress the importance of avoiding significant worsening of income distribution during times of fiscal consolidation, since consolidations perceived as unfair might be difficult to maintain (also confirmed by McManus, 2014). Jenkins et al. (2011) find that countries with a relatively strong welfare state do experience a smaller adverse distributional impact in economic crises as a result of greater automatic fiscal stabilisers. Mulas-Granados (2005) confirms these findings analysing 53 adjustments in 15 EU countries over four decades. In addition, he points out that there might be room for an enhancement of the social safety net and more progressive tax measures during spending cuts in order to offset negative distributional effects, since these are associated with narrowing inequality ratios (which is also confirmed by Joumard et al., 2012 & Martinez-Vazquez et al., 2012).

## 2.2 The trade-off between growth, debt, and equality friendly adjustments

It seems that many of the features of successful and growth-friendly adjustments stated earlier are not particularly equality-friendly, meaning that they would lead to higher income inequality. Yet, there is also evidence that not all of these targets always have to be necessarily conflicting. As governments always face the choice between several goals, fiscal policy should serve, and can draw on a multitude of instruments to achieve these ends, it is worth looking at possible trade-offs between growth, debt, and inequality targets within fiscal consolidations.

There are several explanations for the mechanics of potentially contradictory effects of consolidation on income distribution and GDP growth. In line with previously mentioned scholars, Mulas-Granados (2005) observes possible expansionary consolidations as those, that focus on the spending side and, on the most rigid budget items, namely public wages and social transfers. However, he interprets reductions especially in these areas as income inequality increasing. This reasoning builds upon the work of Ayala et al. (1999) and Chu et al. (2000) who present empirical evidence that social spending is strongly attributed to reducing net income inequality. Notably, public health spending, pensioners and education spending are found to be most suitable to reduce inequality.

On the tax side, there is evidence that proportionally high direct taxes are suited to distribute income from the high-earning household to the state and via the described channels to the worse-off (Mulas-Granados, 2005; IMF, 2012; McManus, 2014). However, these taxes are seen to be distortive for the efficiency and functioning of free markets and therefore harming private investment and productivity (Przeworski, 1986; Boix, 1996). Hence, raising these taxes as an instrument of consolidation may have a positive effect on reducing inequality, but rather a negative one for growth perspectives. Espinoza & Ruiz (2016) simulate different fiscal policy changes in France and evaluate their growth and inequality impact. They find that trade-offs between achieving successful fiscal consolidations and stabilizing inequality at the same time could be possible (with the exception of using increases in capital income taxes). Well-designed packages (i.e. a cut in public spending partly offset by a reduction in social contribution paid by low skilled workers) can achieve both, successful consolidation and unchanged or even improved Gini coefficients. In this vein, the ECB notes that well-designed consolidation packages, such as cuts in unproductive spending and revenue measures, aimed at greater tax system efficiency and fairness are most suited to reach fiscal sustainability in line with other policy goals (Warmedinger et al., 2015).

Kaplanoglou et al. (2013) find that “fair” fiscal adjustment programmes lead to higher probabilities of success. They mainly focus on progressive taxation and social transfers and find evidence that adjustments that are accompanied by redistributive policies aiming for higher progressivity are more likely to succeed. In this vein, Rawdanowicz et al. (2013) analyse the distributional impacts of different fiscal adjustment instruments. Interestingly for this paper, they find that several consolidation instruments are consistent with both: Reducing income inequality without harming growth. They define the progressivity of each instrument and its relative weight in the tax and transfer system as decisive elements for distributional effects. Both social spending and taxation of households are found to dampen income inequality in general, although in most OECD countries the former effect outweighs

the latter. However, transfers might reduce incentives to work and therefore harm growth perspectives. Some household taxes on the other hand also are distortive to GDP growth. Based on this framework, they observe increases in the effective retirement age, raising efficiency in the education and health care systems, cutting certain tax expenditures, raising taxes on immovable property, and broadly-based consumption taxes as suitable instruments to achieve both goals.

The OECD (2013) uses a similar approach to differentiate between consolidation instruments which are growth-supporting, equity-friendly or both at the same time. Based on that, they develop a hierarchical ranking of consolidation instruments. Cuts in subsidies and pensions as well as raising property taxes are ranked highest since they entail strong distributive power without hurting economic activity much, while the opposite is true for cuts on education, family, and social security (similar results attained by Martinez-Vazquez et al., 2012).

Based on the mentioned literature, detailed effects of spending and revenue based consolidation instruments can be classified, which will be elaborated on more in detail in the following chapters of this paper.

# 3 Data and trends in income inequality

## 3.1 Measuring fiscal consolidation and income inequality

A variety of measures can be used to identify consolidation episodes. Earlier papers used the cyclically adjusted budget (CAPB) as their main measure (Giavazzi & Paggano, 1990; Alesina & Perotti, 1996). It is calculated by subtracting estimated effects of business cycle fluctuations on the fiscal account from the actual primary balance. Interest expenditure is excluded from this indicator as well since it is not considered discretionary (Guarjardo et al., 2014).

However, this approach is not free from critique. As Devries et al. (2011) note, the approach suffers from measurement errors that are correlated with the business cycle and therefore might be underestimating contractionary effect. Instead, Devries et al.'s so-called "narrative" approach, which is used in this paper, builds on policymakers' intentions and reviews official publications on changes in the fiscal stance, published by institutions such as the IMF, the OECD or national treasuries. Therefore, consolidation episodes identified by this approach refer to periods, in which changes in fiscal policies were motivated by the intention to reduce public deficits. Another advantage of this approach is that by looking at policymakers' decisions, this procedure eliminates endogeneity problems, consisting of fiscal policy responses to the economy.

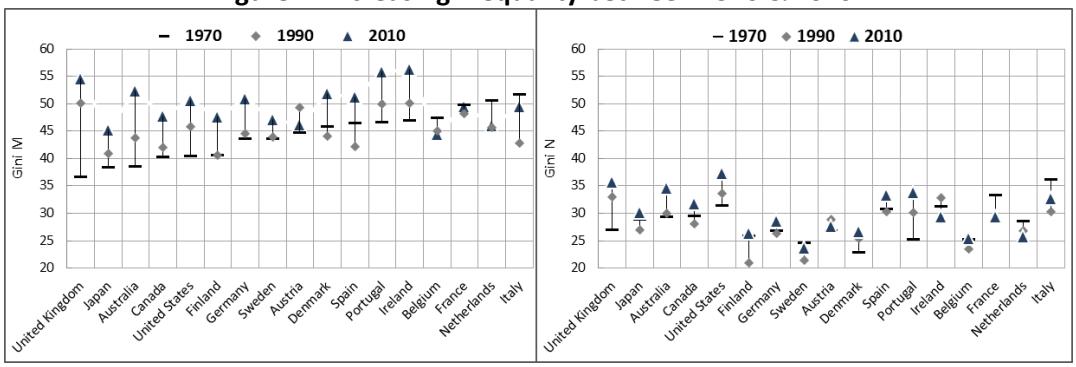
Defining a single indicator that captures the many aspects of economic inequality is challenging if not impossible. The most popular indicator is the well-known Gini coefficient (Hoeller et al., 2012; Keeley, 2015), which benefits from high data availability. Nevertheless, it is relatively insensitive to movements at the upper-end of the income distribution, and it can fail to accurately capture simultaneous changes for different income shares (FES, 2015). One reason behind this is that the richest households tend to be underrepresented in household surveys (Alvaredo, 2011). Hence, other indicators, such as quintile shares, the Theil, or Atkinson index, might be more accurate to gauge income inequality but are far less available. We will, therefore, use Gini here to measure inequality.

To account for redistributive policies and their effect on inequality, the literature mostly focuses on two different versions of the Gini coefficient: Gini coefficients gross and net of taxes. While the former refers to income distribution before state interventions through taxation, the latter is constructed after deducting them. The difference between these two values, therefore, represents the absolute redistributive power of a state. More developed economies with fully fledged welfare state systems use higher social spending and taxation

to redistribute income, which should be reflected in a higher difference between the two Gini coefficients.

As it can be seen in Figure 1, income inequality has increased over the last decades in most advanced countries that are included in this paper. While in most European countries the Gini coefficients before taxation and social spending stood at levels between 38 and 45 in the 1970s, they increased up to values of around 50. A similar pattern can be seen for the Gini coefficients of net disposable income, which stood below 30 in the 1970s for most European countries. Today, the referring values are mostly considerably higher, with the UK being the most unequal European country in the sample (36). The European trends are particularly interesting since these countries are supposed to be among the most equal ones in the world. The focus on a broader sample, given by the average OECD Gini coefficients, confirms this trend. The average net Gini coefficient stood at 29 throughout the OECD countries in the mid-80s and increased to 32 in 2010. It rose in 17 out of 22 OECD countries (OECD, 2011). Between 1990 and 2012 the Gini coefficient of market income increased on average by more than five percentage points throughout the OECD countries.

**Figure 1: Increasing Inequality between 1970 & 2010[2]**




## 3.2 Data

This paper bases its econometric findings on a sample of 17 advanced economies and uses the dataset of Devries et al. (2011).[3] The sample period spans from 1978 – 2009. The key variables of interests here are:

[2] Own illustration, based on SWIID data. Note: 1970 Data for Belgium & Portugal are for 1972 & 1973 respectively.

[3] More precisely the countries used are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom & the United States of America.

*Gini index (Market & Net income Gini):* In line with the overall inequality literature the Gini index is used to account for income inequality and referring changes over time as well as comparisons across countries. Focusing on two different variables of interest by differentiating two income definitions (gross and net of taxes and social spending by governments), helps to account for redistribution, which is the difference between the two values. This might be particularly important for the advanced economies included in the sample, which use greater redistributional power in order to dampen income inequality. Gross inequality is often used synonymous for market income inequality, although this paper will only use the latter name. Similarly, net income inequality is sometimes referred to as disposable income inequality. Data for the Gini indexes are taken from the Standardized World Income Inequality Database (SWIID), version 4.1. This database depicts the most comprehensive inequality database at the moment and harmonises results of different studies and therefore generates greater comparability (Solt, 2014).

*Fiscal consolidation:* Episodes of fiscal consolidation are derived from the narrative approach suggested by Devries et al's. (2011) and using their database. As can be seen in Appendix 3, out of the 544 relevant data-points, 165 are identified as fiscal consolidation years. The raw data conveniently reports the overall consolidation size, as well as tax-based and spending-based consolidation sizes. We can thus derive dummies capturing the occurrence of an overall fiscal consolidation and of tax or spending-based adjustments, as these are the variables we want to relate to the total values of budget balance improvement in percent of GDP.

In addition, we use a set of standard controls. These include:

*Income per capita:* We use log of income per capita and it's square as we assume a non-linear relationship between income and inequality (Kuznets, 1955; Barro, 2000; Barro, 2008; Barro & Lee, 2013). The data is taken from the Penn World Tables (Version 7.1) and refer to real (PPP converted) GDP per capita in constant 2005 USD.

*Inflation:* Theory suggests that high inflation would hurt the poor more than higher income groups and thereby widen the income gap, due to differences in wealth and income protection abilities between the rich and the poor during inflation periods (Bulir, 1998; Easterly & Fisher, 2001; Albanesi, 2007). However, the dataset comprises only high-income countries with moderate average inflation rates (4.4% p.a. over the whole sample period). As observed by Bulir (1998), during years of relatively low inflation, the

impact on inequality tends to be counter-intuitive, if financial deepening is sufficiently high (which can be assumed for our sample). Moreover, reverse causation is possible as suggested by Crowe (2006). Hence, the resulting effect of inflation is expected to be ambiguous. The data used, refer to the annual change in the Consumer Price Index (CPI). Data are extracted from the OECD Economic Outlook database (No. 98).

*Trade Openness:* The share of trade on GDP can affect the distribution of income depending on factor endowments. While inequality in developed countries is observed to rise with higher trade openness, the opposite is true for developing countries due to the different relation of capital income over labour income, which is relatively higher in developed countries and benefits from greater trade openness (IMF, 2007). Since the countries used here are exclusively high-income countries, but the sample time is relatively long, trade openness is expected to have a somewhat ambiguous impact on income inequality. The data are extracted from the World Bank's World Development Indicators (WDI) database.

The data and variables used are broadly in line with the most relevant studies on fiscal consolidation and income inequality, in order to keep the baseline results comparable. However, this paper introduces an innovative way to classify consolidation compositions in section 4.2.2.

# 4 Econometric Analysis

Analysing the dataset of Devries et al. (2011), one can observe that in the sample 51 episodes of fiscal consolidations took place between 1978 and 2009. Hereby, an episode may consist of several years if the consolidation efforts were ongoing. Applying this approach leads to a total of 165 years, in which consolidation programmes were in place, resulting in an episode averaging to 3.24 years. Table 1 shows that the average consolidation size amounts to 3.4 percent of GDP throughout the whole sample. By comparing the cumulative changes in the inequality indexes during these episodes, one can already derive intuitions on the general distributional consequences of fiscal consolidation. As can be seen, fiscal consolidations typically lead to substantial variation in income inequality measures. Market income inequality increases on average 0.92 Gini points during a consolidation episode. Disposable income inequality just increases by 0.33 Gini points, indicating that redistribution might, in general, be cushioning the distributional effect of fiscal consolidations.

**Table 1: Overview of all consolidation episodes and their inequality effects**[4]

| | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 | | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Australia** | 1985-1988 | 2.47 | 1.01 | 0.00 | 0.82 | 1.00 | **Italy** | 1991-1998 | 19.23 | 5.72 | 6.54 | 4.59 | 4.88 |
| | 1994-1999 | 2.47 | 4.02 | 3.04 | 1.82 | 1.57 | | 2004-2007 | 4.72 | -0.74 | -2.20 | -0.90 | -1.60 |
| **Austria** | 1980-1981 | 2.36 | . | . | . | . | **Japan** | 1979-1983 | 1.89 | -6.33 | -4.21 | -1.10 | 0.07 |
| | 1984 | 2.04 | -0.94 | -2.16 | -0.38 | -0.88 | | 1997-1998 | 1.90 | 1.18 | 2.01 | 1.14 | 1.32 |
| | 1996-1997 | 3.97 | -0.91 | -0.44 | -1.10 | -0.80 | | 2003-2007 | 2.27 | -1.63 | -0.68 | 0.10 | 0.26 |
| | 2001-2002 | 1.57 | 1.53 | 1.40 | 0.78 | 0.57 | **Netherlands** | 1981-1988 | 12.98 | 0.41 | -1.28 | 0.16 | 0.82 |
| **Belgium** | 1982-1985 | 5.75 | 2.91 | 2.65 | -0.01 | 0.10 | | 1991-1993 | 1.73 | 1.00 | 0.18 | -0.90 | -0.83 |
| | 1987 | 2.80 | 0.32 | 0.16 | 0.17 | 0.12 | | 2004-2005 | 2.20 | 0.51 | 0.24 | 0.71 | 0.41 |
| | 1990 | 0.60 | 1.08 | 0.37 | 0.02 | -0.44 | **Portugal** | 1983 | 2.30 | -2.46 | 0.47 | -1.31 | -1.04 |
| | 1992-1994 | 3.86 | 1.12 | 1.60 | 1.61 | 4.40 | | 2000 | 0.50 | -1.12 | 0.62 | -0.10 | 0.23 |
| | 1996-1997 | 1.91 | 1.00 | 0.36 | -1.60 | 0.35 | | 2002 | 1.60 | 1.22 | 2.74 | 0.32 | 0.45 |
| **Canada** | 1984-1997 | 7.93 | 5.01 | 6.74 | 0.49 | 2.53 | | 2005-2007 | 3.65 | 2.13 | -0.05 | -1.16 | -1.68 |
| **Denmark** | 1983-1985 | 6.69 | -1.79 | -1.11 | -0.88 | -0.55 | **Spain** | 1983-1984 | 3.02 | -1.81 | -2.24 | -1.67 | -1.93 |
| | 1995 | 0.30 | -0.18 | 0.07 | -0.76 | 0.23 | | 1989 | 1.22 | 2.31 | 2.84 | 1.43 | 1.95 |
| **Finland** | 1992-1997 | 11.43 | 6.51 | 4.11 | 2.02 | 2.74 | | 1992-1997 | 6.64 | 5.26 | 2.30 | 3.73 | 1.93 |
| **France** | 1979 | 0.85 | 0.10 | 0.22 | -0.18 | -0.12 | **Sweden** | 1984 | 0.90 | 0.20 | 0.36 | 0.25 | 0.25 |
| | 1987 | 0.26 | -0.31 | 0.15 | -1.28 | -0.80 | | 1993-1998 | 10.59 | 0.67 | -0.04 | -0.33 | 1.18 |
| | 1991 | 0.25 | 0.00 | 0.04 | -0.02 | 0.04 | **United Kingdom** | 1979-1982 | 2.46 | 4.04 | 3.41 | 0.81 | 0.71 |
| | 1995-1997 | 2.11 | 0.64 | 0.03 | -0.28 | -0.27 | | 1994-1999 | 2.61 | 0.56 | -0.90 | 0.65 | 0.32 |
| **Germany** | 1982-1984 | 2.23 | 3.40 | 2.59 | 2.10 | 0.98 | **United States** | 1978 | 0.14 | 0.05 | 0.04 | -0.34 | -0.48 |
| | 1991-1995 | 3.67 | 1.66 | 0.36 | 0.76 | 0.38 | | 1980-1981 | 0.29 | 0.41 | 0.52 | 0.75 | 0.66 |
| | 1997 | 1.60 | 0.21 | 0.16 | -0.13 | -0.13 | | 1985-1986 | 0.31 | 1.50 | 0.89 | 1.26 | 0.71 |
| | 1999-2000 | 1.00 | 0.54 | 1.09 | 0.01 | 0.43 | | 1988 | 0.85 | 0.20 | 0.21 | 0.12 | 0.10 |
| | 2003-2004 | 1.14 | 0.82 | 0.66 | 0.39 | 0.41 | | 1990-1998 | 3.92 | 3.45 | 2.98 | 3.73 | 3.47 |
| | 2006-2007 | 1.40 | 0.74 | 0.44 | 0.78 | 0.34 | | | | | | | |
| **Ireland** | 1981-1987 | 10.05 | -0.14 | -0.55 | -0.18 | -0.41 | **Average** | **3.24** | **3.40** | **0.92** | **0.76** | **0.33** | **0.47** |
| | 2008 | 4.74 | 1.74 | 2.01 | -0.20 | -0.12 | ***Σ episodes/years*** | *51/165* | | | | | |

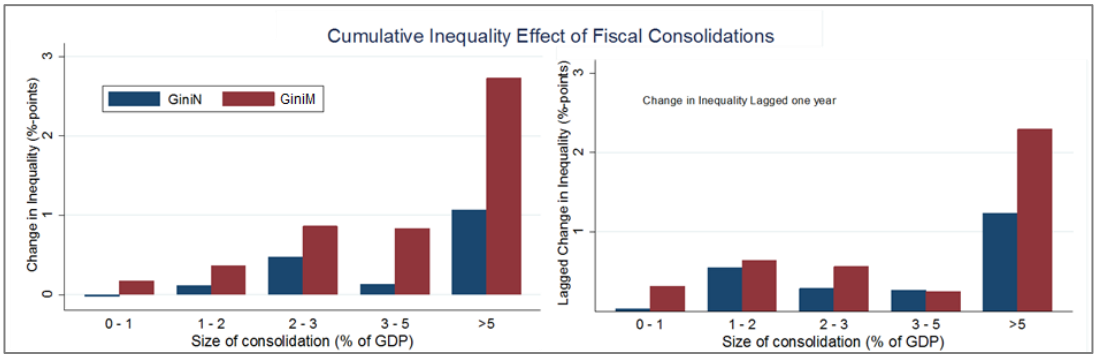
Since the full distributional effects of policy changes are considered to take some time until they fully materialise, the same analysis is repeated with a lag of one year in the inequality measures. In this context, market income inequality is surprisingly observed to increase on average slightly less (0.78 Gini points), while net inequality grows stronger than during the consolidation episode (0.45). This could be explained by an improvement in labour market

[4] Own illustration, based on SWIID & Devries et al. (2011) data

outcomes whenever fiscal policy relaxes (IMF, 2015). In general, it is quite evident that inequality rises after consolidations, although there are some exceptions. For example, Ireland's long consolidation episode in the 1980s was followed by slight decreases in all inequality measures, while a larger decrease in inequality was observed after Japan's fiscal contraction from 1979 onwards.

In Figure 2 the total size of consolidation is plotted on the horizontal axis against the cumulative inequality changes on the vertical axis. The consolidation sizes are grouped into the most frequent ranges that are also roughly equally distributed. The right part of the chart repeats the same exercise with one year lagged change in the inequality measures. It can be seen that the size of the consolidation seems to matter for the resulting income inequality changes. In particular, larger consolidations are followed by widening income gaps. This indicates that these consolidations affect households at the bottom of the income distribution disproportionally more. When the consolidation represents a small share of GDP the impact on market inequality during the consolidation and one year after is also relatively small. For disposable income inequality, the effect is even negligible when the consolidation is below 1% of GDP. One reason could be that larger adjustments might include deeper spending cuts that hit poor households more.

**Figure 2: Inequality development after consolidation episodes[5]**




To go beyond these observed unconditional correlations, we need to explore the relationship between inequality and consolidations further, using appropriate econometric techniques.

## 4.1 Methodology

In order to test the relationship between fiscal adjustment measures and resulting changes in inequality this paper applies panel data technique, to consider both cross-sectional and

[5] Own illustration, based on SWIID & Devries et al. (2011) data

time dimensions. Building on the literature, we use a model consistent with IMF (2012), Woo et al. (2013) and Agnello & Sousa (2014). In particular, we first reproduce first the model of Agnello & Sousa (2014):

$$\mathbf{Y_{it} = X_{it}\,\beta + \alpha_i + U_{it},}$$

Where $Y_{it} = (Y_{it}^{market}, Y_{it}^{net})$, represents the market and the net income Gini index respectively. The regressor matrix is denoted by $X_{it} = (X_1^{market}, X_2^{net})$, where $\beta = (\beta_1^{market}, \beta_2^{net})$ are the associated coefficients. $\alpha_i$ and $U_{it}$ are the error terms, assumed to have zero means and mutually uncorrelated with $X_{it}$. The main regressor matrix consists of the log of per capita GDP and its squared form, trade openness, and various variables, capturing fiscal consolidation occurrences. Applying time lags in the independent variables seems convincing since the effects of fiscal consolidations need some time to fully unfold. Especially their effects on income inequality are expected to occur with some time lag since they work through different channels. These augmentations lead to the following baseline model:

$$\mathbf{Gini^{market}_{it} = cons. + \beta_1\, log\_GDP_{t-1} + \beta_2\, log\_GDP^2_{t-1} + \beta_3\, inflation_{t-1} + \beta_4\, tradeopenness_{t-1} + \beta_5\, fiscal\ consolidation_{t-1} + \alpha_i + U_{it}.}$$

Here, we will start by using the market income Gini coefficient as dependent variable before turning our attention to the net income Gini coefficient. Fiscal consolidation will also first be proxied by the dummy variable capturing the occurrence of a consolidation period, before being replaced by the actual value of the primary balance improvement in percent of GDP. Afterwards, the baseline model will be augmented in different ways, in order to test the mentioned effects.

## 4.2 Results

We will present our results here, noting that they should be interpreted as associations, rather than causations.

### 4.2.1 The effect of fiscal consolidation on income inequality

Table 2 reports the output of three regressions undertaken to establish the baseline model as described in the last section. Column 1 focuses on the whole set of control variables, without adding consolidation variables. The two GDP indicators are used to test the expected Kuznets relationship as described above. As it can be seen, both the squared and the simple logarithm of GDP (lagged one year) are significant to explain the variation in within-country market income inequality. As expected, the squared term has a negative sign, while the simple term has a positive one, thereby suggesting the validity of the Kuznets relationship between GDP per capita and income inequality. Moreover, it is obvious that the lags of inflation and trade openness both entail sufficient eligibility to be included in the model since both comprise significant effects on income inequality. It can be observed that higher inflation here actually leads to lower inequality. This result might be a bit counter-intuitive, but is also in line with the literature, since e.g. Woo et al. (2013) observe it as well. Referring to Bulir (1998), it can be reasoned that this result is inherited in the high-income country sample, used here. If lower income countries would be included and examined together with the sample in place one could expect a positive relationship between inflation and income inequality.

As it can be seen, higher trade openness is associated with a slight increase in inequality, although not significantly. The $R^2$ of this model sums up to 0.275. Hence, a significantly high portion of variability can be explained by the controls. It should not be surprising that the value is not higher since such a complex concept like income inequality is expected to be influenced by an array of other factors than described here.

Column 2 introduces the dummy for fiscal consolidation to the equation. It can be seen that in line with the expectations and keeping all other factors constant, the occurrence of a fiscal consolidation on average raises the market inequality about 0.659 Gini points in the year after. The effect is found to be statistically significantly different from zero at a 5% confidence level. Adding the consolidation occurrence leads to a further $R^2$ increase up 0.296. Since this variable only captures the occurrence of a consolidation in the year before, coded with 1 for an occurrence or 0 for an absence, the coefficient can only be interpreted as the average effect of a consolidation occurrence. It would be more interesting to analyse the discretionary effect of a consolidation in points of GDP. Therefore, in column 3 the occurrence dummy is replaced by the absolute size of the consolidation episode. This does not strongly alter the signs, significance or magnitude of the other coefficients estimated. However, the consolidation coefficient now can be interpreted in a more meaningful way: A

deliberate improvement of the primary balance about one percent of GDP in one year is (ceteris paribus) associated with an increase in market income inequality of 0.597 Gini points in the next year, which represent more than half a percent increase in market income inequality.[6] To put this value in perspective: As described in section 3, the Gini coefficient for market income rose on average about 5 points between 1990 and 2010 throughout the OECD countries. Loosely speaking, keeping all other factors unchanged, a fiscal consolidation of 1% of GDP refers to one tenth of the income inequality rise in two decades in the sample. Interestingly, the effect is the second strongest of all controls after the GDP variable. The coefficient is found to be statistically significant at a 1% level. This effect is neither negligible nor irrelevant for market income inequality.

**Table 2: Effects of fiscal consolidation on market income inequality[7]**

| **Variable** | **(1)** Gini M coeff | **(2)** Gini M coeff | **(3)** Gini M coeff |
|---|---|---|---|
| GDP per capita, log, *t-1* | 3.486** *{0.015}* | 3.517** *{1.395}* | 3.453** *{1.386}* |
| GDP per capita sqrd, log, *t-1* | -0.127** *{0.060}* | -0.130** *{0.012}* | -0.127** *{0.013}* |
| Inflation, *t-1* | -0.334*** *{0.036}* | -0.360*** *{0.000}* | -0.360*** *{0.000}* |
| Trade Openness, *t-1* | 0.021* *{0.069}* | 0.026** *{0.022}* | 0.028** *{0.014}* |
| Consolidation Occurence, *t-1* | | 0.659** *{0.010}* | |
| Consolidation (%), *t-1* | | | 0.597*** *{0.001}* |
| Constant | 23.760** *{0.005}* | 23.281** *{0.005}* | 23.577** *{0.004}* |
| Countries | 17 | 17 | 17 |
| N | 533 | 517 | 517 |
| R sqrd | 0.275 | 0.296 | 0.303 |
| F | 48.613 | 41.568 | 43.124 |

* p<0.1, ** p<0.05, *** p<0.01 P-Values in parantheses

A Panel unit roots test based on Im et al. (2003) shows that the null hypothesis of the Gini coefficient being stationary cannot be rejected. Moreover, a Hausman test confirmed that fixed effects were appropriate here. Further tests showed some minor deviations from

[6] However, one has to acknowledge that this result is with respect to a scenario in which no fiscal consolidation is implemented and deficits continue to not cause major disruptions. If this assumption would not hold and such a disruption in form of a fiscal crisis would occur because consolidations were not undertaken, risks for economic downturns could arise. These risks in turn could lead to even greater income inequality caused by absence of fiscal discipline, which cannot be considered in this model.

[7] Note: The dependent variable is the market income Gini coefficient. The table reports the referring coefficients obtained by a Panel regression system with time and country fixed effects. *, ** & *** in this and all following regression outputs indicate significance of the coefficient on a 10%, 5% and 1% level, respectively.

normality, especially at the end of the tails, but these are too small to threaten the overall validity of the model. All results presented are also corrected for heteroscedasticity.[8]

Focusing now on net income inequality we replicate the same three models. Column 1 of Table 3, therefore, reports the results including only the control variables. As it can be seen, the joint effects can only explain 19.7% of the variation in net income inequality while they were able to account for 27.5% in market inequality. This already indicates that there must be more factors involved in explaining changes in net income inequality. Also, the significance of each one of the variables we are considering is relatively lower. Only inflation and to a lower extent trade openness are able to explain some of the variation in net income inequality at a statistically significant level. The size of the single effects also decreases remarkably in comparison to the model with market inequality as the dependent variable, thereby indicating that their influences are much stronger on market than on disposable income inequality.

Focusing on the consolidation impact, one can see that the referring coefficient decreases both in size and in significance. Based on that, it can already be inferred that redistribution poses a very strong impact on net income inequality, not only in normal times but also during consolidation episodes. While the coefficient was significant and sizeable (0.597), when regressing on market income inequality it is significantly smaller (0.057) and completely loses its explanatory power for net income inequality.

**Table 3: Effects of fiscal consolidations on net income inequality [9]**

| **Variable** | **(1)** Gini N coeff | | **(2)** Gini N coeff | |
|---|---|---|---|---|
| GDP per capita, log, *t-1* | 1.529 | *{0.113}* | 1.529 | *{0.108}* |
| GDP per capita sqrd, log, *t-1* | -0.058 | *{0.150}* | -0.059 | *{0.139}* |
| Inflation, *t-1* | -0.180*** | *{0.000}* | -0.200*** | *{0.000}* |
| Trade Openness, *t-1* | 0.016* | *{0.037}* | 0.018** | *{0.020}* |
| Consolidation (%), *t-1* | | | 0.057 | *{0.627}* |
| Constant | 18.841*** | *{0.001}* | 18.818*** | *{0.001}* |
| Countries | 17 | | 17 | |
| N | 533 | | 517 | |
| R sqrd | 0.197 | | 0.212 | |
| F | 31.454 | | 26.631 | |

* p<0.1, ** p<0.05, *** p<0.01 P-Values in parantheses

[8] All test results available from author upon request.

[9] Note: The dependent variable is the net income Gini coefficient.

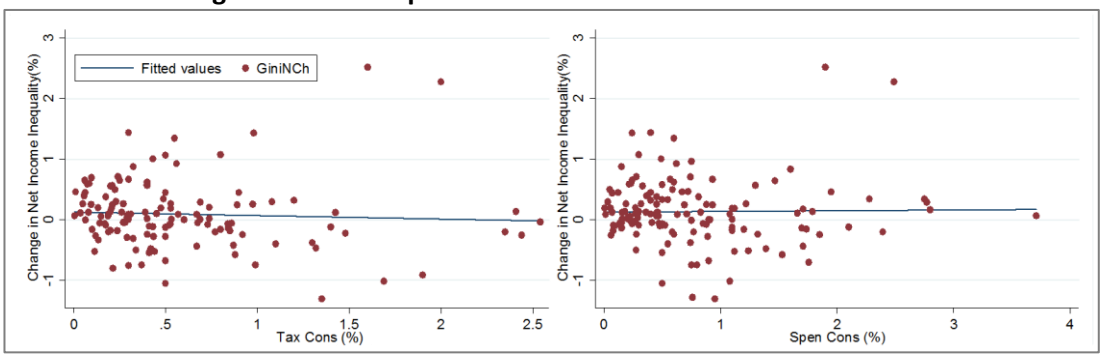
Supporters of social market economy might interpret this as evidence for functioning social states that are able to redistribute from the rich to the poor even in times of fiscal constraints and thereby offset negative effects on market income inequality. This presumption is also backed by redistribution theory. Paulus et al. (2009), OECD (2011) and Caminada et al. (2012) all find that redistributive fiscal policies reduce net inequality. However, it might be a bit too early for this conclusion without exploring further the features of the consolidation packages implemented. First and foremost, one would have to incorporate clear and unambiguous variables capturing redistribution. According to Meltzer & Richard (1981), higher inequality creates pressures to redistribute income with the voters having the incentive to push for reforms that are going to benefit them. Thereby, as pointed out by the OECD (2015), when more inequality leads to more redistribution, one would also have to consider reverse causality issues, which further exacerbate a valid econometric analysis. Yet, the results and the stated literature point to relevant inequality implications of focusing on taxation and government spending within consolidations. Therefore, the next section will deal with the differentiation between spending and tax-based consolidations and their effects on both Gini coefficients.

### 4.2.2 The compositional effects: Tax- vs. spending-based consolidations

As described earlier, spending cuts are supposed to be more growth-friendly and tend to lead to greater debt reduction than tax increases. Now, intuition and earlier studies indicate that the opposite might be the case for income inequality. Figure 3 already provides some graphical insight on this link. As can be seen on the left part of the graph there is a slightly decreasing line of fit between tax cuts size and the resulting change in net income inequality in the sample. The opposite is true for spending cuts: As the graph suggests, the net income Gini coefficient increases slightly with the size of the spending cuts. Within the sample, 134 episodes are identified as tax-based consolidations, while spending-based ones occurred 142 times.[10]

[10] See Appendices 4 & 5 for more details.

**Figure 3: The compositional effect of fiscal consolidations**[11]




To account for spending and taxation based deficit cuts, the fiscal consolidation dummy that we have used so far in our models is first replaced by a tax and a spending consolidation dummy variable. These two variables capture the occurrence of either a tax rise or a spending cut, respectively. Both are taken from the Devries et al. (2011) database. Table 4 reports the findings of this model. Column 1 and 2 refer to market income inequality, whereas column 3 and 4 are dedicated to the effects on net income inequality. Looking at the results for market income inequality, one can observe that both coefficients have the expected sign: While tax hikes are associated with lower net income inequality in the year after, the opposite holds for spending cuts. More precisely, the occurrence of a tax hike within a consolidation leads to an average reduction of market income inequality of 0.409 Gini points, while a spending cut leads to a remarkably high rise in market income inequality about 1.192 Gini points in the following year. Nevertheless, only the latter is found to be statistically significant. All other variables remain significant as well. Replacing the dummies by the actual values as done in column 2 indicates the absolute effect of both consolidation instruments. Surprisingly, the sign of the tax consolidation coefficient changes now, although not being significant. In contrast, the spending cut effect is found to be significant and still relatively large (+ 0.753 Gini points). Column 2 replaces the dummy variables of spending and tax consolidations by their actual values. Doing so confirms the findings from before. However, this augmentation does not lead to an improvement of the model explanatory power. In the case of Woo et al. (2013) the results look relatively similar. They find spending-based consolidations to result in statistically significant inequality increases up to 2%, while tax based ones are slightly inequality reducing but not significant.

Turning to net income inequality, it can be seen in column 4, that spending cuts have a more important impact, although the coefficients are not significant. By replacing the occurrence

[11] Note: The scatter plots only contain data points, of which the referring values were bigger than zero in order to illustrate the discretionary effect of tax rises and spending cuts, respectively.

dummies with absolute values the results look rather inconclusive. Once again, it is obvious that the model is less powerful in explaining the variation in the independent variable when net income inequality is used. At this point, it is important to mention the limitation of the data to capture the composition of the tax system and its progressivity. An increase in taxes can increase inequality if they are made through indirect taxes rather than e.g. by a progressive personal income tax. The data do not capture these alternatives, so it would be interesting to control for the tax composition of every country in order to further explore this effect. The results for tax-based consolidations can thereby be somewhat ambiguous.

**Table 4: Distributional effects of tax- and spending-based consolidations (Conventional approach)[12]**

| Variable | (1) Gini M coeff | | (2) Gini M coeff | | (3) Gini N coeff | | (4) Gini N coeff | |
|---|---|---|---|---|---|---|---|---|
| GDP per capita, log, *t-1* | 3.595** | *{0.010}* | 3.498* | *{0.012}* | 1.56 | *{0.101}* | 1.493 | *{0.117}* |
| GDP per capita sqrd, log, *t-1* | -0.133* | *{0.023}* | -0.128* | *{0.028}* | -0.060 | *{0.131}* | -0.058 | *{0.147}* |
| Inflation, *t-1* | -0.353*** | *{0.000}* | -0.356*** | *{0.000}* | -0.198*** | *{0.000}* | -0.203*** | *{0.000}* |
| Trade Openness, *t-1* | 0.026** | *{0.021}* | 0.028** | *{0.015}* | 0.018** | *{0.019}* | 0.018** | *{0.019}* |
| Tax Consolidation Occurence, *t-1* | -0.409 | *{0.270}* | | | -0.195 | *{0.442}* | | |
| Spending Cons. Occurence, *t-1* | 1.192*** | *{0.001}* | | | 0.290 | *{0.237}* | | |
| Tax Consolidation (%), *t-1* | | | 0.368 | *{0.273}* | | | 0.241 | *{0.293}* |
| Spending Cons. (%), *t-1* | | | 0.753** | *{0.004}* | | | -0.068 | *{0.702}* |
| Constant | 22.817** | *{0.005}* | 23.253** | *{0.004}* | 18.616*** | *{0.001}* | 19.078*** | *{0.001}* |
| Countries | 17 | | 17 | | 17 | | 17 | |
| N | 517 | | 517 | | 517 | | 517 | |
| R sqrd | 0.305 | | 0.304 | | 0.214 | | 0.213 | |
| F | 36.170 | | 36.016 | | 22.394 | | 22.332 | |

* p<0.1, ** p<0.05, *** p<0.01 P-Values in parantheses

As stated earlier, this conventional approach to differentiate compositional features of consolidations is expected to inherit some flaws. Namely, the cited literature just simply uses the un-adopted time series of Devries et al. (2011) and incorporates them into their regression analysis as done in the last subsection. This procedure is not free of critique. Buyse (2015) for example criticizes the IMF (2012) and Agnello & Sousa (2014) for using consolidation periods on a year-to-year basis, instead of focusing on the cumulative effects of multiple years. More important, problems in this approach arise, since most consolidations are mixed ones, meaning consisting of both spending cuts and tax increases. Out of the 165 consolidation episodes in the sample, 102 were mixed.[13] Especially larger consolidations tend to be achieved by a composition of both measures. This is not surprising since it might be

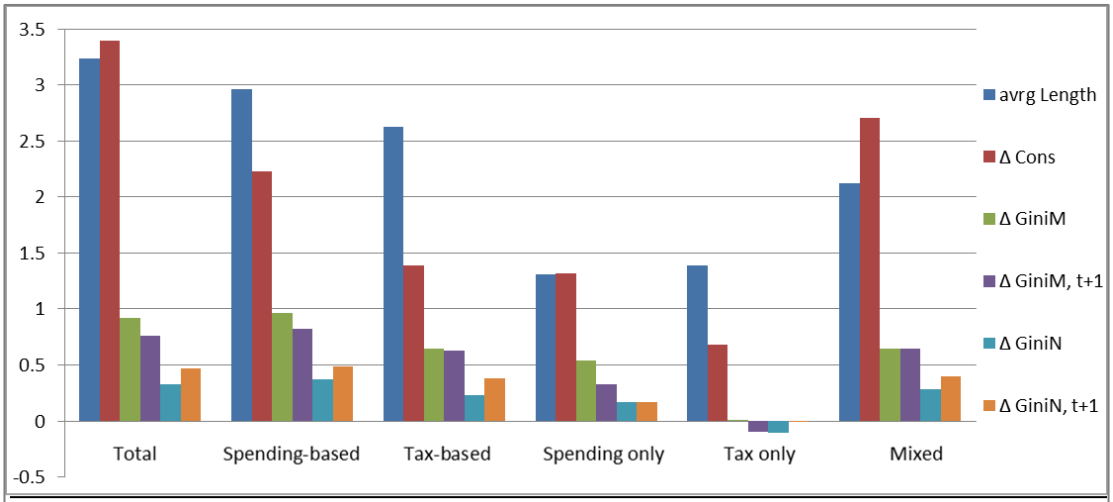
[12] Note: The dependent variable is the Gini coefficient for market income Gini coefficient (columns 1 & 2) and net income inequality (columns 3 & 4), respectively.
[13] See Appendix 8 for more details.

hard to justify, why a consolidation should only be done on one side of the budget balance. The traditional approach hereby just identifies any episode as a spending one, whenever a cut in spending occurs, not accounting for tax increases implemented in the same year and vice versa. After disentangling the episodes in spending-only, tax-only and mixed ones, the distribution of the episodes looks a bit different than presented in the last subsection: Only 25 of all consolidation years were tax-only ones, 38 spending-only and the rest mixed, as stated above.[14]

Figure 4 graphically explains the big differences of the average results between the conventional and the augmented approach regarding the average length, cumulated consolidation size, and the associated increases in both Gini coefficients in the same year and the year after. As shown here, both the length and the cumulated size of consolidations are much smaller for both tax-only and spending-only consolidations. While tax-only consolidations are slightly longer, spending-only ones are much larger in size. However, it is striking that both are much shorter and less sizeable than mixed one, as assumed. The largest benefit of this approach lies in the more accurate way to look at distributional impacts of different consolidation compositions. While spending-only ones are followed by mild increases in both inequality measures, tax-only ones are actually followed by a decrease in income inequality. Mixed consolidations, on the other hand, are longer, larger, and less equitable than single side measures.

[14] A detailed breakdown of the episodes into tax-based only, spending-based only and mixed consolidations can be found in Appendices 6 - 8.

**Figure 4: Compositional consolidation effects depending on definition[15]**




| | avrg length (years) | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 | ∑ episodes/years |
|---|---|---|---|---|---|---|---|
| **Total** | **3.2** | **3.4** | **0.9** | **0.8** | **0.3** | **0.5** | 51/165 |
| **Spending-based** | **3.0** | **2.2** | **1.0** | **0.8** | **0.4** | **0.5** | 48/142 |
| **Tax-based** | **2.6** | **1.4** | **0.6** | **0.6** | **0.2** | **0.4** | 51/134 |
| **Spending only** | **1.3** | **1.3** | **0.5** | **0.3** | **0.2** | **0.2** | 29/38 |
| **Tax only** | **1.4** | **0.7** | **0.0** | **-0.1** | **-0.1** | **0.0** | 18/25 |
| **Mixed** | **2.1** | **2.7** | **0.6** | **0.6** | **0.3** | **0.4** | 48/102 |

Yet, these findings should be treated with extreme caution. As it has been said, single side consolidations tend to be much smaller than combined measures. Combining this thought with the earlier finding of the linear relationship between consolidation size and income inequality leads the way to the conclusion that causality rather runs from consolidation size to composition measure. However, it can clearly be seen that there is a difference in the inequality effects of spending-only and tax-only consolidations. Having said that and keeping the caveats of graphical approaches in mind, it makes sense to incorporate the new indicators in the econometric model from earlier. Table 5 presents the findings of the same model like in the last section but uses the augmented approach to identify compositional effects. Again, the first two columns report the coefficients' effects on market income inequality. As can be seen, the occurrence of a tax-only consolidation decreases market income inequality on average by 0.602 Gini points the following year, ceteris paribus, although the effect is not significant.[16] The occurrence of a spending-only consolidation is found to be significant on a 95% confidence level and leads to an increase of market inequality by 1.061 Gini points in

[15] Source: Author's own calculations based on Devries et al. (2011) & Solt (2009). Note: The vertical axis denotes the average cumulative values for the consolidation length (in years), the consolidation size (in percent of GDP), and the resulting changes in inequality (in Gini points), respectively.

[16] The low significance level might to some extent also be explained by the relative low amount of observations that are considered spending-only and even more relevant for those, which are tax-only. This fact already points to further research potential regarding theses consolidation types in a bigger sample.

the year after. Mixed consolidations score up to 0.813 Gini points and are significant at 1%. Replacing the dummies by absolute values confirm these findings with the same signs and significance levels. These results are also in the spirit of the theoretical concepts of Ball et al. (2001), who argue that spending-based consolidations reduce the wage share in total income. While wage loss effects are persistent over time, losses on capital and rent incomes are rather short-lived, hence the widening of market income inequality.

Turning to net income inequality (columns 3 & 4), the new approach produces findings congruent to the model applied before. Inconclusive results appear when comparing the model with occurrence dummies with the model including absolute values. Hence, again the applied variables seem not to be relevant enough to explain the full effect on net income inequality. However, it can clearly be seen that the augmented approach delivers meaningful results for market income inequality that are more accurate in describing the discretionary effect of one-sided and mixed consolidations, than what is defined in the literature. Hence, the hypothesis that spending-based consolidations are less equitable could be proved using both the conventional and the augmented approach.

**Table 5: Distributional effects of tax-only, spending-only and mixed consolidations (Augmented approach)[17]**

| Variable | (1) Gini M coeff | | (2) Gini M coeff | | (3) Gini N coeff | | (4) Gini N coeff | |
|---|---|---|---|---|---|---|---|---|
| GDP per capita, log, *t-1* | 3.598*** | *{0.010}* | 3.608*** | *{0.010}* | 1.567* | *{0.099}* | 1.537 | *{0.107}* |
| GDP per capita sqrd, log, *t-1* | -0.134** | *{0.022}* | -0.133** | *{0.023}* | -0.062 | *{0.123}* | -0.060 | *{0.135}* |
| Inflation, *t-1* | -0.353*** | *{0.000}* | -0.357*** | *{0.000}* | -0.197*** | *{0.000}* | -0.201*** | *{0.000}* |
| Trade Openness, *t-1* | 0.026** | *{0.022}* | 0.027** | *{0.016}* | 0.017** | *{0.024}* | 0.018** | *{0.018}* |
| Tax-only Cons. Occurence, *t-1* | -0.602 | *{0.272}* | | | -0.739* | *{0.048}* | | |
| Spending-Only Cons. Occurence, *t-1* | 1.061** | *{0.019}* | | | -0.082 | *{0.790}* | | |
| Mixed Cons. Occurence, *t-1* | 0.813*** | *{0.007}* | | | 0.179 | *{0.386}* | | |
| Tax-Only Consolidation (%), *t-1* | | | -0.008 | *{0.992}* | | | 0.078 | *{0.886}* |
| Spending-Only Cons. (%), *t-1* | | | 0.798** | *{0.013}* | | | -0.132 | *{0.546}* |
| Mixed Cons. (%), *t-1* | | | 0.524*** | *{0.003}* | | | 0.148 | *{0.225}* |
| Constant | 22.861** | *{0.005}* | 22.640** | *{0.006}* | 18.741*** | *{0.001}* | 18.795*** | *{0.001}* |
| Countries | 17 | | 17 | | 17 | | 17 | |
| N | 517 | | 517 | | 517 | | 517 | |
| R sqrd | 0.306 | | 0.305 | | 0.220 | | 0.215 | |
| F | 30.987 | | 30.965 | | 19.867 | | 19.267 | |

* p<0.1, ** p<0.05, *** p<0.01 P-Values in parantheses

The results shown here indicate a strong justification for the use of the augmented approach to identify compositions of fiscal consolidations. While the conventional approach delivers flawed results in differentiating between the true effects of spending cuts and tax rises,

[17] Note: The dependent variable is the Gini coefficient for market income Gini coefficient (columns 1 & 2) and net income inequality (columns 3 & 4), respectively.

respectively, the augmented approach seems to be more accurate. Hence, a more pronounced view on the composition of consolidations is possible: By comparing the results of both approaches, one can see that the most relevant distributional effects of consolidations stem from spending-side measures and mixed consolidations. Especially the latter is highly interesting and adds a strong contribution to the literature since the traditional approach does not account for mixed consolidations, although they form the large majority of all consolidations in the sample. Both approaches find that tax-based consolidations are actually income inequality-reducing, although not statistically significantly. Interestingly, the coefficients for spending-based consolidations in both approaches are similar in size and significance. At first sight, these results suggest using tax hikes as preferred instrument for fiscal consolidations, since they tend to be followed by improving distributional outcomes. However, it seems that this fact can rather be ascribed to the generally smaller consolidation sizes that these consolidation packages are usually comprised of. Furthermore, as pointed out in the literature review, these consolidations are found to be less suitable to meet debt reduction and growth targets. Thus, the augmented approach points to the importance of also considering the accompanying conditions of all three types of consolidations: E.g. while tax-based ones tend to be followed by a reduction in income inequality, they should not be interpreted as equity-friendly per se. It rather seems that this effect rather stems from the small size that tax-only consolidations entail. This thought is also backed by the somewhat larger and significant effect of mixed consolidations, which are also found to be the largest in cumulative consolidation size. Hence, further research potential focusing on the interplay between accompanying consolidation conditions, such as pressure to consolidate, their composition and the public opinion on these plans is found already here.

Reviewing our results so far, some important comments have to be made. Different policies tend to have varying effects across countries and also at different points in time, possibly depending on further accompanying features, not accounted for here.[18] Moreover, measurement issues may bias our results. As it is shown, an array of inter-related factors, that sometimes take a long time to unfold, drive inequality outcomes over time. Bearing these limitations in mind, the present analysis still provides a nuanced examination of the effect of different approaches to consolidation on inequality. To judge if the reported effects

[18] Other features such as the size and length of the consolidation, occurrence during and after financial crises, and accompanying macroeconomic conditions were also examined econometrically form during the preparation of this article, but will not be interpreted here, since this would go beyond the scope and space limits of this article.

hold under different specifications, a sensitivity analysis will be undertaken in the next section.

## 4.3 Sensitivity Analysis

So far, each of the applied models used one-year time lags in the independent variables, in order to account for the slightly delayed effects, any policy changes pose on income inequality. However, as seen in the graphical presentations in the last chapter, there seem to be some reactions already in the year of consolidation occurrence. Therefore, this section will test the sensitivity of the baseline model including both inequality measures as dependent variables, as well as the augmented approach for compositional differences for distributional changes in the year of occurrence.

Table 6 provides the re-estimated baseline model without lags in the variables. Column 1 depicts the augmented results for market income inequality and column 2 for net income inequality. Since all observations now can be used, the sample size increases to 533. Interestingly, the coefficients for market income inequality keep their signs and significance levels with the exception of trade openness, which now is significant at 1%. The coefficients for the control variables remain consistent with our earlier estimations. Turning to the consolidation effect, the referring coefficient is 0.488, which indicates that the distributional effect of a consolidation is somewhat smaller in the year of its occurrence than in the year after. This is not surprising, as the graphical presentation in the last chapter has already indicated. The $R^2$ is only slightly lower in this model. Hence, it can be derived that the model is robust in replacing lagged effects by same year consequences. Looking at the results for net income inequality, the control variables appear largely congruent to the baseline model. However, the consolidation effect here turns negative, in contradiction with the original model. Therefore, this again proves the weaknesses of the model for net income inequality.

**Table 6: Effects of fiscal consolidation on income inequality in the year of occurrence**[19]

| Variable | (1) Gini M coeff | | (2) Gini N coeff | |
|---|---|---|---|---|
| GDP per capita, log | 3.611** | *{0.011}* | 1.949* | *{0.042}* |
| GDP per capita sqrd, log | -0.134** | *{0.025}* | -0.074* | *{0.066}* |
| Inflation | -0.348*** | *{0.000}* | -0.185*** | *{0.000}* |
| Trade Openness | 0.033*** | *{0.004}* | 0.019** | *{0.012}* |
| Consolidation (%) | 0.488*** | *{0.004}* | -0.078 | *{0.492}* |
| Constant | 22.182*** | *{0.008}* | 23.281** | *{0.005}* |
| Countries | 17 | | 17 | |
| N | 533 | | 533 | |
| R sqrd | 0.291 | | 0.202 | |
| F | 41.942 | | 25.912 | |

* p<0.1, ** p<0.05, *** p<0.01 P-Values in parantheses

Perhaps more important than testing the sensitivity of the baseline model is to see if the augmented approach on the compositional effect holds true since this approach was not tested before. Table 7 presents this model's findings, using non-lagged regressor sets. As can be seen in the first two columns, all controls remain significant, with trade openness again increasing its significance. The coefficients are slightly lower in size than in the usual model, although not remarkably. Moreover, the significance levels almost stay the same; only mixed consolidations are now found to be significant at 5%, instead of 1% previously. The $R^2$ drops only slightly in both cases. Turning to the results for net income inequality, we confirm the rather mixed findings from the last subsection since all consolidation types are found to lower inequality, whereas none of them is statistically significant.

[19] Note: The dependent variable is the Gini coefficient for market income Gini coefficient (column 1) and net income inequality (columns 2), respectively.

**Table 7: Distributional effects of tax-only, spending-only and mixed consolidations in the year of occurrence (augmented approach)[20]**

| Variable | (1) Gini M coeff | | (2) Gini M coeff | | (3) Gini N coeff | | (4) Gini N coeff | |
|---|---|---|---|---|---|---|---|---|
| GDP per capita, log | 3.758*** | *{0.008}* | 3.694*** | *{0.009}* | 1.955** | *{0.042}* | 1.961** | *{0.042}* |
| GDP per capita sqrd, log | -0.14** | *{0.020}* | -0.136** | *{0.023}* | -0.075* | *{0.063}* | -0.075* | *{0.064}* |
| Inflation | -0.342*** | *{0.000}* | -0.344*** | *{0.000}* | -0.184*** | *{0.000}* | -0.186*** | *{0.000}* |
| Trade Openness | 0.032*** | *{0.005}* | 0.033*** | *{0.004}* | 0.019** | *{0.014}* | 0.019** | *{0.015}* |
| Tax-only Cons. Occurence | -0.382 | *0.948*** | | | -0.695* | *-0.157* | | |
| Spending-Only Cons. Occurence | 0.948** | *{0.041}* | | | -0.157 | *{0.615}* | | |
| Mixed Cons. Occurence | 0.662** | *{0.032}* | | | -0.022 | *{0.914}* | | |
| Tax-Only Consolidation (%) | | | -0.162 | *{0.840}* | | | -0.415 | *{0.445}* |
| Spending-Only Cons. (%) | | | 0.798** | *{0.026}* | | | -0.265 | *{0.273}* |
| Mixed Cons. (%) | | | 0.439** | *{0.016}* | | | -0.027 | *{0.828}* |
| Constant | 21.316** | *{0.011}* | 21.572*** | *{0.010}* | 16.050*** | *{0.004}* | 15.952*** | *{0.005}* |
| Countries | 17 | | 17 | | 17 | | 17 | |
| N | 533 | | 533 | | 533 | | 533 | |
| R sqrd | 0.292 | | 0.293 | | 0.207 | | 0.204 | |
| F | 29.932 | | 30.167 | | 18.981 | | 18.657 | |

* p<0.1, ** p<0.05, *** p<0.01 P-Values in parantheses

Overall, these results thereby again confirm the stated idea that i) spending-only consolidations are less equitable and ii) the effects of any consolidation are more pronounced one year after the package is implemented. Thus, it seems that the augmented approach to identify the composition of fiscal consolidations can be considered as robust in this case.

[20] Note: The dependent variable is the Gini coefficient for market income Gini coefficient (columns 1 & 2) and net income inequality (columns 3 & 4), respectively.

# 5 Conclusion

This paper examined the effects of several fiscal consolidation indicators and a set of compositional variables on income inequality by using econometric analysis for a panel of high-income countries over the last four decades. The results suggest that fiscal consolidations are relevant levers for income inequality. It was found that on average, a consolidation of one percent of GDP is associated with an increase in market income inequality of 0.6% in the next year. Net income inequality is found to be less affected by austerity measures, which indicates the strong redistributive power of the social welfare state. Moreover, the hypothesis that spending cuts spark income inequality more than tax rises could be supported by the data. Even more relevant, in adopting the conventional approach to identifying compositional features of consolidations to episodes that are exclusively undertaken on the spending or the tax revenue side, this paper acts as an innovation for the very narrow literature in this field. Applying this novel approach leads to even more pronounced findings regarding the compositional effect. It was proven that consolidations, which were undertaken only through tax hikes, produce more equitable outcomes, although they tend to be rather small in consolidation size. Another important finding consists in the fact that especially mixed consolidations are found to be significantly harming the income distribution. Since these consolidations tend to be most sizeable, these two findings combined, point in the direction of considering accompanying consolidation features such as policymakers' pressure to consolidate and the public opinion on these plans as decisive elements for the distribution outcomes, rather than just looking at the pure composition.

This paper thereby clearly demonstrates that the conventional method for studying compositional effects of fiscal consolidations entails some serious flaws since it fails to identify consolidation episodes, only based on spending cuts or tax rises. In this vein, it is important to note that all studies on the success and growth effect of fiscal consolidations so far rely on the conventional approach on how to identify spending and tax-based episodes. Therefore, it might be promising to implement the augmented approach also for this kind of studies in order to produce meaningful results for the discretionary effect of tax-only and spending-only consolidation. Since this paper was not able to obtain conclusive results for compositional effects on net income inequality, there is potential for further research on the proper analysis of the referring levers.

Further tests to these results should be undertaken using different inequality indicators since the Gini coefficient is not sensitive to changes at the tails of income distributions and a large

share of the surge in income inequality is expected to stem from diverging top and bottom income groups.

Although one should be careful about deriving concrete policy recommendations from these results, one conclusion clearly stands out: Fiscal consolidations generally go hand in hand with increased inequality. Even though consolidations exclusively undertaken on the tax side lead to favourable income equality outcomes, they seem to act less successful on debt reduction and are considered less growth-friendly. Looking ahead, further large consolidations are expected to be required for many developed countries, given their current fiscal positions. Keeping the historically unprecedented high levels of inequality and their possible social and economic fallouts in mind, these countries should do everything in their power to prevent another rise in income inequality. Therefore, it will be critical to design upcoming consolidation packages in a way that they are able to fairly distribute their burden throughout the society and not disproportionally on the back of the most vulnerable citizens. Yet, given the sizeable consolidation needs, it is more than questionable if a single focus on tax revenue rises might be the right strategy to achieve both, positive outcomes for debt reduction and growth on the one hand and a containment of inequality on the other. Hence, there is a large need for further academic research to elaborate on specific consolidation instruments that fulfil all these targets. Moreover, it might be the right time to conclude that it seems that the dangerous economic cocktail of high-income inequality and large consolidation needs might entail a greater risk for the stability of market economies than is usually believed among academic scholars. Perhaps, if in this environment the conventional consolidation methods are not sufficient enough to meet the described targets; one should seriously reconsider the robustness of the current macroeconomic structure of many developed countries. In this vein, this paper ends with the words of the U.S. Federal Reserve's chair Janet Yellen (2014): "Inequality has risen to the point that it seems to me worthwhile […] to seriously consider taking the risk of making our economy more rewarding for more of the people".

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# Appendices

**Appendix 1: Variable description**

| Variable | Description | Source |
|---|---|---|
| *I. Dependent* | | |
| Gini M | Market income inequality Gini coeff. | SWIID, v. 4.1 |
| Gini N | Net income inequality Gini coeff. | SWIID, v. 4.1 |
| *II. Fiscal consolidation* | | |
| Consolidation Occurence | 1 - Occurence, 0 - no occurence | *all from Devries et al. (2011)* |
| Consolidation (%) | improvement of primary balance in % of GDP | |
| Spending based consolidation occurence | 1 - Occurence, 0 - no occurence | |
| Spending based consolidation (%) | improvement of primary balance in % of GDP | |
| Tax based consolidation occurence | 1 - Occurence, 0 - no occurence | |
| Tax based consolidation (%) | improvement of primary balance in % of GDP | |
| Spending-only occurence | 1 - Occurence, 0 - no occurence | |
| Spending-only (%) | improvement of primary balance in % of GDP | |
| Tax-only occurence | 1 - Occurence, 0 - no occurence | |
| Tax-only (%) | improvement of primary balance in % of GDP | |
| Mixed consolidation occurence | 1 - Occurence, 0 - no occurence | |
| Mixed consolidation (%) | improvement of primary balance in % of GDP | |
| *III. Controls* | | |
| GDP per capita | Real GDP (PPP converted) in const. 2005 USD | Penn World Tables (v. 7.1) |
| GDP per capita sqrd | Real GDP (PPP converted) in const. 2005 USD | Penn World Tables (v. 7.1) |
| Inflation | Annual change in CPI | OECD Economic Outlook database (No. 98) |
| Trade Openness | Sum of Imports & Exports divided by GDP | World Bank's WDI database |
| Europe | 1 - European country, 0 - not | |
| Before 1994 | 1 - before 1994, 0 - not | |

**Appendix 2: Summary Statistics**

| Variable | Obs | Unique | Mean | Min | Max | Label |
|---|---|---|---|---|---|---|
| year | 538 | 33 | 1993.586 | 1977 | 2009 | Year |
| ginin | 533 | 164 | 28.49081 | 19.7 | 37.8 | GiniN |
| ginig | 533 | 160 | 45.77824 | 33.1 | 56.6 | GiniG |
| cons | 538 | 131 | .3174796 | -.75 | 4.743 | Cons (%) |
| taxcons | 538 | 121 | .1194257 | -.75 | 2.54 | Tax Cons |
| spencons | 538 | 111 | .1980502 | -.29 | 3.71 | Spen Cons (%) |
| taxonlyocc | 538 | 2 | .0464684 | 0 | 1 | Tax only (Occ) |
| spenonlyocc | 538 | 2 | .070632 | 0 | 1 | Spen only (Occ) |
| mixedocc | 538 | 2 | .1895911 | 0 | 1 | mixed (Occ) |
| taxonlyocc~g | 521 | 2 | .0479846 | 0 | 1 | Tax only (Occ), lag |
| spenonlyoc~g | 521 | 2 | .0729367 | 0 | 1 | Spen only (Occ), lag |
| mixedocclag | 521 | 2 | .193858 | 0 | 1 | Mixed (Occ), lag |
| taxonly | 538 | 21 | .0229368 | 0 | 1.9 | Tax only (%) |
| spenonly | 538 | 37 | .0708922 | 0 | 3.71 | Spen only (%) |
| mixed | 538 | 80 | .2412268 | 0 | 4.74 | Mixed (%) |
| taxonlylag | 521 | 3 | .0172745 | 0 | 2 | Tax only (%), lag |
| spenonlylag | 521 | 5 | .074856 | 0 | 4 | Spen only (%), lag |
| mixedlag | 521 | 5 | .2476008 | 0 | 4 | Mixed (%), lag |
| consocc | 538 | 2 | .3066914 | 0 | 1 | Cons (Occ) |
| taxconsocc | 538 | 2 | .2360595 | 0 | 1 | Tax Cons (Occ) |
| spenconsocc | 538 | 2 | .260223 | 0 | 1 | Spen Cons (Occ) |
| loggdppc | 538 | 416 | 10.18027 | 7.226 | 17.477 | log(GDP p C) |
| loggdppcs | 538 | 533 | 103.9263 | 52.218 | 305.438 | log(GDP p C), s |
| tradeop | 538 | 537 | 63.76428 | 15.924 | 175.174 | Trade Op |
| inflation | 538 | 517 | 4.328725 | -1.347 | 28.385 | Inflation |
| inflationlag | 538 | 517 | 4.693983 | -.9 | 31.017 | Inflation, lag |
| conslag | 521 | 130 | .3187351 | -.75 | 4.49 | Cons (%), lag |
| taxconslag | 521 | 120 | .1188138 | -.75 | 2.54 | Tax Cons (%), lag |
| spenconslag | 521 | 110 | .1999175 | -.29 | 3.71 | Spen Cons (%), lag |
| consocclag | 521 | 2 | .3147793 | 0 | 1 | Cons (Occ), lag |
| taxconsocc~g | 521 | 2 | .2418426 | 0 | 1 | Tax Cons (Occ),lag |
| spenconsoc~g | 521 | 2 | .2667946 | 0 | 1 | Spen Cons (Occ), lag |
| tradeoplag | 538 | 537 | 63.09067 | 15.924 | 175.174 | Trade Op, lag |
| loggdppclag | 538 | 417 | 10.15913 | 7.226 | 17.477 | log(GDP p C), lag |
| loggdppcslag | 538 | 532 | 103.4904 | 52.218 | 305.438 | log(GDP p C), s, lag |
| europe | 538 | 2 | .7732342 | 0 | 1 | EUROPE |
| gininch | 530 | 457 | .0796038 | -1.477 | 2.6 | GiniNCh |
| ginigch | 530 | 476 | .1934642 | -3.431 | 4.932 | GiniGCh |
| before1994 | 538 | 2 | .4962825 | 0 | 1 | before 1994 |
| country | 538 | 17 | 9.055762 | 1 | 17 | Country |

**Appendix 3: Consolidations per country**

| | Consocc | |
|---|---|---|
| | 0 | 1 |
| country | N | N |
| Australia | 22 | 10 |
| Austria | 25 | 7 |
| Belgium | 21 | 11 |
| Canada | 12 | 14 |
| Denmark | 28 | 4 |
| Finland | 26 | 6 |
| France | 26 | 6 |
| Germany | 17 | 15 |
| Ireland | 24 | 8 |
| Italy | 20 | 12 |
| Japan | 20 | 12 |
| Netherlands | 19 | 13 |
| Portugal | 26 | 6 |
| Spain | 23 | 9 |
| Sweden | 25 | 7 |
| United Kingdom | 22 | 10 |
| United States | 17 | 15 |
| Total | 373 | 165 |

## Appendix 4: Overview of Tax-based consolidations (conventional approach)

| | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 | | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Australia** | 1986-1987 | 0.36 | -0.56 | 0.16 | 0.03 | 0.50 | **Japan** | 1979-1983 | 1.13 | -6.33 | -4.21 | -1.10 | 0.07 |
| | 1994-1998 | 1.32 | 3.38 | 2.50 | 1.38 | 1.17 | | 1997-1998 | 1.30 | 1.18 | 2.01 | 1.14 | 1.32 |
| **Austria** | 1980-1981 | 0.61 | . | . | . | . | | 2004-2007 | 0.85 | -0.85 | -0.34 | 0.21 | 0.21 |
| | 1984 | 1.30 | -0.94 | -2.16 | -0.38 | -0.88 | **Netherlands** | 1981 | 0.53 | 0.98 | 0.46 | 0.27 | 0.18 |
| | 1996-1997 | 1.32 | -0.91 | -0.44 | -1.10 | -0.80 | | 1983 | 0.49 | 0.79 | -0.69 | 0.34 | -0.70 |
| | 2001 | 0.90 | 0.81 | 0.72 | 0.45 | 0.33 | | 1987 | 1.48 | 0.21 | -0.92 | -0.23 | 0.97 |
| **Belgium** | 1983-1985 | 1.70 | 2.43 | 1.88 | -0.11 | 0.09 | | 1991-1993 | 0.13 | 1.00 | 0.18 | -0.90 | -0.83 |
| | 1990 | 0.40 | 1.08 | 0.37 | 0.02 | -0.44 | | 2004-2005 | 0.60 | 0.51 | 0.24 | 0.71 | 0.41 |
| | 1992-1994 | 1.97 | 1.12 | 1.60 | 1.61 | 4.40 | **Portugal** | 1983 | 1.35 | -2.46 | 0.47 | -1.31 | -1.04 |
| | 1996-1997 | 0.91 | 1.00 | 0.36 | -1.60 | 0.35 | | 2002 | 1.20 | 1.22 | 2.74 | 0.32 | 0.45 |
| **Canada** | 1984-1997 | 3.34 | 5.01 | 6.74 | 0.49 | 2.53 | | 2005-2007 | 2.12 | 2.13 | -0.05 | -1.16 | -1.68 |
| **Denmark** | 1983-1985 | 2.36 | -1.79 | -1.11 | -0.88 | -0.55 | **Spain** | 1983-1984 | 2.27 | -1.81 | -2.24 | -1.67 | -1.93 |
| | 1995 | 0.30 | -0.18 | 0.07 | -0.76 | 0.23 | | 1989 | 0.98 | 2.31 | 2.84 | 1.43 | 1.95 |
| **Finland** | 1994 | 0.69 | 1.32 | 1.37 | 0.29 | 0.34 | | 1992-1993 | 1.10 | 3.76 | 2.79 | 2.51 | 1.91 |
| **France** | 1979 | 0.85 | 0.10 | 0.22 | -0.18 | -0.12 | | 1996-1997 | 0.30 | -1.32 | -1.15 | -0.33 | -0.52 |
| | 1995-1997 | 1.70 | 0.64 | 0.03 | -0.28 | -0.27 | **Sweden** | 1984 | 0.21 | 0.20 | 0.36 | 0.25 | 0.25 |
| **Germany** | 1982-1983 | 0.86 | 0.80 | 2.77 | 1.60 | 1.17 | | 1993-1998 | 3.81 | 0.67 | -0.04 | -0.33 | 1.18 |
| | 1991-1995 | 2.20 | 1.66 | 0.36 | 0.76 | 0.38 | **United Kingdom** | 1981-1982 | 1.90 | 1.71 | 1.89 | 0.31 | 0.56 |
| | 1997 | 0.50 | 0.21 | 0.16 | -0.13 | -0.13 | | 1994-1995 | 0.90 | 1.46 | -0.03 | 0.45 | 0.41 |
| | 1999 | 0.30 | 0.28 | 0.83 | 0.01 | -0.01 | | 1994-1999 | 1.04 | -0.37 | -0.51 | 0.29 | -0.10 |
| | 2003 | 0.74 | 0.43 | 0.39 | 0.20 | 0.19 | **United States** | 1978 | 0.14 | 0.05 | 0.04 | -0.34 | -0.48 |
| | 2007 | 0.50 | 0.41 | 0.03 | 0.45 | 0.45 | | 1980-1981 | 0.29 | 0.41 | 0.52 | 0.75 | 0.66 |
| **Ireland** | 1981-1986 | 6.66 | -0.96 | 0.06 | -0.64 | -0.14 | | 1985-1986 | 0.31 | 1.50 | 0.89 | 1.26 | 0.71 |
| | 2008 | 2.35 | 1.74 | 2.01 | -0.20 | -0.12 | | 1988 | 0.39 | 0.20 | 0.21 | 0.12 | 0.10 |
| **Italy** | 1991-1998 | 7.59 | 5.72 | 6.54 | 4.59 | 4.88 | | 1990-1997 | 1.61 | 3.62 | 3.16 | 3.86 | 3.61 |
| | 2004-2007 | 2.89 | -0.74 | -2.20 | -0.90 | -1.60 | | | | | | | |
| | | | | | | | **Average** | | **2.63** | **1.39** | **0.64** | **0.63** | **0.23** | **0.38** |
| | | | | | | | ***∑ episodes/years*** *51/134* | | | | | | |

## Appendix 5: Overview of Spending-based consolidations (conventional approach)

| | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 | | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Australia** | 1985-1988 | 2.38 | 1.01 | 0.00 | 0.82 | 1.00 | **Italy** | 1991-1998 | 11.64 | 5.72 | 6.54 | 4.59 | 4.88 |
| | 1996-1999 | 1.19 | 0.33 | 1.57 | 0.11 | 1.01 | | 2004-2007 | 1.83 | -0.74 | -2.20 | -0.90 | -1.60 |
| **Austria** | 1980-1981 | 1.75 | . | . | . | . | **Japan** | 1982-1983 | 0.76 | -1.05 | 0.28 | 0.49 | 1.05 |
| | 1984 | 0.74 | -0.94 | -2.16 | -0.38 | -0.88 | | 1997-1998 | 0.60 | 1.18 | 2.01 | 1.14 | 1.32 |
| | 1996-1997 | 2.65 | -0.91 | -0.44 | -1.10 | -0.80 | | 2003-2006 | 1.42 | -1.74 | -0.85 | 0.05 | 0.21 |
| | 2001-2002 | 0.67 | 1.53 | 1.40 | 0.78 | 0.57 | **Netherlands** | 1981-1986 | 10.42 | 1.12 | 0.14 | -0.59 | -1.08 |
| **Belgium** | 1982-1985 | 4.05 | 2.91 | 2.65 | -0.01 | 0.10 | | 1988 | 0.75 | -0.92 | -0.71 | 0.97 | 0.93 |
| | 1987 | 2.80 | 0.32 | 0.16 | 0.17 | 0.12 | | 1992-1993 | 1.60 | 0.76 | -0.11 | -0.48 | -0.59 |
| | 1990 | 0.20 | 1.08 | 0.37 | 0.02 | -0.44 | | 2004-2005 | 1.60 | 0.51 | 0.24 | 0.71 | 0.41 |
| | 1992-1994 | 1.89 | 1.12 | 1.60 | 1.61 | 4.40 | **Portugal** | 1983 | 0.95 | -2.46 | 0.47 | -1.31 | -1.04 |
| | 1996-1997 | 1.00 | 1.00 | 0.36 | -1.60 | 0.35 | | 2000 | 0.50 | -1.12 | 0.62 | -0.10 | 0.23 |
| **Canada** | 1985-1997 | 4.59 | 4.54 | 6.51 | 0.53 | 2.60 | | 2002 | 0.40 | 1.22 | 2.74 | 0.32 | 0.45 |
| **Denmark** | 1983-1985 | 4.33 | -1.79 | -1.11 | -0.88 | -0.55 | | 2005-2007 | 1.53 | 2.13 | -0.05 | -1.16 | -1.68 |
| **Finland** | 1992-1997 | 12.07 | 6.51 | 4.11 | 2.02 | 2.74 | **Spain** | 1984 | 0.75 | -0.79 | -1.45 | -0.75 | -1.18 |
| **France** | 1987 | 0.76 | -0.31 | 0.15 | -1.28 | -0.80 | | 1989 | 0.24 | 2.31 | 2.84 | 1.43 | 1.95 |
| | 1991 | 0.25 | 0.00 | 0.04 | -0.02 | 0.04 | | 1992-1997 | 5.24 | 5.26 | 2.30 | 3.73 | 1.93 |
| | 1996-1997 | 0.56 | 0.28 | -0.22 | -0.17 | -0.21 | **Sweden** | 1984 | 0.69 | 0.20 | 0.36 | 0.25 | 0.25 |
| **Germany** | 1982-1984 | 1.78 | 3.40 | 2.59 | 2.10 | 0.98 | | 1993-1998 | 6.78 | 0.67 | -0.04 | -0.33 | 1.18 |
| | 1991-1995 | 1.47 | 1.66 | 0.36 | 0.76 | 0.38 | **United Kingdom** | 1979-1982 | 1.14 | 4.04 | 3.41 | 0.81 | 0.71 |
| | 1997 | 1.10 | 0.21 | 0.16 | -0.13 | -0.13 | | 1994-1999 | 0.68 | 0.56 | -0.90 | 0.65 | 0.32 |
| | 2000 | 0.75 | 0.26 | 0.83 | -0.01 | 0.43 | **United States** | 1988 | 0.46 | 0.20 | 0.21 | 0.12 | 0.10 |
| | 2004 | 1.10 | 0.39 | 0.26 | 0.19 | 0.22 | | 1990-1998 | 2.31 | 3.45 | 2.98 | 3.73 | 3.47 |
| | 2006-2007 | 0.90 | 0.74 | 0.44 | 0.78 | 0.34 | | | | | | | |
| **Ireland** | 1981-1982 | 0.32 | -0.65 | -1.02 | -0.29 | -0.54 | | | | | | | |
| | 1986-1987 | 3.07 | 1.25 | 0.20 | 0.65 | 0.19 | **Average** | | **2.96** | **2.23** | **0.96** | **0.83** | **0.37** | **0.48** |
| | 2008 | 2.39 | 1.74 | 2.01 | -0.20 | -0.12 | ***∑ episodes/years*** *48/142* | | | | | | | |

## Appendix 6: Overivew of Tax-only consolidations (augmented approach)

| | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 |
|---|---|---|---|---|---|---|
| **Australia** | 1994-1995 | 0.75 | 3.69 | 1.47 | 1.72 | 0.56 |
| **Canada** | 1984 | 0.27 | 0.47 | 0.23 | -0.04 | -0.07 |
| | 1988 | 0.33 | 0.13 | 0.22 | -0.31 | -0.18 |
| **Denmark** | 1995 | 0.30 | -0.18 | 0.07 | -0.76 | 0.23 |
| **France** | 1979 | 0.85 | 0.10 | 0.22 | -0.18 | -0.12 |
| | 1995 | 0.43 | 0.37 | 0.25 | -0.11 | -0.06 |
| **Germany** | 1999 | 0.30 | 0.28 | 0.26 | 0.01 | -0.01 |
| | 2003 | 0.74 | 0.43 | 0.39 | 0.20 | 0.19 |
| **Ireland** | 1983-1985 | 1.15 | -0.75 | 0.27 | -0.54 | -0.06 |
| **Italy** | 2007 | 1.32 | -0.61 | -0.86 | -0.47 | -0.61 |
| **Japan** | 1979-1981 | 0.76 | -5.28 | -4.49 | -1.60 | -0.98 |
| | 2007 | 0.15 | 0.11 | 0.17 | 0.06 | 0.05 |
| **Netherlands** | 1987 | 1.48 | 0.21 | -0.92 | -0.23 | 0.97 |
| | 1991 | 0.87 | 0.24 | 0.29 | -0.42 | -0.24 |
| **Spain** | 1983 | 1.90 | -1.02 | -0.79 | -0.92 | -0.75 |
| **United States** | 1978 | 0.14 | 0.05 | 0.04 | -0.34 | -0.48 |
| | 1980-1981 | 0.29 | 0.41 | 0.52 | 0.75 | 0.66 |
| | 1985-1986 | 0.31 | 1.50 | 0.89 | 1.26 | 0.71 |
| | | | | | | |
| **Average** | **1.39** | **0.69** | **0.01** | **-0.10** | **-0.11** | **-0.01** |
| ***∑ episodes/years*** *18/25* | | | | | | |

## Appendix 7: Overview of Spending-only consolidations (augmented approach)

| | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 |
|---|---|---|---|---|---|---|
| **Australia** | 1985 | 0.45 | 1.33 | -0.49 | 0.38 | -0.06 |
| | 1988 | 0.37 | 0.23 | 0.33 | 0.41 | 0.56 |
| | 1999 | 0.07 | 0.65 | 0.53 | 0.44 | 0.40 |
| **Austria** | 2002 | 0.55 | 0.72 | 0.68 | 0.33 | 0.24 |
| **Belgium** | 1982 | 1.66 | 0.48 | 0.77 | 0.11 | 0.01 |
| | 1987 | 2.80 | 0.32 | 0.16 | 0.17 | 0.12 |
| **Canada** | 1992-1993 | 0.58 | 1.47 | 1.59 | 0.18 | 0.24 |
| **Finland** | 1992-1993 | 4.62 | 4.11 | 3.19 | 0.07 | 0.35 |
| | 1995-1997 | 4.68 | 1.08 | -0.45 | 1.66 | 2.04 |
| **France** | 1987 | 0.76 | -0.31 | 0.15 | -1.28 | -0.80 |
| | 1991 | 0.25 | 0.00 | 0.04 | -0.02 | 0.04 |
| **Germany** | 1984 | 0.59 | 2.60 | -0.18 | 0.50 | -0.20 |
| | 1993 | 0.18 | -0.58 | -0.07 | 0.14 | 0.13 |
| | 2000 | 0.75 | 0.26 | 0.83 | -0.01 | 0.43 |
| | 2004 | 1.10 | 0.39 | 0.26 | 0.19 | 0.22 |
| | 2006 | 0.50 | 0.33 | 0.41 | 0.33 | 0.45 |
| **Ireland** | 1987 | 1.95 | 0.81 | -0.61 | 0.46 | -0.26 |
| **Italy** | 1994 | 1.70 | -0.16 | 0.26 | -0.13 | 0.13 |
| | 1996 | 1.08 | 0.22 | 0.34 | 0.09 | 0.25 |
| **Japan** | 2003 | 0.48 | -0.78 | -0.35 | -0.11 | 0.06 |
| **Netherlands** | 1982 | 1.71 | 0.46 | 0.79 | 0.18 | 0.34 |
| | 1984-1986 | 4.74 | -1.11 | -0.21 | -1.37 | -0.90 |
| | 1988 | 0.75 | -0.92 | -0.71 | 0.97 | 0.93 |
| | 1992-1993 | 1.60 | 0.76 | -0.11 | -0.48 | -0.59 |
| **Portugal** | 2000 | 0.50 | -1.12 | 0.62 | -0.10 | 0.23 |
| **Spain** | 1994-1995 | 2.34 | 2.82 | 0.65 | 1.55 | 0.54 |
| **United Kingdom** | 1979-1980 | 0.93 | 2.34 | 1.52 | 0.50 | 0.15 |
| | 1996 | 0.30 | -0.53 | -0.35 | -0.09 | 0.01 |
| **United States** | 1998 | 0.15 | -0.18 | -0.18 | -0.13 | -0.14 |
| | | | | | | |
| **Average** | **1.31** | **1.32** | **0.54** | **0.32** | **0.17** | **0.17** |
| ***∑ episodes/years*** *29/38* | | | | | | |

## Appendix 8: Overview of mixed consolidations (augmented approach)

| | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 | | Period | Δ Cons | Δ GiniM | Δ GiniM, t+1 | Δ GiniN | Δ GiniN, t+1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Australia** | 1986-1987 | 1.92 | -0.56 | 0.16 | 0.03 | 0.50 | **Italy** | 1996-1997 | 2.50 | 0.78 | 0.28 | 0.71 | -0.26 |
| | 1996-1998 | 1.69 | -0.32 | 1.04 | -0.33 | 0.61 | | 2004-2006 | 3.69 | -0.13 | -1.34 | -0.43 | -0.99 |
| **Austria** | 1980-1981 | 2.36 | . | . | . | . | **Japan** | 1982-1983 | 1.13 | -1.05 | 0.28 | 0.49 | 1.05 |
| | 1984 | 2.04 | -0.94 | -2.16 | -0.38 | -0.88 | | 1997-1998 | 1.90 | 1.18 | 2.01 | 1.14 | 1.32 |
| | 1996-1997 | 3.97 | -0.91 | -0.44 | -1.10 | -0.80 | | 2004-2006 | 1.64 | -0.96 | -0.51 | 0.15 | 0.15 |
| | 2001 | 1.02 | 0.81 | 0.72 | 0.45 | 0.33 | **Netherlands** | 1981 | 1.75 | 0.98 | 0.46 | 0.27 | 0.18 |
| **Belgium** | 1983-1985 | 4.09 | 2.43 | 1.88 | -0.11 | 0.09 | | 1983 | 3.24 | 0.79 | -0.69 | 0.34 | -0.70 |
| | 1990 | 0.60 | 1.08 | 0.37 | 0.02 | -0.44 | | 2004-2005 | 2.20 | 0.51 | 0.24 | 0.71 | 0.41 |
| | 1992-1994 | 3.86 | 1.12 | 1.60 | 1.61 | 4.40 | **Portugal** | 1983 | 2.30 | -2.46 | 0.47 | -1.31 | -1.04 |
| | 1996-1997 | 1.91 | 1.00 | 0.36 | -1.60 | 0.35 | | 2002 | 1.60 | 1.22 | 2.74 | 0.32 | 0.45 |
| **Canada** | 1985-1986 | 2.30 | 0.24 | 0.14 | -0.27 | -0.50 | | 2005-2007 | 3.65 | 2.13 | -0.05 | -1.16 | -1.68 |
| | 1989-1991 | 1.58 | 1.67 | 2.16 | 0.11 | 0.34 | **Spain** | 1984 | 1.12 | -0.79 | -1.45 | -0.75 | -1.18 |
| | 1994-1997 | 2.92 | 1.03 | 2.40 | 0.82 | 2.70 | | 1989 | 1.22 | 2.31 | 2.84 | 1.43 | 1.95 |
| **Denmark** | 1983-1985 | 6.69 | -1.79 | -1.11 | -0.88 | -0.55 | | 1992-1993 | 1.80 | 3.76 | 2.79 | 2.51 | 1.91 |
| **Finland** | 1994 | 3.46 | 1.32 | 1.37 | 0.29 | 0.34 | | 1996-1997 | 2.50 | -1.32 | -1.15 | -0.33 | -0.52 |
| **France** | 1996-1997 | 1.83 | 0.28 | -0.22 | -0.17 | -0.21 | **Sweden** | 1984 | 0.90 | 0.20 | 0.36 | 0.25 | 0.25 |
| **Germany** | 1982-1983 | 2.05 | 0.80 | 2.77 | 1.60 | 1.17 | | 1993-1988 | 10.59 | 0.67 | -0.04 | -0.33 | 1.18 |
| | 1991-1992 | 1.57 | 1.98 | -0.15 | 0.56 | 0.40 | **United Kingdom** | 1981-1982 | 2.11 | 1.71 | 1.89 | 0.31 | 0.56 |
| | 1994-1995 | 1.99 | 0.26 | 0.58 | 0.06 | -0.15 | | 1994-1995 | 1.10 | 1.46 | -0.03 | 0.45 | 0.41 |
| | 1997 | 1.60 | 0.21 | 0.16 | -0.13 | -0.13 | | 1997-1999 | 1.21 | -0.37 | -0.51 | 0.29 | -0.10 |
| | 2007 | 0.90 | 0.41 | 0.03 | 0.45 | -0.11 | **United States** | 1988 | 0.85 | 0.20 | 0.21 | 0.12 | 0.10 |
| **Ireland** | 1981 | 5.30 | -0.65 | -1.02 | -0.29 | -0.54 | | 1990-1997 | 3.77 | 3.62 | 3.16 | 3.86 | 3.61 |
| | 1986 | 1.65 | 0.44 | 0.81 | 0.19 | 0.46 | | | | | | | |
| | 2008 | 4.74 | 1.74 | 2.01 | -0.20 | -0.12 | | | | | | | |
| **Italy** | 1991-1993 | 10.76 | 4.62 | 5.44 | 3.79 | 4.67 | **Average** | **2.13** | **2.70** | **0.65** | **0.65** | **0.29** | **0.40** |
| | 1995 | 4.20 | 0.26 | 0.22 | 0.13 | 0.09 | ***∑ episodes/years*** | *48/102* | | | | | |