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Consolidating Out of Crisis?

—A Genuine Savings Perspective

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a thesis submitted to the Faculty of Emory College of Arts and Sciences
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Abstract

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The global financial crisis and the subsequent government fiscal predicaments have greatly affected lives around the world. Together with deteriorating global environmental conditions, the three crises raise serious questions about the sustainability of the current mode of development. In an attempt to restore fiscal stability and pave way to long-term economic growth, governments in the developed world implemented large, expansive fiscal consolidation policies by cutting spending and raising taxes. However, the short-term and long-term ramifications of these policies have been heatedly debated. Using genuine savings as an indicator for sustainability, this study constructs a first-difference panel regression model for 17 OECD countries over the period of 1978-2009 to investigate the impact of fiscal consolidation policies on sustainable development. The findings suggest that while consolidation measures improve genuine savings, policymakers ought to exercise caution in balancing expenditure and tax-based measures so as to minimize potential externalities.

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I. Introduction

The 2007 U.S. subprime mortgage crisis triggered long-lasting financial turmoil around the world, which, in turn, led to the most severe global economic recession since the Great Depression. The global economic fallout was far-reaching in almost every aspect. The International Monetary Fund (IMF) reported a 0.8 percent decline in global economic output in 2009 (IMF 2010). The International Labor Organization (ILO) estimated that 212 million people were unemployed in 2009, an increase of almost 34 million over the number unemployed in 2007 (Tienhaara 2010). What started as a crisis in one sector in one country eventually became "the world's first truly *global* financial crisis" (Omarova 2009).

In order to avert a global breakdown, governments acted to rescue the financial sector, stimulate the economy, and provide safety net to workers and the unemployed. However, as economic recessions sharply reduced revenues, governments were left with sizeable deficits thereafter. The crisis aggravated the imbalances in public finances, as many OECD countries ran structural deficits when economies were growing. In the U.S., federal government outlays as a percentage of GDP rose substantially from 19.5% before the crisis to over 24% after the crisis (IMF 2013). Budget deficits in the periphery of the Euro area, including Portugal, Ireland, Italy, Greece and Spain, averaged around 10% of GDP—Irish deficit reached a staggering 30.9% of GDP in 2010. The average deficit across the OECD was 4.9% of GDP in 2010 compared to 1% in 2007 (Figure 1). These deficits, combined with low economic growth and recession, have sharply increased public debt levels in many countries. On average, public debt stands at 110.3% of GDP across the OECD area in 2013 compared to 73.5% in 2007 (Figure 2).

To combat the rising debt problem and revitalize the economy, most OECD countries adopted fiscal consolidation packages, both under the governments' own initiatives and as part of

the conditions for international bailout. During the height of the Great Recession (2009-2011), OECD countries as a whole implemented fiscal consolidation measures of 2.8% of GDP. In particular, Greece and Ireland, two heavily indebted countries that have entered into bailout agreements with the EU and IMF, implemented consolidation efforts of 10.3% and 12.8% of GDP respectively between 2010 and 2011 and are committed to consolidate by over 18% of GDP by 2015 (OECD 2012). However, drastic government spending cuts and tax increases not only sparked widespread protests against austerity but also, as some say, prolonged economic recessions (Krugman 2013).

Proponents of fiscal consolidation as a solution to the economic and debt crisis argue that it would "restore the fiscal credibility of financially shaken countries and combat the rise of interest rates, which normally accompany growing debt levels" (IMF 2013). The IMF, in particular, argued that "strong and sustained fiscal consolidation" was needed to restore market confidence and lay the foundation for sound medium-term growth (IMF 2013). In addition, academics such as Carmen Reinhart and Kenneth Rogoff, who published the controversial *Growth in a Time of Debt*, claim that debt has a long-term detrimental impact on economic growth: specifically, nations with debt over 90 percent of their GDP faced significantly diminished growth prospects (Reinhart and Rogoff 2011). On the other hand, Nobel-prize winning Paul Krugman and other economists and politicians argue that fiscal austerity is self-defeating: while austerity reduces budget deficits in the short run, it is possible that "austerity today may reduce future tax revenues by so much that the national debt ends up larger than it would have been without austerity" ("Debt, Growth and Competing Risks" 2013).

At the same time that the world is experiencing the worst financial crisis in a generation, it is faced with a severe environmental crisis. The global recession led to substantial Greenhouse

Gas (GHG) reductions in 2008 and 2009—global emission dropped by 1.4% in 2009. However, the 2010 picture was different. GHG emissions increased by 2.35% compared with 2009 for the 15 countries in the Eurozone, mainly due to the recovery from the economic crisis. GHG emissions from Greece, Ireland and Spain decreased, but there was an increase from the UK and Germany (Peters 2012). Also looming over current environmental challenges is the enormous danger of human-induced climate change. The United Nations Environment Programme (UNEP) concludes: "serious and persistent barriers to sustainable development remain…Environmental degradation is therefore undermining development and threatens development progress" (UNEP 2013).

The lingering financial, debt, and environmental crises attest to three different aspects of the issue of sustainability facing the world. While many governments around the world have pursued fiscal consolidation to tackle the immediate fiscal and economic problems, it is questionable whether doing so will indeed restore sustainability in those aspects. Moreover, the current discourse on the economics of fiscal austerity centers on a very growth-oriented notion of sustainability. During debates over the consequences of drastic government spending cuts and tax hikes, the associated potential environmental costs rarely come into the picture, despite their implications for long-term economic welfare. Certainly, governments are faced with an intricate problem trying to balance long-run development goals with a range of short-run cost, when limited policy tools are available.

This study aims to investigate the impact of deficit-reduction-oriented fiscal consolidation policies on the broader concept of sustainable development. Specifically, the analysis uses adjusted net saving, also known as genuine saving, to as a proxy for sustainability. The indicator measures the true rate of saving after taking into account investment in human

capital, depletion of natural resources, and damages caused by pollution. Positive savings allow wealth to grow over time thus ensuring that future generations enjoy at least as many opportunities as current generations (Cassiers 2007). While researchers have looked at both the short-run and long-run effects of fiscal consolidation on economics growth, few have investigated its potential impact on the comprehensive sustainability of a country as measured by adjusted net savings. Using data for 17 OECD countries from 1978-2009, this analysis fills this gap by examining how expenditure and revenue-based fiscal consolidation affects genuine savings and economic growth and whether these effects evolve as countries accumulate debt. It is intended that the study will help expand the current discussion on the viability of fiscal consolidation as a policy tool by introducing a new framework for thinking about sustainable development.

II. Literature review

1. Fiscal Consolidation

Although few existing studies investigate directly the relationship between fiscal consolidation and adjusted net savings, researchers have looked at the impact of contractionary fiscal policies on more traditional measures of economic wellbeing.

There exist two competing views regarding the relationship between fiscal consolidation and economic growth. According to the Keynesian school of thought, fiscal consolidation reduces output growth in the short term as government expenditure cuts reduce aggregate demand in the economy by way of a Keynesian multiplier effect, whereby total economic output declines by more than the original reduction in public spending that caused it (Briotti 2005) (Blinder 2008). On the other hand, there is a literature that stresses the possibility that fiscal

consolidation might in fact result in a boost in economic output. This non-Keynesian effect is thought to be in part due to improvements in financial market confidence when governments with high and growing public debt ratio implement consolidation. As contractionary fiscal policies reduce the risk of default in countries with high public debt ratios, interest rate declines, thereby spurring aggregate demand directly through investments and indirectly through consumption. In particular, large fiscal contractions could signal lower future tax burdens, which, in turn, lead to an increase in expected disposable income, thereby increasing consumption. Public spending cuts also tend to augment short-run investment because of reduced wage pressure in the private sector (Briotti 2005).

Research has provided evidence supporting both theories about the effect of fiscal consolidation. In support of the non-Keynesian mechanism, Ardagna (2004) presents evidence from 17 OECD countries over 1975-2002 and argue that GDP growth is higher the larger the decrease in government expenditure while the effect through tax increases is significantly less. In addition, she identifies the labor market as opposed to agents' expectations of future fiscal policy as the more important channel of transmission for this non-Keynesian effect. Meanwhile, Hernandez de Cos and Moral-Benito (2013) provide evidence against the alleged positive effect of fiscal consolidation on output growth. Using data for a panel of OECD countries over the years of 1980-2007, the researchers present results of robustness tests disproving the hypothesis that contractionary fiscal policies are exogenous to economic growth. Furthermore, they show that fiscal retrenchment in fact has a significant negative effect on GDP growth once the exogeneity assumption is dropped, and the results are consistent using both the cyclically adjusted primary balance (CAPB) based definition of fiscal consolidation and the fiscal consolidations identified by the International Monetary Fund (2010). These results echo those in

Guajardo et al. (2011), which similarly concludes that the use of action-based definition alleviates the biases arisen from using CAPB-based measures and support a contractionary effect of fiscal retrenchment.

Meanwhile, studies that instead looked at the effect of consolidation on saving rates tend to indicate a positive impact. Using data for a group of 18 OECD countries over the period 1970-1996, Giavazzi, Jappelli and Pagano (2000) estimate dynamic regression models of national saving rates regressed on government taxes and spending. The results suggest a strong overall positive correlation with increases in net taxes and national saving, while increases in government saving reduce it. The positive effects are therefore channeled through changes in private sector behavior and expectations. They are, however, dampened during large fiscal contractions, especially when tax measures make up a large part of the consolidation effort. In addition, the researchers do not identify a debt dynamics—high and growing public debt does not predict increased saving rates. These findings suggest that fiscal consolidation, a combination of tax hikes and spending cuts, could potentially improve genuine savings through increasing national saving rates.

2. Adjusted Net Savings

While there is little research directly linking fiscal consolidation to adjusted net savings, the sustainability indicator has been widely used to study development trends. This analysis is in part inspired by literature in this area and draws from them a list of determinants of adjusted net savings. Summaries of select studies are presented below:

Atkinson and Hamilton (2003) examine the relationship between genuine savings and per capita economic growth in the context of the "resource curse" hypothesis, which suggests that

natural resource endowment of a country may lead to depressed economic growth. In particular, the researchers use genuine savings to measure sustainability as it captures the change in the real value of assets over time. Using average data for 91 countries during the period of 1980-95, the study presents cross-sectional regression results for both developed and developing countries with varying degree of resource abundance as measured by the share of resource rents in GDP. Not only does the study show a significantly negative correlation between resource abundance and average per capita GDP growth rate during the 15-year period, lending support to the resource curse hypothesis, it also presents evidence that higher initial period genuine saving leads to higher GDP per capita growth rates. In addition, this study presents evidence that resource abundant countries with positive genuine saving rates are able to avoid the resource curse as the proceeds from resource depletion are either saved or invested in human capital and other sustainable factors as opposed to squandered away. This finding serves as further proof of the long-term economic benefits of positive genuine savings.

Dietz et al. (2005) conduct a similar study of both gross and genuine savings investigating the validity of the resource curse hypothesis. In contrast to the cross-sectional analysis in Atkinson and Hamilton (2003), the researchers carried out a panel study of 115 countries over an 18-year period to identify determinants of the two types of savings. Specifically, the paper estimates the regression model in two ways: first with country-specific fixed effect and robust standard errors, and then with variants of the Generalized Method of Moments (GMM) estimator, which are executed by first-differencing the dependent and independent variables. Some of the consistently significant determinants of genuine savings demonstrated in the study include lagged value of genuine savings, lagged value of GDP growth, age dependency, and share of resource exports in GDP. In addition, significant coefficients of the

interaction between resource exports and various indicators of institution quality—lack of corruption, bureaucratic quality, and rule of law—lend support to the resource curse hypothesis. Although these two studies do not directly relate genuine savings to fiscal consolidation, they highlight the role of political factors in determining genuine savings.

Inspired by the 2007-2009 global financial crisis, Yongfu Huang conducts a study on adjusted net savings with a different focus, investigating the effects of output volatility on global sustainability. Analyzing a sample of 128 countries over the period of 1979-2008, Huang identifies a strong negative impact on genuine savings as a result of fluctuations in economic output. Using resource depletion as the dependent variable, the research establishes that, in addition to the significant impact of volatility on savings suggested in previous literature, the negative effect of output volatility is due to the positive impact of output volatility on natural resources depletion. In particular, he identifies a financial development channel—as measured by the liquid liabilities of banks and non-bank financial intermediaries over GDP—through which output volatility intensifies depletion of natural resources. This paper follows Huang's example and investigate whether fiscal consolidation has any environmental repercussions, in addition to examining the relationship between consolidation and the aggregated indicator of adjusted net savings.

3. Emission Damages

Given that emission damages form part of the adjusted net savings indicator, this study also reviews literature relating air pollution to government fiscal policies. According to the World Bank, the orientation of broad fiscal policy—including the level and composition of most government spending (not purposely directed to the environment)—may have a great impact on the environment (López et al. 2008). In fact, both qualitative and quantitative evidence indicate

that the size and proportion of government expenditure and taxes influence pollution levels. While the empirical studies reviewed in this section do not include carbon dioxide—the pollutant used in calculating the emission damages portion of adjusted net savings—as one of the pollutants of interest, the identified correlations and mechanisms through which government fiscal policies influence air quality are nonetheless applicable to studying the environmental ramifications of fiscal consolidation.

A recent case study of post-austerity Greece suggests a potential adverse relationship between fiscal consolidation and environmental welfare. According to Lekakis and Kousis, Greece, arguably the country most affected by the financial crisis, is experiencing "natural resource depletion, environmental decay, and national wealth reduction" because of the austerity policies imposed on the country. On the one hand, the economic crisis in Greece indeed generated some environmental benefits in terms of reduced damage resulting from various pollutants from production and consumption activities: emissions of pollutants such as SO_2, CO_2, phosphorous, and nitrogen have experienced a downward trend as production and consumption declined during crisis years. On the other hand, however, as Greece was demanded by its international lenders—the EU and the IMF—to increase the price of heating fuel as a state-revenue raising measure, there has been "a massive substitution of central heating oil with wood, other fuel and, by some, even dangerous but available materials including, for example, old furniture and plastics" (Lekakis and Kousis 2011). As a result, Greek cities have seen harmful pollutants—particulate matters, sulfur dioxide, and carbon monoxide—at a least five times the acceptable levels. In addition, austerity measures led to reduced spending on environmental protection and regulation as environmental agencies became understaffed due to insufficient funding. As a result, one has seen illegal logging increase, which led to deforestation in the

country (Lekakis and Kousis 2011).

A number of empirical studies also lend support to the argument that deficiency in government investment due to the austerity measures may have long-term environmental ramifications. Lopez et al. (2010) examines the role of government fiscal spending in determining pollution levels using a theoretical model, which they subsequently support with empirical results. Specifically, they argue that government expenditure in public goods, environmental protection included, may alleviate negative externalities such as pollution, whereas expenditure in private goods, which includes subsidies to fossil fuels production and consumption, tend to crowd out private investment in those areas and do not correct market failures. Using cross-national panel data, they examine two measures of environmental degradation: air pollution as measured by SO_2 emissions from 1986-1999 and water quality as measured by lead concentration in water sources from 1980-2005. They show that shifting government expenditure toward a greater provision of public goods reduces air and water pollution. In addition, their results show that expanding total fiscal spending is consistently neutral or positive for the environment (López et al. 2010). The discovered constant or positive effect of government spending on emission levels has implication for this study on genuine savings of which emission damages are a component. It may be expected that fiscal consolidation policies, which nearly always include government spending cuts, increase genuine savings through their negative impact on emission levels.

Furthermore, a study by the World Bank looks directly at the relationship between the size and composition of government expenditure and air pollution as measured by sulfur dioxide, nitrogen dioxide, carbon monoxide, air particles, and lead. Panel regression analysis is run on a sample of 31 developing and developed countries, with annual data for about 300 sites in 86

cities over 1985–2000. After controlling for per capita household income, the level of total GDP, the growth rate of GDP, and unobserved site-fixed effects, the study finds a positive correlation between air quality and both government consumption and the share of public goods in total government spending (López et al. 2008). Conversely, as governments seek to improve budget balance through expenditure reduction, it is likely that pollution levels would increase, thereby undermining genuine savings.

III. Data and Methodology

This research studies whether fiscal consolidation has any significant impacts on sustainable development, controlling for a series of variables including per capita gross national income, real exchange rate regime, debt to GDP ratio, population, inflation rate, abundance of natural resource, age dependency, and trade. Specifically, cross-country regressions are run on a panel of 17 OECD countries over the period of 1978-2009. The number of countries in the sample is actually limited by availability of data on fiscal consolidation episodes, and a list of countries in the sample can be found in Appendix 1.

The Data

1. Dependent Variables

This paper follows the example of Huang (2011) and uses adjusted net savings, also known as genuine savings, as the main measurement of sustainability. Deemed a proxy for sustainability by the World Bank, adjusted net savings "measure the true rate of savings in an economy after taking into account investments in human capital, depletion of natural resources and damage caused by pollution" ("Adjusted Net Saving" May 28, 2010). Negative adjusted

saving rates indicate that the stock of overall capital assets (human, physical, and natural) is in decline and imply an unsustainable development trajectory. Specifically, adjusted net saving is calculated as net national saving (NNS), which is the difference between gross national saving (GNS) and the consumption of fixed capital (DEPR), plus education expenditure (EE), minus energy depletion (ED), mineral depletion (MD), net forest depletion (NFD), and carbon dioxide damage (CO_2D). The data for adjusted net savings, excluding particulate emission damage (% of Gross National Income), from 1978 to 2009, are taken from the World Bank Development Indicators Database (2014). The time series of the variable is shown in Figure 3. This study primarily focuses on the first differences of the adjusted net savings variable for two reasons: 1. To allow direct comparison and contrast with GDP growth, a commonly used measurement of economic development that does not factor in long-term costs of output growth; 2. To avoid of autoregressive issues that could bias and destabilize econometric models. Figure 4 displays the time series of the first differenced variable.

The calculation of ANS in this paper follows the one released by World Bank (2004) and is based on crude estimates from World Bank (2003), as follows:

$$ANS = NNS + EE - DEP - CO_2D$$[1]

where:

ANS adjusted net saving

NNS net national saving

EE current public education expenditure

[1] "In the calculation of ANS, current expenditure on education (books, salaries of teachers, etc.) is treated as saving rather than consumption, since it increases the country's human capital. Pollution damages seek to reflect losses of welfare in the form of human sickness. Energy depletion is the depletion of oil, coal and natural gas. Mineral depletion is the sum of the depletion of bauxite, copper, iron, lead, nickel, phosphate, tin, zinc, gold and silver. Measures of depletion stand for the management of the natural resources." (Gnégné 2008)

DEP rents from depletion of natural resources (energy, mineral, and forest)

CO_2D carbon dioxide (CO_2D) damage

$$NNS = GNS - CFC$$

where: GNS = gross national saving; CFC = consumption of fixed capital; and

$$GNS = GNI - private\ consumption - public\ consumption + net\ current\ transfers$$

Figure 5 contains country-specific pie charts that visualize relative proportions of the different components of ANS. According to the pie charts, net national savings constitute the largest component of ANS in the majority of the 17 countries over the 31-year period, while for some countries—Belgium, the United Kingdom, and the United States, for example—public investment in education, along with NNS, is represented significantly in calculating ANS. Natural resource depletion makes up the third largest share of ANS and represents significant proportions of ANS in a select group of countries including Australia, Canada, the UK, and the US, where natural resource extraction contributes significantly to national economic output. Lastly, carbon dioxide damage carries the least weight in calculating ANS in comparison to NNS and resource depletion; among the 17 countries in the sample, Australia, Belgium, Portugal, and the U.S. have seen CO_2 damage having the largest presence in calculating their respective ANS.

To better understand the effect of fiscal consolidation on sustainability, this paper also uses each components of the adjusted net saving indicator as dependent variables: gross national saving (GNS), education expenditure (EE), carbon dioxide damage (CO_2D), and resource depletion (DEP). In particular, resource depletion is calculated as the sum of energy depletion, mineral depletion, and net forest depletion. In addition, carbon dioxide damage measures in percentage of gross national income "the present value of global damage to economic assets and

human welfare" over time, where each ton of carbon is estimated to result in $20 of economic damage (measured in 1995 U.S. dollars) (World Bank 2014). Data for these variables are also obtained from the World Bank World Development Indicators Database.

2.Independent Variables

"Fiscal Consolidation", denoted by CONS, is the primary independent variable of this analysis. It is defined as "concrete policies aimed at reducing government deficits and debt accumulation, *e.g.* active policies to improve the fiscal position" (OECD 2012). Data for this variable come from Devries et al. (2011), which records fiscal consolidation measures taken by the governments of 17 OECD economies to reduce budget deficits during 1978-2009. Figures 6 and 7 shows country specific time series of aggregate fiscal consolidation as well as those of its tax and spending components. Given that fiscal consolidation is achieved through expenditure reduction and revenue augmentation, the dataset also records separately the budgetary effects of spending cuts and tax hikes in percent of GDP terms. In this sample, when governments consolidate, the fiscal impact is valued at about 1% of GDP on average; the largest fiscal consolidation measure, 4.74%, is recorded in Ireland in 2009 following the financial crisis.

In contrast to another popular definition of fiscal consolidation, a measure derived from cyclically-adjusted primary budget balance (CAPB) of government, the Devries dataset is based on "actions" rather than actual budgetary outcomes, which would be affected by numerous factors determining the pace of economic growth (Devries *et al.*) (Agca and Igan). More precisely, only the measures announced and implemented with an aim to reduce budget deficit are recorded as a fiscal consolidation—neither consolidation policies motivated by the desire to restrain domestic demand, nor those offset by fiscal actions not primarily motivated by cyclical

fluctuations, are included. For example, because of a one-time capital transfer to the social housing subsidy program in 1995, Netherlands recorded a 7% increase in CAPB-to-GDP ratio—a budgetary expansion—in 1996; this fiscal change is not recorded in the Devries dataset as no deficit-reduction driven fiscal consolidation measures were implemented. In addition, Ireland's cyclically adjusted budget balance fell by 4.4 % of GDP in 2009 when historical record reports fiscal consolidation measures of 4.7% of GDP. In reality, the sharp recession in 2009, during which stock and housing prices fell by 44 and 20 percent, had a significant negative impact on CAPB, causing the CAPB-based approach to inaccurately identify the size of fiscal consolidation measures.

According to existing literature, the short-term macroeconomic impact of fiscal consolidation can be either positive or negative. However, it is likely that the outcome on saving rates is positive based on Giavazzi, Jappelli and Pagano (2000). Additionally, a negative correlation between air quality and fiscal retrenchment is expected because of the identified benefits of government spending to the environment. In addition to using the aggregated fiscal consolidation measure as an independent variable, this analysis also analyzes individually its expenditure (EXP) and revenue-based (TAX) components in order to discern their respective macroeconomic impact.

Another key independent variable is gross public debt as measured by government debt-to-GDP ratios. Recent studies such as Reinhart and Rogoff (2010) have looked at the effect of public debt on GDP growth and identified critical debt levels (90% of GDP) above which economic growth is notably slower. This paper uses data compiled by Abbas et al. (2010), and they are extracted from the IMF World Economic Outlook database (2014). The natural log of debt-to-GDP ratio will be used to eliminate the right skewedness in the original data. Debt will

be interacted with the first differences of the consolidation variables so as to investigate the potential for a debt differential in the effect of fiscal consolidation on genuine savings and other dependent variables of interest.

3.Other variables

This analysis also controls for a number of independent variables that potentially influence saving rates and economic growth. Following previous literature, the regression models first control for a number of income-related variables: gross national income (GNI), GNI per capita, lagged gross domestic product (GDP), and external balance. Higher income should lead to higher aggregate saving rates; so should economic growth (GDPGR): an increased share of transitory income in total income should raise average saving rates as indicated by permanent income hypothesis. As GDP growth is likely correlated with other indicators of economic development, the lagged value is used to avoid biases due to simultaneity. The natural logs of per capita and aggregate GNI are used to account for the right-skewedness.

The literature on saving rates also suggest that age structure of the population, reflected in the burden of dependency, may play a role in determining national saving rates. According to the theory, an increase in the share of youth dependents (under the age of 15 years) in the total population would reduce saving rates, as a higher share of income is required for the current social welfare expenditure of children (education, healthcare, food, and clothing). Similarly, an increase in the share of the population 65 years and older (elderly dependents) would also tend to reduce the national saving rate as a higher proportion of the population moved into the dissaving years and with rising elderly health care expenses (Hess 2010). This analysis controls for the age structure of the population using the share of population of labor force age (between the ages of

15 and 64); a larger share of working age population is expected to improve overall saving rates. In addition, the idea of the demographic dividend[2] suggests that a country with a larger working-age population relative to the share of dependents would also experience accelerated economic growth. That is, age structure as defined here should have a positive impact on GDP growth.

Also included in the regression models is a set of environment-related variables: trade and resource export. To begin with, studies on long-run determinants of pollution suggest that trade may reduce emissions due to greater competitive pressure or "greater access to greener production technologies" (Hess 2010); this research therefore controls for the natural log of trade as a percentage of GDP. Furthermore, Dietz, Neumayer, and de Soysa (2007) identified natural resource abundance as a significant determinant of adjusted net savings. Specifically, adjusted net savings rate is often significantly lower for natural-resource economies not only because economic growth in those countries likely depends on the unsustainable practice of natural resource extraction, but also because of the so-called "Dutch disease", whereby natural resource booms set off "inflationary public spending resulting in real appreciation of the domestic currency, damaging the other sectors of the economy" (Hess 2010). To measure the extent to which the country depends on natural resource to generate income, the analysis controls for the share of fuels, ores, and metals in merchandise exports (RESOURCE). This measure is selected over the value of resource rents, employed by studies such as Atkinson and Hamilton (2003), to avoid causing partial identity of the left-hand side and right-hand side of the regression equation as resource rents form part of genuine saving.

[2] "The demographic dividend is the accelerated economic growth that may result from a decline in a country's mortality and fertility and the subsequent change in the age structure of the population. With fewer births each year, the country's young dependent population grows smaller in relation to the working-age population. With fewer people to support, a country has a window of opportunity for rapid economic growth if the right social and economic policies developed and investments made." (Gribble and Bremner 2012)

Additional regressors include inflation rate, external balance, and share of investment in GDP. Inflation rate (INFLATION) is used to capture the precautionary saving effects: it is expected to have a negative influence on savings as people have an incentive to spend their income before rising prices erode their purchasing power (Loayza et al.). External balance is the value of exports of goods and services less imports of goods and services and directly determines a country's current account position (World Bank 2014). Negative external balance, or external balance deficits, suggests that the country is in essence borrowing from the rest of the world; therefore, an increase in external should lead to accelerated GDP growth based on the Keynesian model for aggregate demand. Gross investment should have a positive effect on economic growth and is correlated with savings again according to Keynesian economic theories.

Tables 1 and 2 report summary statistics of both the levels and first differences of the variables described above. Note that ANS and GNS, two measures of national savings, have similar standard errors and are closely correlated. Compared to GNS, ANS has a slightly wider range and a smaller mean, reflecting the fact that ANS is a more comprehensive measure that takes into account various elements of economic activity. Fiscal consolidation, the main independent variable of interest, ranges from -0.75 to 4.74 percent of GDP and has a standard deviation of 0.7. Also worth noting is the relatively large spread of debt to GDP ratio observed in the sample: it ranges from 4.95 to 210.25 percent of GDP and has a standard deviation of nearly 30 percent of GDP. According to Table 2, GDP growth, trade, external balance, and investment as a share of GDP are some of the variables most positively correlated with adjusted net savings, while its correlations with resource export and fiscal consolidation are negative. Further regression analysis will reveal whether fiscal consolidation is indeed detrimental to sustainable development. Moreover, fiscal consolidation appears to be associated with the level of public

debt, which makes intuitive sense as government would have more of an incentive to save through fiscal retrenchment when its highly indebted.

Validation of the Dependent Variable—Adjusted Net Savings

Some may raise questions about whether adjusted net savings or genuine savings qualify as valid measures of sustainable development. According Dietz et al. (2007), "current genuine savings should in theory be equal to growth in the present value of future well-being along the optimal growth path of the economy", meaning that countries with poor genuine savings performance would also fare less well in terms of future growth. Studies find that negative genuine savings is associated with declining welfare per capita as well as GDP (Atkinson and Hamilton 2003). Moreover, studies such as Gnégné (2008) present empirical evidence that adjusted net saving has a significant positive relationship with aggregate welfare as measured by infant mortality rate and human development index.

Figures 8 further attests to the validity of adjusted net savings as an indicator for sustainable development as measured by 5-year averages of growth in per capita GDP. According to the scatterplot, adjusted net savings exhibit a positive relationship with long-run GDP per capita growth in all but one of the 17 countries in the sample—Denmark is the only country where higher adjusted net savings seem to be associated with slightly declining long-run per capita growth in GDP. The scatterplots also illustrate the cross-national discrepancies in terms of the spread of adjusted net savings levels: initial values of ANS are relatively spread out in Finland, Ireland, Japan, and Portugal compared to countries such as Australia, Austria, Italy and the Netherlands where they are clustered together. In addition, countries exhibit varying degrees of positive relationship between ANS and long-run per capita output growth: some of the

most positive such relationships are observed in Belgium, Ireland, Italy, and the Netherlands, while Australia, the UK, and the US exhibit some of the weakest relationships between the two indicators.

IV. Econometric Models

Cross-country panel regressions are run on a panel of 17 advanced economies in the OECD (see Appendix 1 for a full list of countries in the sample) over 1978 to 2009. In particular, the estimated regression models control for the unobserved time effects common to all countries as well as time-invariant country-specific factors. While previous studies on genuine saving also controlled for political factors (corruption, rule of law, regime type, etc.) and variables that measure the level of development (Human Development Index, for example), this study forgoes the additional control variables because of the relatively homogeneous nature of the countries in the sample, which are all industrialized countries with market economies and mature democratic political systems.

This analysis follows the examples of previous studies on genuine savings and uses first-difference estimator models with country-specific and time-varying fixed effects (Huang 2012) (Dietz et al. 2007). They are constructed by taking the first-differences of the dependent as well as independent variables; that is, the models estimate the effect of growth in the independent variable on that of the dependent variable. First differencing the dependent and independent variables turns the potentially non-stationary panel into a mean-stationary one, hence reducing the disturbance due to autocorrelation between the dependent variable and its lags. In addition, this approach is advantageous to a static model as it incorporates a time dynamic and therefore captures deviations in the trend of the dependent variables. The regression will include two lags

of the consolidation variables to capture both the short-term and medium-term effects. Consider the following regression equation in first difference:

$$(1)\ \Delta DEPVAR_{it} = DEPVAR_{it} - DEPVAR_{it-1} = \beta' \sum_{n=0}^{2} \Delta CONS_{it-n} + \theta' \Delta X_{it} + \eta_i + \delta_t + \epsilon_{it}$$

where *DEPVAR* denotes the dependent variables, which include adjusted net savings (ANS) measure and its components (NNS, EE, DEP, and CO_2D), gross national savings (GNS), and GDP growth (GDPGR). *X* represents a set of potential determinants of the dependent variables as introduced in the data section: gross national income, lagged GDP growth, investment, trade, age structure, urbanization rate, etc. The model also includes unobserved heterogeneity with the country-specific fixed effect is captured by η_i and a set of time varying factors denoted by δ_t. Lastly, the error term is represented by ϵ_{it}. The subscripts *i* and *t* represent country and time periods, respectively.

As much of the controversies on fiscal consolidation policies today concern their benefits and costs when public debt levels are dangerously high and growing, a second model is estimated controlling for public debt levels. Because a change in public reflects fiscal consolidation or expansion, the regression controls for lagged level of debt as opposed to its first difference. The regression equation is presented as follows:

$$(2)\ \Delta DEPVAR_{it} = \beta' \sum_{n=0}^{2} \Delta CONS_{it-n} + \gamma DEBT_{it-1} + \theta' \Delta X_{it} + \eta_i + \delta_t + \epsilon_{it}$$

In order to investigate whether the impact of fiscal consolidation changes with respect to public debt levels, this analysis estimates a regression equation containing interactions between consolidation and the log of debt-to-GDP ratios. The regression model is estimated as follows:

$$(3)\ \Delta\, DEPVAR_{it} = \beta' \sum_{n=0}^{2} \Delta CONS_{it-n} + \gamma \Delta DEBT + \alpha' \sum_{n=0}^{2} \Delta CONS_{it-n} * DEBT + \theta' \Delta X_{it} + \eta_i + \delta_t + \epsilon_{it}$$

Lastly, the analysis seeks to differentiate between the effects of spending cuts and tax hikes by regressing the dependent variables on EXP and TAX separately. Equations (4) and (5) AND (6) are estimated as follows:

$$(4)\ \Delta\, DEPVAR_{it} = \beta' \sum_{n=0}^{2} \Delta EXP_{it-n} + \rho' \sum_{n=0}^{2} \Delta TAX_{it-n} + \theta' \Delta X_{it} + \eta_i + \delta_t + \epsilon_{it}$$

$$(5)\ \Delta\, DEPVAR_{it} = \beta' \sum_{n=0}^{2} \Delta EXP_{it-n} + \rho' \sum_{n=0}^{2} \Delta TAX_{it-n} + \gamma DEBT_{it-1} + \theta' \Delta X_{it} + \eta_i + \delta_t + \epsilon_{it}$$

(6)

$$\Delta\, DEPVAR_{it} = \beta' \sum_{n=0}^{2} \Delta EXP_{it-n} + \rho' \sum_{n=0}^{2} \Delta TAX_{it-n} + \gamma DEBT_{it-1} + \alpha' \sum_{n=0}^{2} \Delta EXP_{it-n} * DEBT + \sigma' \sum_{n=0}^{2} \Delta TAX_{it-n} * DEBT + \theta' \Delta X_{it} + \eta_i + \delta_t + \epsilon_{it}$$

V. Empirical Results

Overall, first-difference regression analysis shows that fiscal consolidation improves the trend of genuine saving rate while hurting GDP growth in the short-run. The positive effect on genuine savings appears to be driven by the fact that fiscal consolidation improves national saving rates. This positive effect of fiscal consolidation dominates the estimated negative impact it has on two other components of genuine savings—education expenditure and air quality, which is in part determined by the level of public at the time of the implementation. Meanwhile, further analysis reveals that the benefits of fiscal consolidation are primarily achieved through cutting public spending, while the short-term economic slowdown and environmental damages are associated with tax increases. Spending cuts can also benefit GDP growth, although the effect is only significant in the long run. Details of the regressions are presented as follows:

Table 3 presents first-difference estimations for three models with adjusted net savings, gross national savings, and GDP growth as the dependent variables. Columns I-III report the cross-country first-difference estimations as specified in Equation (1). This basic model regresses the three main dependent variables of interest on three lags of consolidation, and the results provide some preliminary insights into the macroeconomic impact of fiscal consolidation. As predicted, consolidation has an overall positive impact on saving rates, while the effect on GDP growth is negative but statistically insignificant. Specifically, the coefficients for the first-degree lag of consolidation are positive and significant for both genuine and gross savings. In addition, current-year consolidation has a positive effect on gross national savings as well, and the coefficient is significant at the 10% level. Comparing the effects of consolidation on the two saving indicators, it appears that the positive impact on genuine savings is slightly greater than the impact on gross savings: consolidating by an additional one percent of GDP in the previous period causes genuine saving rate to increase by an additional 0.17% of GNI, compared to an

additional increase of 0.14% of GNI in gross savings. In terms of the control variables, both investment and external balance have strongly significant, positive influence on genuine and gross savings and GDP growth; the direction of these effects is consistent with expectation. The log of gross national income per capita is a significant positive determinant of gross savings, while in regression III the coefficients for inflation rate (negative) and the log of trade (positive) are significant at the 1% level. Resource export is a weakly significant determinant of both saving rates. It improves gross saving rate while hurting the adjusted net indicator and the disparity reflects that the latter accounts for the cost to growth in the form of depleted natural resources. Lastly, the coefficients for age dependence are significant and positive for both genuine savings and GDP growth, which is consistent with the theories that having a large working-age population contributes to both saving and output growth.

Next, the analysis looks at whether public debt influences the macroeconomic effects of fiscal consolidation by introducing the first-degree lag of the log of debt-to-GDP ratio as an additional control variable. Regressions IV-VI report results for the model specified in Equation (2). As shown, the lagged value of debt has a positive effect on both genuine and gross savings, and the coefficients are strongly significant at the 1% level. In particular, increasing public debt by an additional 10% of GDP elevates both saving rates by about 0.05% of GNI. Meanwhile, the lagged first difference of fiscal consolidation continue to be positive and significant determinants of genuine and gross savings with effects of virtually the same magnitude. Note that the first difference of the logged GNI variable now has a significant and positive effect on genuine savings, while the coefficients of resource exports and age dependency, two previously significant determinants of genuine saving, are no longer statistically significant. In addition, the

positive effect of logged GNI per capita on gross saving also disappeared after controlling for debt levels.

The relationship between public debt and fiscal consolidation is further examined in regressions VII-IX, which contain current and lagged interactions between the first differences of consolidation and the natural log of debt-to-GDP ratio. Looking at regressions VII and VIII, the positive effect of consolidation on saving rates are no longer statistically significant, while the negative coefficients of the second-degree lag of consolidation, although insignificant, suggest that a medium-term adverse impact on saving rates may be present. In addition, the negative coefficients of the interaction terms suggest that the beneficial effects of fiscal consolidation on saving rates may subside as debt levels increase; however, there is once again insufficient evidence to confirm this debt dynamic as the coefficients are not statistically different from zero. On the other hand, regression IX reports coefficients that suggest a negative correlation between consolidation and GDP growth in the short term and a positive one as time goes on, while the interaction terms tend to influence GDP growth in a way that balances out the stand-alone effects. Nonetheless, regression analysis fails to produce sufficient evidence to validate this claim, as none of the key coefficients are statistically significant. Public debt does not appear to play a role in determining the effect of fiscal consolidation measures as a whole.

Given the macroeconomic effects of the aggregated consolidation variables, one wonders to what extent does the composition of fiscal consolidation matter. In other words, do spending or tax-based policies lead to different economic outcomes? In Table 4, the dependent variables are regressed on expenditure reduction (EXP) and tax increase (TAX)—two forms of consolidation measures—separately as demonstrated in Equation (4). Looking at regressions I, one can see that the first-degree lag of EXP is the only significant, albeit weakly so (10%),

determinant among the consolidation variables, suggesting that the previously estimated positive effect on genuine saving is primarily due to government spending cuts. A similar result is shown for gross national savings: the trend in the dependent variable is significantly improved by the current and first-degree lagged first difference of EXP, while none of the tax variables are significant. The fact that the coefficients of EXP on its own are more positive than those of the aggregated consolidation indicator serve as further evidence that expenditure-based consolidation is the primary driver of the benefits to saving rates. The regression results in column III reflect an opposite pattern. Both the current and first lag of TAX is significant at the 1% level and the effects are negative: an additional tax increase amounting to one percent of GDP is estimated to lower the trend in GDP growth by 0.43% in the current period and 0.55% in the following year. Meanwhile, the medium-term negative impact of tax increases can be mitigated by spending cuts as indicated by the positive coefficient of the second lagged first difference of EXP, although the positive effect is less strong. The fact that coefficients are significant when consolidation is decomposed into spending cuts and tax hikes suggests that GDP growth is quite sensitive to the kinds of fiscal consolidation policy implemented. Overall, regressions I-III show that expenditure-based consolidation measures are overall beneficial, whereas tax-oriented policies tend to incur short-term economic costs in the form of depressed output growth.

Regressions IV-VI repeat the same exercise as before and control for the level of public debt. The same pattern of significant determinants is estimated, although the size of the effects of the tax and expenditure variables all appears to be slight stronger after controlling for debt. To further investigate the interaction between the two consolidation variables and debt, regressions VII-IX are estimated following Equation (9). Once again, statistical evidence do not support a

debt dynamic when it comes to the macroeconomic impact of fiscal consolidation, as none of the coefficients of the consolidation variables are significant.

So far, the results in Tables 3 and 4 have provided some insights into the macroeconomic effects of fiscal consolidation. In particular, fiscal consolidation improves the trend in genuine savings in the short-term and the positive effect is greater than when gross national saving is the dependent variable. In order to identify the drivers of this positive impact of genuine savings, regression models are estimated using the four components of adjusted net savings—net national savings (NNS), education expenditure (EE), resource depletion (DEP), and carbon dioxide damage (CO_2 D).

Table 5 reports first-difference regression results using Equations (1) –(3). From regression I-IV, fiscal consolidation is only significant in determining net national saving, which is the difference between gross national savings and the consumption of fixed capital (depreciation). The first-degree lag of consolidation has a positive coefficient of 0.132 and is significant at the 5% level. Note that this effect nearly accounts for all of the positive influence on gross savings (0.137) estimated in the same model, indicating that the positive correlation between consolidation and genuine savings is largely driven by the improvements in gross savings due to consolidation. Meanwhile, fiscal consolidation appears to have no effect on other components of genuine savings, as the coefficients of the consolidation variables are all insignificant. In terms of control variables, the same controls that determined gross savings in regression II in Table 3 also were significant determinants of net national savings. In addition, age dependency also significantly improves the trend in net national savings as it did genuine savings. Lagged GDP growth significantly lowers the trend in education expenditure, which could mean that the additional wealth generated from economic growth is not invested in

education. Moreover, external balance also has a significant, negative effect on education expenditure. Significant determinants of resource depletion include investment, external balance, and age dependency. Lastly, carbon dioxide damage is significantly determined by investment, log of trade, external balance, and age dependency.

Regressions V-VIII report results with the lagged value of debt as an additional control variable. To begin with, the coefficients of lagged debt is significant in regression V only, in which net national saving is the dependent variable. While most of the coefficients stay the same, that of the current first difference of fiscal consolidation in regression VIII is positive and significant at the 10% level. The coefficient of 0.0024 suggests that consolidating by an additional one percent of GDP causes additional carbon dioxide damage valued at 0.0024% of GNI in the same year.

The analysis looks further into the effect of debt by estimating regressions VII-XII, which includes interaction terms of debt and consolidation. As reported in Table 5, fiscal consolidation continues to have no significant effect on education expenditure and resource depletion. Meanwhile, the significant effect of consolidation on net national savings disappears, reaffirming that no debt dynamic is present. Although the consolidation variables are no longer significant in determining net national savings, the introduction of interaction terms yields interesting results for the other components of genuine savings. On the other hand, evidence does suggest that debt plays an important role in the dynamic between consolidation and carbon dioxide pollution. The positive and significant coefficient of the current-period consolidation suggests that air quality suffers in the short run. Specifically, consolidating government budgets by 1% of GDP on average increases the trend in carbon dioxide pollution by 0.02% of GNI. Given that GDP and GNI are quite comparable, the coefficient can be interpreted in simpler terms: in trying to save a

dollar, governments on average incur approximately two cents in air pollution damage. However, it appears that the adverse effect on air quality is reversed in the medium term, as the coefficient of the second-degree lag of consolidation is significant at the 5% level. Moreover, the significant and negative coefficients of the interaction terms indicate that consolidation tends to damage air quality when public debt levels are relatively low. In other words, it is likely that governments tend to implement consolidation policies that result in greater pollution damages when debt burdens are small.

Lastly, this analysis estimates the effects of spending cuts and tax increases on the four components of genuine savings. The results are reported in Table 6. Looking at regression I, the uniquely significant coefficient of the lagged first difference of EXP once again confirms that the improvements in savings are achieved through expenditure-based consolidation. Meanwhile, regression IV indicates that the adverse influence on air quality is primarily due to tax increases in the current period given the significant coefficient of the lagged first difference of TAX. Again, regressions II and III confirm that education expenditure and resource depletion are not determined by either form consolidation when debt is not in the equation. Regressions V-VIII in essence reaffirm this observation. Regressions X, however, introduces refreshing results. Fiscal consolidation—in the form of spending cuts specifically—is now negatively correlated with education expenditure, as one would expect. The fact that the second-degree lagged interaction term is the only significant variable suggests that debt level explains much of the correlation between consolidation and education expenditure. In particular, as governments become more indebted, it is more likely that spending cuts will involve public education expenditure. Regression XI presents yet another interesting result. The coefficients of both the first and second lags of EXP are now significant at the 10% level or beyond. The signs are opposite, and

the positive effect of the second lag is significantly stronger than that of the first lag. In other words, spending cuts lead to reduced resource depletion in the short-run and intensifies the trend to a greater degree as time goes on. Moreover, the significant coefficient of the lagged interaction between debt and EXP suggests that even the short-term beneficial effect on the environment can turn into an adverse one as public debt increases. This debt dynamic indicates that governments likely pursue different combinations of consolidation policies when faced with various levels of debt obligations and that they tend to resort to more environmentally damaging measures when obligations are high. Last but not least, regression XII indicates that both spending cuts and tax hikes are responsible for the acceleration in carbon dioxide damage. Moreover, it takes relatively longer for the adverse effect of spending cuts to materialize: TAX is significant in the current period, while only the first lag of EXP is statistically significant. However, overall tax hikes result in worse environmental outcomes as the positive effect of lagged spending cuts is countered by a negative effect from the previous period. In addition, the negative and significant coefficient of the first-degree lag of the interaction between debt and consolidation suggests that the adverse impact tend to decline as debt levels rise. A debt dynamic is again present, implying that governments tend to cut spending in areas that improve air quality when debt burdens are small.

VI. Conclusion

Overall, regression analysis using first-difference method suggests that fiscal consolidation has an above all positive effect on genuine savings in the short run. The size of the improvement is around 0.17% of gross national income when there is no interaction between debt and consolidation. Moreover, it appears that spending cuts are responsible for this positive effect: cutting spending by an additional percent of GDP is estimated to raise the trend in genuine

savings by around 0.24% of GNI. To put the numbers into perspective, the first difference of fiscal consolidation measures average at around 0.18% of GDP, which corresponds to an increase of 0.04% of GNI in the trend of genuine savings in the following year, and the maximum change in consolidation, 2.8% of GDP, raises the trend by 0.67% of GNI.

In addition, this analysis identifies improvements in net national savings, which is derived from gross national saving, as the source of the positive impact on genuine savings. The identified positive effect of fiscal retrenchment on national savings is consistent with Giavazzi, Jappelli and Pagano (2000), which reports positive correlation between the two components of fiscal consolidation—tax increases and spending cuts—and national saving rates. Given that gross savings account for the largest share of genuine savings in the sample, it is not surprising that fiscal consolidation also positively affects genuine savings. It is puzzling, however, that the effect on genuine savings is larger than that on national savings by about 0.03% of GNI, when spending cuts—the driver of the improvements in saving rates—affects the other components of genuine savings only in an adverse way. A close examination of the results in Table 4 suggests that tax measures may be responsible for the additional benefit, as the coefficients of spending cuts are virtually the same in regarding both genuine and gross savings at around 0.23. Looking now at Table 6, the results indicate that the beneficial effects of tax increases are likely channeled through improvements in education expenditure and reduction in resource depletion as the signs of the coefficients suggest. However, it is important to note that none of these effects are statistically significant. As such, further research will be required to unravel the mystery.

Despite its overall positive impact on genuine savings, fiscal consolidation does seem to incur short-term environmental costs in the form of carbon dioxide pollution. The effect is primarily driven by tax increases and possibly spending cuts as well. There is evidence

indicating that such adverse impact is present in the context of the recent recessions and the fiscal consolidation that followed suit. According to Peters et al. (2011), in developed countries, carbon dioxide emissions decreased 1.3% in 2008 and 7.6% in 2009, but increased 3.4% in 2010; CO_2 emissions grew by 4.1% in the U.S. and 2.2% in the EU as a whole. Regression results suggest that the additional pollution damage is apparently as result of the additional taxes imposed on the economy. This empirical evidence supports the qualitative findings in Lekakis and Kousis (2011), which indicate that the drastic tax increases that Greece implemented as part of its austerity program led to elevated air pollution levels in many Greek cities. Moreover, spending cuts also contribute to the increase in carbon damage when debt is a factor. This result is consistent with the findings in Lopez et al. (2008), which identify a correlation between large government expenditure and sulfur dioxide pollution. In other words, pollution is predicted to rise when the role of the government as a public good provider is weakened during fiscal austerity. Furthermore, according to a recent report by the World Health Organization, air pollution is responsible for 7 million deaths every year worldwide and is "the single biggest environmental health risk", meaning that fiscal austerity policies, to which many governments seem to subscribe, may in fact exasperate this trend ("WHO | Ambient and Household Air Pollution and Health" 2014).

This study also identifies short-term economic repercussions of fiscal consolidation, driven mostly by the damaging effects of tax increases. This result confirms the Keynesian effect of fiscal retrenchment identified in Hernandez de Cos and Moral-Benito (2013) and Guajardo et al. (2011). However, regression results also indicate that spending cuts improve the trend in economic growth in the medium term, which suggests that the non-Keynesian mechanism put forth by scholars such as Ardagna (2004) may also be valid. Linking these results with the

previously discussed effects on genuine savings, the paper concludes that fiscal consolidation improves the prospect for sustainable development through its positive impact on genuine savings while incurring a short-run cost in the form of dampened GDP growth and intensified air pollution. In order to maximize the benefits and minimize the associated short-run economic and environmental costs, fiscal consolidation should focus on expenditure reduction while avoiding the imposition of distortionary taxes. A sound fiscal adjustment program should possibly coordinate expenditure-based consolidation with expansionary tax policies.

The policy implications can be further tailored to countries based on their relative levels of public debt. While public debt in general tend to improve saving rates, pursuing fiscal consolidation with different levels of debt leads to different macroeconomic and environmental outcomes. While the effect of consolidation on saving rates and GDP growth seems to remain constant as debt levels grow, governments do tend to resort to fiscal consolidation measures that tend to undermine sustainability when they are more indebted. In particular, education expenditure is more likely to be cut as debt levels rise, so is spending on environmental protection and regulation, leading to intensified natural resource depletion. This finding in part echoes the recorded rise in deforestation and depletion of other natural resources in Greece following drastic spending cuts by its heavily indebted government.

The implications are also relevant in the context of the three crises that the world is currently facing. This means that the ongoing consolidation policies—given that spending reduction makes up the majority of the consolidation strategy—should help improve the long-term growth prospects through raising genuine savings while minimizing short-term damages to economic growth. However, when governments focus instead on increasing revenues, the resulting economic slowdown may undermine efforts to reduce deficits and public debt. In

reality, tax-based measures indeed contribute significantly to consolidation programs implemented today—nearly half of total fiscal retrenchment in countries such as Greece, Portugal, Italy, and France (OECD 2012). As such, the distortionary effect of tax hikes identified in this study goes a long way towards explaining the prolonged recessions as well as difficulties in reducing debt levels in those countries. That is to say consolidation programs should have been adjusted or even postponed in the context of the recent economic and debt crisis. In fact, the IMF, one of strongest proponents of austerity programs, admitted in 2013 that it had underestimated the damage its prescribed austerity program would do to Greece's economy, which had been mired in recession since the onset of the financial crisis. Although reorienting consolidation policies toward spending cuts may help mitigate the short-term repercussions, doing so may inevitably hurt long-term development prospects if such cuts involve investment in human capital and funding for environmental protection and regulation. This poses a challenging dilemma for policymakers, who must have long-term visions in reallocating government resources toward ensuring sustainable development.

However, there are also limits to extrapolating the findings of this study to the current predicaments. Although the sample covers the majority of the countries in crisis today, the timeframe of the analysis is restricted to fiscal consolidation episodes before 2009 due to data limitations. As a result, this study is not able to estimate directly the impact of consolidation policies implemented during the height of the economic and debt crises. However, the unprecedented nature of today's crises likely implies increased repercussions of consolidation policies. The Great Recession was the most far-reaching, severe global economic decline in nearly a century, from which countries are still struggling to recover. Moreover, the advanced economies of the world today have an average debt-to-GDP ratio of 110.2%, well above the 60%

observed in the sample of this study. Given the fragile economic and fiscal conditions, the unprecedentedly large, simultaneous fiscal consolidation efforts implemented around the world may result in further economic slowdown that thwarts the objective to save.

Furthermore, compared to the fiscal consolidation episodes recorded in the dataset that were carried out under government discretion, some of the most drastic consolidation measures—in countries such as Greece, Ireland, and Portugal—undertaken today are imposed upon the countries by supranational lenders led by the IMF. As a result, no only do programs tend to overlook potential short-term economic costs (Greece, for example, has seen its economy contract by nearly a third since 2007, they are likely to entail spending cuts (education and environmental protection) and tax hikes (fuel) that undermine the country's long-term development prospect ("Greece Sees End of Recession in 2014" 2014).

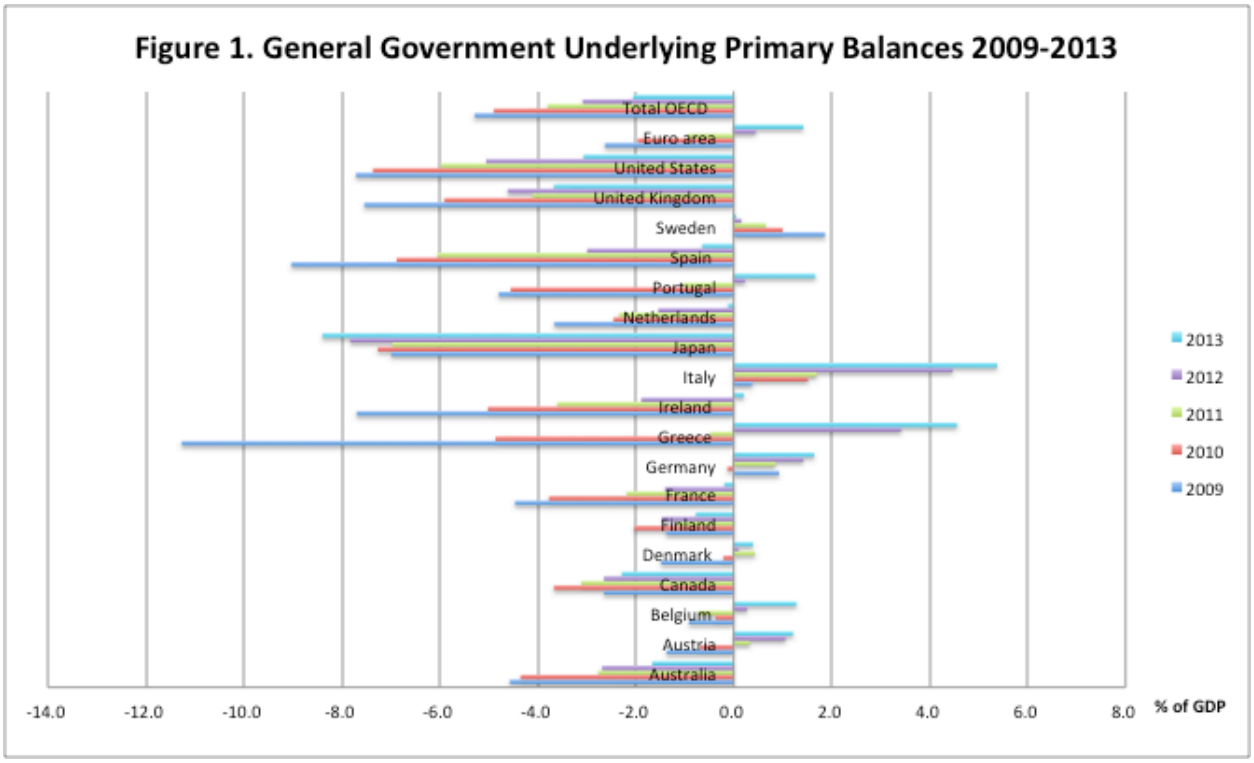
Lastly, the financial markets today play a much more critical role in the interplay between debt and consolidation. More globalized than ever before, it reacts fast to policy changes in the countries in crisis and would have driven countries such as Greece, Ireland, and Portugal into bankruptcy had the EU and IMF not interfered. In fact, Ireland decided to continue implementing fiscal consolidation after exiting its bailout program in part due to its fear that failing to do so would cause its borrowing costs to rise (Spiegel 2013). Given the distressed macroeconomic environment and volatile financial market in which fiscal consolidation take place today, it is likely the associated side effects are much stronger than they are estimated in this study. In fact, the OECD estimates that reducing a government's primary balance, as a share of GDP, by one percentage point cuts its growth rate by about 0.5% ("Fiscal Consolidation" 2014).

This study is also limited in explaining the workings of fiscal consolidation in developing countries due to a lack of available data on consolidation episodes. The differences in economic systems, infrastructure, demographics, and even political regimes between the developed and developing world may well lead to diverging ramifications for the impact of consolidation. In fact, it is likely that the impact may be more extreme in developing countries, where government expenditure tends to play a greater role in driving development and tax increases often result in more distortion. Further research using a more comprehensive dataset will be needed to investigate this unique dynamic.

Lastly, there are certain limitations in using adjusted net savings as a measure of sustainability. As pointed out in Gnégné (2004), while the World Bank promotes the indicator as a "comprehensive measure of a country's rate of saving after accounting for investments in human capital, depreciation of produced assets, and depletion and degradation of the environment", it only measures a fraction of the change in human capital, resource depletion, and environmental degradation because of data limitations. For example, as adjusted net savings do account for private investment in education and investment in research and development, it is likely that the estimated negative impact of consolidation on human capital is much more benign than it would in reality. Similarly, had more forms of pollution been included in the measurement of environmental damages—for example, sulfur dioxide, carbon monoxide and even water and land pollution—the correlation between consolidation would have likely been much stronger.

In all, this study can be improved as data on recent fiscal consolidation episodes become available, and the impact of fiscal policies on sustainable development better understood with the development of a more comprehensive and complete measure of sustainability.

VII. Figures and Tables



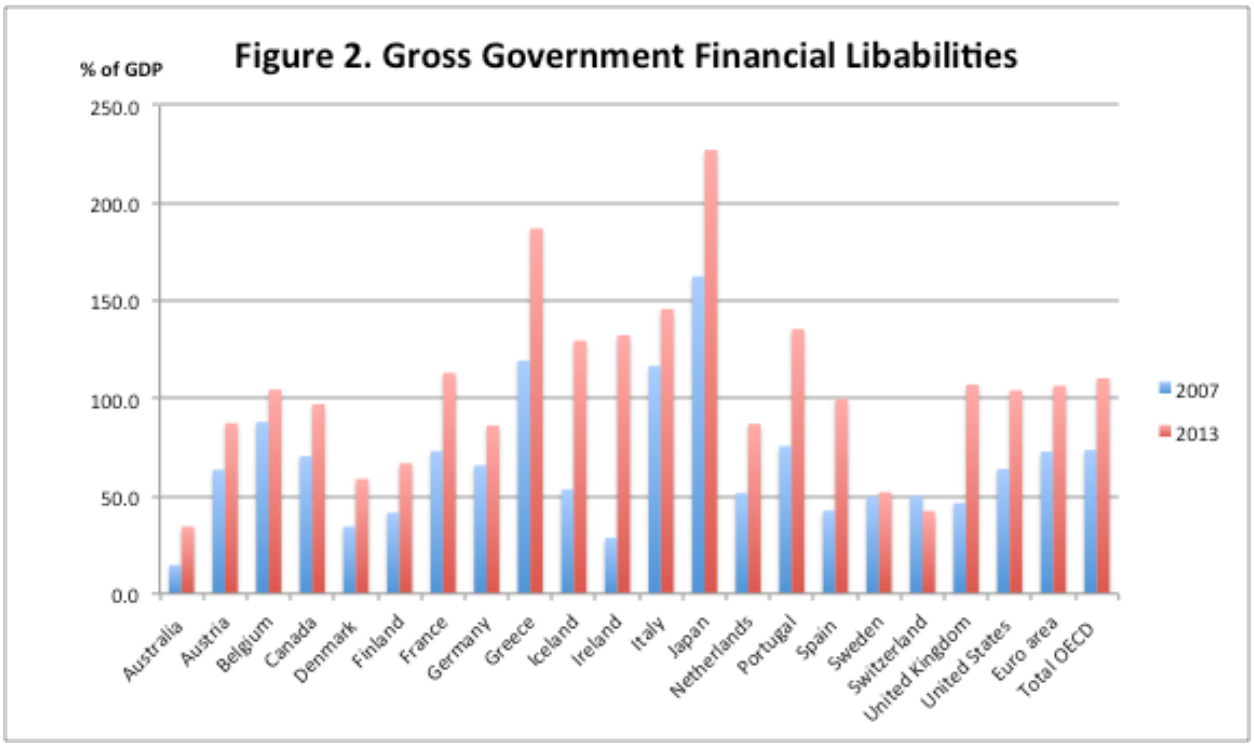


Figure 3. Adjusted Net Savings 1978-2009

Figure 4. First Differenced Adjusted Net Savings 1978-2009

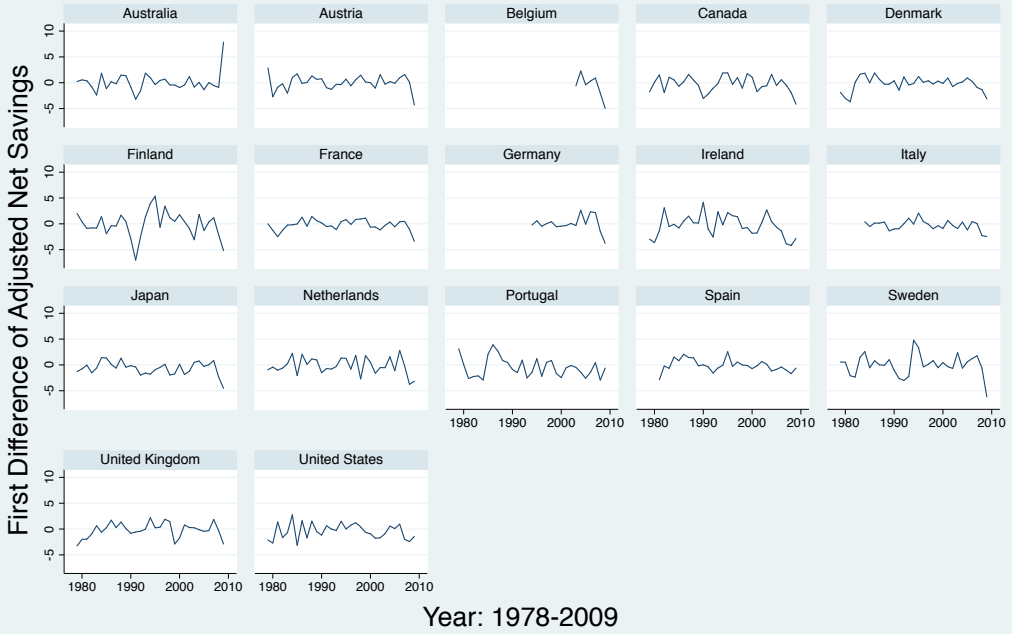


Figure 5. Components of Adjusted Net Saving

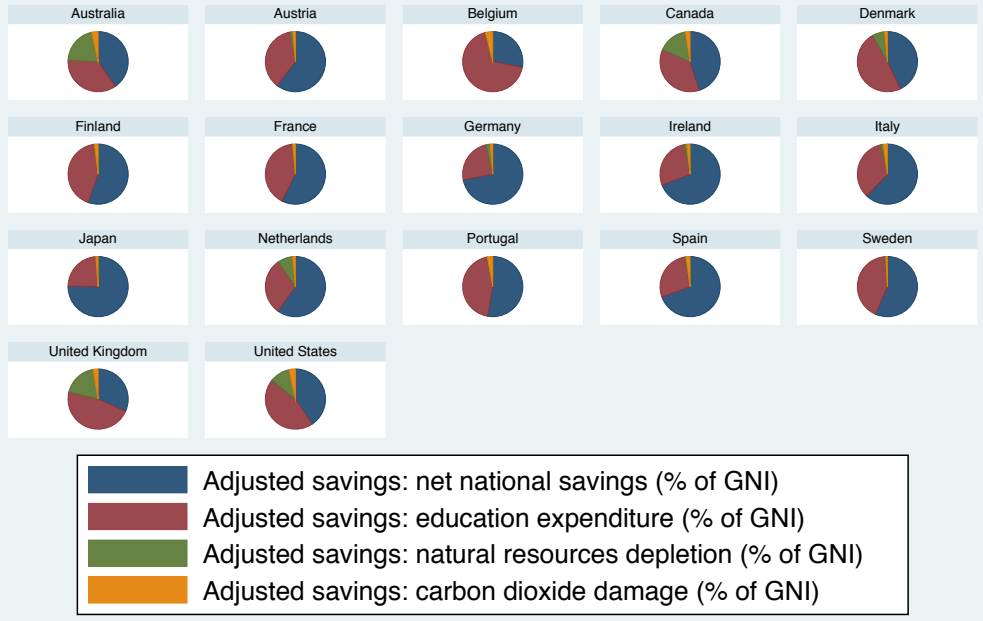


Figure 6. Fiscal Consolidation Episodes 1978-2009

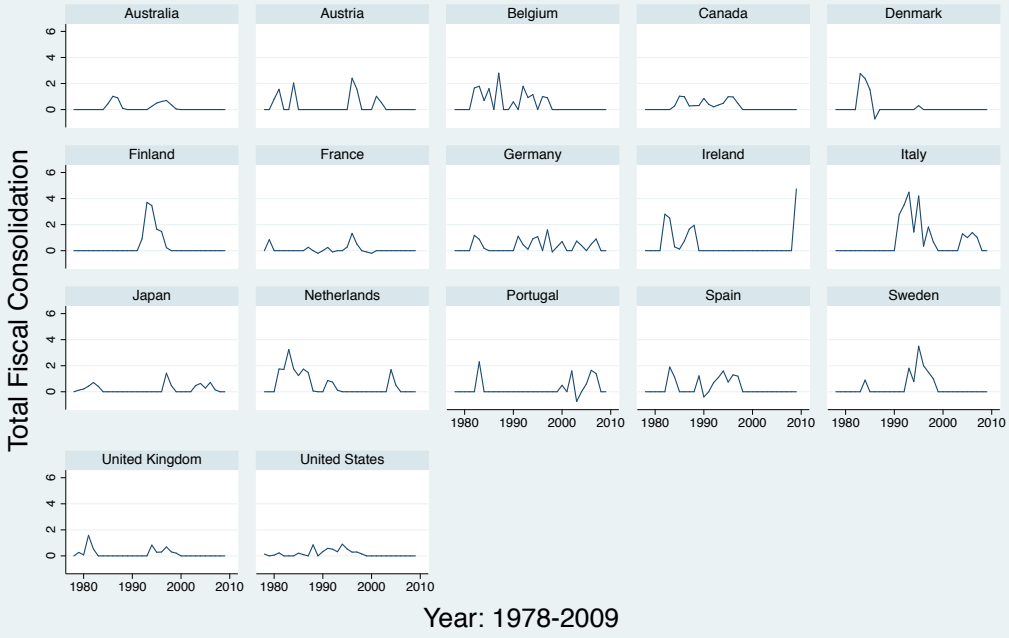
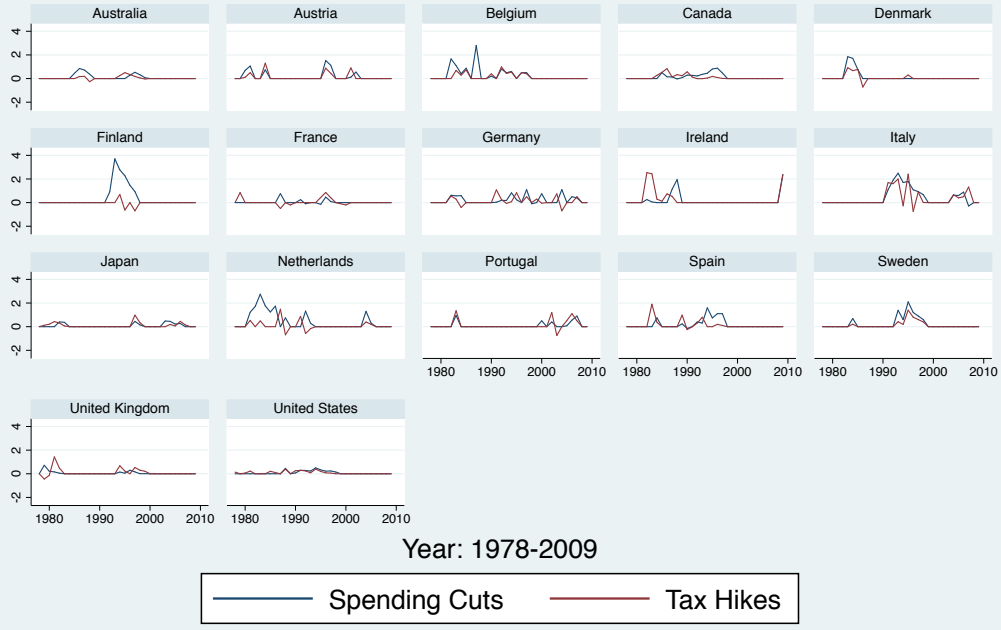


Figure 7. Spending Cuts & Tax Hikes 1978-2009



Graphs by Country Name

Figure 8. ANS vs. Long-Run GDP Growth

Graphs by Country Name

Table 1. Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Adjusted Net Savings	452	11.59914	4.239621	-2.535665	22.48687
Net National Savings	452	7.421499	3.911869	-8.003377	17.83598
Education Expenditure	452	5.251272	1.191773	2.363033	8.28483
Resource Depletion	452	0.8080692	1.262704	0	7.194407
CO2 Damage	452	0.2655611	0.1155578	0.070836	0.5956884
Gross National Savings	452	21.86621	4.224227	10.42973	33.92129
GDP Growth	452	2.283006	2.269297	-8.538613	7.489108
Fiscal Consolidation	165	1.050848	0.9116117	0.04	4.74
Spending Cuts	165	0.648	0.6832849	-0.29	3.71
Tax Hikes	165	0.4031515	0.5743934	-0.74	2.54
Debt/GDP Ratio	452	59.38812	28.64616	9.71	210.25
GNI	452	1.58E+12	2.49E+12	9.34E+10	1.38E+13
GNI per capita	452	29397.37	7925.052	9555.286	50086.46
GNI Growth	452	2.283006	2.269297	-8.538613	7.489108
Inflation Rate	452	3.829071	3.918506	-4.771232	24.67572
Investment/GDP	452	23.24016	4.428506	13.71516	35.7625
Trade/GDP	452	61.76933	30.73895	15.92399	170.447
External Balance	452	0.8496154	4.281871	-15.41505	17.17984
Resource Export	452	10.05716	10.26693	0.6375548	60.98774
Age Dependence	452	49.97932	3.339086	43.08764	59.92095

Table 2. Summary Statistics of First Differences

Variable	N	Mean	Std. Dev.	Min	Max
ΔANS	433	-0.2076919	1.605799	-7.026844	7.841026
ΔNNS	433	-0.2453565	1.685464	-8.22092	5.77174
ΔEE	433	0.0085837	0.3098393	-2.194744	2.263056
ΔDEP	433	-0.0232957	0.4079907	-3.227369	2.140676
ΔCO2D	433	-0.0057852	0.030533	-0.1455347	0.086798
ΔGNS	433	-0.1734188	1.427379	-6.774206	3.742533
ΔGDP Growth	433	-0.234841	2.054329	-8.832183	7.060585
ΔCONS	133	0.2587218	1.114466	-3.86	4.74
ΔEXP	133	0.1594737	0.6681332	-1.74	2.8
ΔTAX	133	0.0993985	0.7843978	-3.15	2.68
lnDEBT	431	3.99047	0.4982641	2.273156	5.348297
ΔlnGNI	433	0.0223051	0.0246082	-0.0982456	0.0798187
ΔlnGNIPC	433	0.01668	0.0246679	-0.1057348	0.0808525
ΔINFLATION	433	-0.3561727	1.54653	-10.35435	3.91493
ΔINVESTMENT	433	-0.0264872	1.380188	-7.091972	3.806732
ΔTRADE	433	0.4715527	4.139949	-23.33456	12.74777
ΔEX.BALANCE	433	0.0599683	1.223234	-3.66302	6.98672
ΔRESOURCE	433	0.0626021	1.689335	-9.249078	9.227806
ΔAGE	433	-0.1003017	0.4645665	-2.011765	1.321258

Table 3. First-Difference Model with Fixed Effects: ANS, GNS, and GDP Growth

	Basic Model			Controlling for Debt			Debt/Consolidation Interaction		
	I	II	III	IV	V	VI	VII	VIII	IX
VARIABLES	ΔANS	ΔGNS	ΔGDPGR	ΔANS	ΔGNS	ΔGDPGR	ΔANS	ΔGNS	ΔGDPGR
ΔCONS	0.0412	0.0893*	-0.0697	0.0430	0.0931*	-0.0840	0.6001	0.5756	-1.3106
	(0.069)	(0.052)	(0.096)	(0.069)	(0.051)	(0.097)	(0.607)	(0.445)	(0.803)
ΔCONS (t-1)	0.1661**	0.1370**	-0.0859	0.1664**	0.1380**	-0.0923	0.0185	0.1885	0.2976
	(0.075)	(0.057)	(0.107)	(0.075)	(0.056)	(0.107)	(0.499)	(0.365)	(0.649)
ΔCONS (t-2)	0.0782	0.0473	0.1143	0.0747	0.0443	0.1076	-0.2352	-0.4146	1.1349
	(0.071)	(0.053)	(0.098)	(0.070)	(0.052)	(0.100)	(0.600)	(0.442)	(0.827)
lnDEBT (t-1)				0.5316***	0.5171***	0.1176	0.4834**	0.5006***	0.1238
				(0.194)	(0.146)	(0.287)	(0.201)	(0.152)	(0.298)
lnDEBT * ΔCONS							-0.1314	-0.1161	0.2948
							(0.144)	(0.106)	(0.189)
lnDEBT * ΔCONS (t-1)							-0.0946	-0.1270	0.2042
							(0.147)	(0.108)	(0.201)
lnDEBT * ΔCONS (t-2)							-0.0126	-0.0104	-0.0297
							(0.017)	(0.012)	(0.023)
ΔlnGNI	18.0349	2.4488	17.7634	30.2066*	15.0338	18.9557	32.5253*	16.3939	19.6741
	(17.352)	(12.773)	(24.565)	(17.725)	(12.992)	(25.633)	(17.911)	(13.163)	(25.761)
ΔlnGNIPC	28.3079	31.6366**	17.5966	15.6918	18.6810	17.0757	13.3092	17.3338	15.6475
	(17.284)	(12.790)	(24.541)	(17.706)	(13.040)	(25.728)	(17.894)	(13.217)	(25.878)
ΔGDP Growth (t-1)	-0.0123	0.0074		-0.0157	0.0039		-0.0270	-0.0003	
	(0.030)	(0.022)		(0.029)	(0.022)		(0.031)	(0.023)	
ΔINVESTMENT	0.4469***	0.4913***	0.4297***	0.4438***	0.4880***	0.4032***	0.4530***	0.4880***	0.3716***
	(0.055)	(0.041)	(0.077)	(0.055)	(0.040)	(0.079)	(0.057)	(0.042)	(0.082)
ΔINFLATION	-0.0045	0.0249	-0.2299***	-0.0120	0.0184	-0.2227***	-0.0108	0.0187	-0.2324***
	(0.031)	(0.024)	(0.045)	(0.031)	(0.023)	(0.046)	(0.032)	(0.024)	(0.046)
ΔlnTrade	1.0899	-0.0686	7.6614***	0.9580	-0.2338	7.4546***	1.3203	-0.0436	7.6418***
	(1.019)	(0.761)	(1.457)	(1.010)	(0.748)	(1.466)	(1.033)	(0.769)	(1.497)
ΔEX. BALANCE	0.5922***	0.6299***	0.2647***	0.5982***	0.6344***	0.2613***	0.6082***	0.6384***	0.2462***
	(0.045)	(0.034)	(0.064)	(0.044)	(0.033)	(0.065)	(0.046)	(0.034)	(0.067)
ΔRESOURCE	-0.0558*	0.0435*	-0.0098	-0.0504	0.0492**	-0.0133	-0.0585*	0.0471*	0.0046
	(0.033)	(0.025)	(0.048)	(0.033)	(0.024)	(0.048)	(0.034)	(0.025)	(0.049)
ΔAGE	0.2763**	0.1098	0.3587**	0.1864	0.0354	0.3679**	0.1678	0.0123	0.3848**
	(0.133)	(0.093)	(0.175)	(0.134)	(0.094)	(0.181)	(0.138)	(0.097)	(0.186)
Observations	433	449	472	430	446	466	418	434	449
R-squared	0.744	0.807	0.649	0.753	0.816	0.648	0.757	0.816	0.657
Number of country	17	17	17	17	17	17	17	17	17

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Time Effects are included; Coefficients not shown

Table 4. EXP and TAX as Regressors: ANS, GNS, and GDP Growth

	Basic Model			Controlling for Debt			Debt/Consolidation Interaction		
	I	II	III	IV	V	VI	VII	VIII	IX
VARIABLES	ΔANS	ΔGNS	ΔGDPGR	ΔANS	ΔGNS	ΔGDPGR	ΔANS	ΔGNS	ΔGDPGR
ΔEXP	0.1261	0.1677*	0.2506	0.1295	0.1750**	0.2380	0.4628	0.5790	-1.5774
	(0.119)	(0.090)	(0.154)	(0.118)	(0.088)	(0.157)	(1.288)	(0.956)	(1.375)
ΔEXP (t-1)	0.2346*	0.2269**	0.2047	0.2407*	0.2339**	0.2084	-0.1706	-0.5838	0.2341
	(0.125)	(0.094)	(0.166)	(0.123)	(0.092)	(0.168)	(1.229)	(0.911)	(1.311)
ΔEXP (t-2)	0.1232	0.0246	0.3095**	0.1189	0.0205	0.3192**	0.5414	0.5127	2.0189
	(0.115)	(0.087)	(0.152)	(0.114)	(0.085)	(0.160)	(1.245)	(0.927)	(1.685)
ΔTAX	-0.0456	0.0010	-0.4289***	-0.0459	0.0008	-0.4386***	0.5285	0.5731	-1.0668
	(0.117)	(0.088)	(0.164)	(0.116)	(0.086)	(0.165)	(0.864)	(0.624)	(1.174)
ΔTAX (t-1)	0.0552	0.0169	-0.5452***	0.0491	0.0108	-0.5544***	-0.2002	0.2711	-0.0113
	(0.146)	(0.109)	(0.203)	(0.145)	(0.107)	(0.204)	(0.631)	(0.460)	(0.890)
ΔTAX (t-2)	0.0071	0.0216	-0.2063	0.0016	0.0166	-0.2138	-0.6461	-0.7730	0.1191
	(0.121)	(0.091)	(0.169)	(0.120)	(0.089)	(0.170)	(0.848)	(0.617)	(1.176)
lnDEBT (t-1)				0.5389***	0.5249***	0.1447	0.4866**	0.5038***	0.1384
				(0.194)	(0.146)	(0.285)	(0.202)	(0.153)	(0.298)
lnDEBT * ΔEXP							-0.0740	-0.0958	0.4242
							(0.310)	(0.230)	(0.321)
lnDEBT * ΔEXP (t-1)							0.0362	0.1039	0.4066
							(0.305)	(0.227)	(0.413)
lnDEBT * ΔEXP (t-2)							-0.0444	-0.0124	-0.0056
							(0.028)	(0.021)	(0.039)
lnDEBT * ΔTAX							-0.1436	-0.1389	0.1578
							(0.203)	(0.147)	(0.276)
lnDEBT * ΔTAX (t-1)							-0.0986	-0.2015	0.0440
							(0.212)	(0.154)	(0.291)
lnDEBT * ΔTAX (t-2)							0.0322	-0.0067	-0.0208
							(0.031)	(0.023)	(0.043)
ΔlnGNI	17.4030	2.0864	16.8932	29.7367*	14.8461	18.6223	30.7284*	16.1987	20.0609
	(17.409)	(12.786)	(24.376)	(17.776)	(12.996)	(25.435)	(17.982)	(13.195)	(25.732)
ΔlnGNIPC	29.1632*	32.2219**	19.2474	16.3827	19.0967	18.1486	15.2248	17.5221	16.0025
	(17.350)	(12.807)	(24.354)	(17.763)	(13.048)	(25.532)	(17.977)	(13.256)	(25.854)
ΔGDP Growth (t-1)	-0.0136	0.0066		-0.0171	0.0030		-0.0326	-0.0027	
	(0.030)	(0.022)		(0.030)	(0.022)		(0.031)	(0.023)	
ΔINVESTMENT	0.4426***	0.4893***	0.4180***	0.4394***	0.4858***	0.3868***	0.4490***	0.4889***	0.3566***
	(0.056)	(0.041)	(0.077)	(0.055)	(0.041)	(0.079)	(0.057)	(0.042)	(0.082)
ΔINFLATION	-0.0061	0.0246	-0.2391***	-0.0137	0.0180	-0.2285***	-0.0085	0.0197	-0.2391***
	(0.032)	(0.024)	(0.045)	(0.031)	(0.023)	(0.046)	(0.032)	(0.024)	(0.046)
ΔlnTrade	1.0491	-0.1160	7.4919***	0.9127	-0.2876	7.3192***	1.3112	-0.0038	7.6650***
	(1.023)	(0.762)	(1.447)	(1.014)	(0.749)	(1.455)	(1.051)	(0.778)	(1.514)
ΔEX. BALANCE	0.5899***	0.6308***	0.2597***	0.5959***	0.6353***	0.2529***	0.6046***	0.6395***	0.2403***
	(0.045)	(0.034)	(0.064)	(0.045)	(0.033)	(0.065)	(0.046)	(0.034)	(0.067)
ΔRESOURCE	-0.0554*	0.0437*	-0.0066	-0.0499	0.0495**	-0.0093	-0.0587*	0.0445*	0.0074
	(0.033)	(0.025)	(0.047)	(0.033)	(0.024)	(0.048)	(0.034)	(0.025)	(0.049)
ΔAGE	0.2799**	0.1142	0.3813**	0.1898	0.0396	0.3794**	0.1792	0.0150	0.3935**
	(0.133)	(0.094)	(0.174)	(0.135)	(0.094)	(0.179)	(0.139)	(0.097)	(0.186)
Observations	433	449	472	430	446	466	418	434	449
R-squared	0.745	0.808	0.657	0.754	0.817	0.656	0.758	0.818	0.666
Number of country	17	17	17	17	17	17	17	17	17

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Time Effects are included; Coefficients not shown

Table 5. First-Difference Model with Fixed Effects: Components of Adjusted Net Savings

	Basic Model				Controlling for Debt				Debt/Consolidation Interactions			
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
VARIABLES	ΔNNS	ΔEE	ΔDEP	ΔCO2D	ΔNNS	ΔEE	ΔDEP	ΔCO2D	ΔNNS	ΔEE	ΔDEP	ΔCO2D
ΔCONS	0.0555	0.0130	0.0004	0.0023	0.0589	0.0120	-0.0017	0.0024*	0.4813	-0.0680	0.0085	0.0233*
	(0.058)	(0.024)	(0.021)	(0.001)	(0.057)	(0.025)	(0.022)	(0.001)	(0.498)	(0.213)	(0.178)	(0.012)
ΔCONS (t-1)	0.1321**	0.0177	-0.0177	0.0014	0.1331**	0.0174	-0.0175	0.0014	0.1681	0.1271	-0.0618	0.0133
	(0.063)	(0.027)	(0.024)	(0.002)	(0.062)	(0.027)	(0.024)	(0.002)	(0.408)	(0.173)	(0.144)	(0.010)
ΔCONS (t-2)	0.0682	0.0320	0.0120	0.0007	0.0652	0.0335	0.0147	0.0006	-0.2742	0.0247	0.0615	-0.0292**
	(0.059)	(0.025)	(0.022)	(0.001)	(0.058)	(0.026)	(0.022)	(0.002)	(0.494)	(0.219)	(0.183)	(0.012)
lnDEBT (t-1)					0.5404***	-0.1031	-0.0783	0.0025	0.5256***	-0.1044	-0.0395	0.0022
					(0.163)	(0.073)	(0.064)	(0.004)	(0.170)	(0.077)	(0.066)	(0.004)
lnDEBT * ΔCONS									-0.1004	0.0189	-0.0014	-0.0049*
									(0.118)	(0.050)	(0.042)	(0.003)
lnDEBT * ΔCONS (t-1)									-0.1065	-0.0049	0.0091	-0.0075**
									(0.121)	(0.053)	(0.045)	(0.003)
lnDEBT * ΔCONS (t-2)									-0.0166	-0.0026	-0.0009	-0.0003
									(0.014)	(0.006)	(0.005)	(0.000)
ΔlnGNI	4.2376	3.2768	-9.1211*	0.4754	17.2682	0.6627	-10.4841*	0.5810	19.1404	0.5324	-10.6281*	0.6335
	(14.205)	(6.395)	(5.436)	(0.374)	(14.518)	(6.662)	(5.702)	(0.390)	(14.727)	(6.830)	(5.709)	(0.386)
ΔlnGNIPC	40.9404***	-4.4935	7.8517	-0.5582	27.5191*	-1.7933	9.1892	-0.6695*	25.6544*	-1.4932	9.4463	-0.7009*
	(14.223)	(6.359)	(5.433)	(0.372)	(14.572)	(6.653)	(5.720)	(0.390)	(14.787)	(6.823)	(5.732)	(0.385)
ΔGDP Growth (t-1)	0.0044	-0.0226**	0.0031	-0.0001	0.0008	-0.0226**	0.0036	-0.0002	-0.0041	-0.0261**	0.0057	-0.0003
	(0.025)	(0.011)	(0.009)	(0.001)	(0.025)	(0.011)	(0.010)	(0.001)	(0.026)	(0.012)	(0.010)	(0.001)
ΔINVESTMENT	0.5549***	-0.0303	0.0601***	-0.0043***	0.5516***	-0.0292	0.0649***	-0.0040***	0.5496***	-0.0262	0.0635***	-0.0037***
	(0.046)	(0.020)	(0.017)	(0.001)	(0.045)	(0.020)	(0.018)	(0.001)	(0.047)	(0.021)	(0.018)	(0.001)
ΔINFLATION	0.0323	-0.0169	0.0168*	0.0004	0.0257	-0.0166	0.0156	0.0003	0.0265	-0.0171	0.0158	0.0001
	(0.026)	(0.011)	(0.010)	(0.001)	(0.026)	(0.012)	(0.010)	(0.001)	(0.027)	(0.012)	(0.010)	(0.001)
ΔlnTrade	0.4554	0.0268	-0.4899	0.2823***	0.2919	0.0868	-0.4983	0.2776***	0.4951	0.0845	-0.6825**	0.2623***
	(0.846)	(0.374)	(0.323)	(0.022)	(0.836)	(0.377)	(0.326)	(0.022)	(0.860)	(0.392)	(0.332)	(0.022)
ΔEX. BALANCE	0.7153***	-0.0315*	0.0858***	-0.0030***	0.7197***	-0.0291*	0.0892***	-0.0028***	0.7208***	-0.0271	0.0840***	-0.0027***
	(0.038)	(0.016)	(0.014)	(0.001)	(0.037)	(0.017)	(0.015)	(0.001)	(0.038)	(0.017)	(0.015)	(0.001)
ΔRESOURCE	0.0578**	0.0034	0.1229***	0.0007	0.0641**	0.0018	0.1222***	0.0008	0.0625**	0.0008	0.1274***	0.0008
	(0.027)	(0.012)	(0.011)	(0.001)	(0.027)	(0.012)	(0.011)	(0.001)	(0.028)	(0.013)	(0.011)	(0.001)
ΔAGE	0.1882*	-0.0376	-0.0732*	-0.0050*	0.1103	-0.0335	-0.0619	-0.0045	0.0920	-0.0361	-0.0542	-0.0034
	(0.104)	(0.048)	(0.039)	(0.003)	(0.105)	(0.049)	(0.040)	(0.003)	(0.108)	(0.052)	(0.041)	(0.003)
Observations	449	455	471	460	446	449	465	454	434	432	448	437
R-squared	0.829	0.163	0.535	0.681	0.836	0.170	0.539	0.675	0.836	0.188	0.539	0.699

Table 6. First-Difference Model with Fixed Effects: Components of Adjusted Net Savings

	Basic Model				Controlling for Debt				Debt/Consolidation Interactions			
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
VARIABLES	ΔNNS	ΔEE	ΔDEP	ΔCO2D	ΔNNS	ΔEE	ΔDEP	ΔCO2D	ΔNNS	ΔEE	ΔDEP	ΔCO2D
ΔEXP	0.1196	0.0196	0.0054	-0.0007	0.1261	0.0186	-0.0003	-0.0009	0.4302	-0.1065	-0.3260	0.0091
	(0.100)	(0.039)	(0.034)	(0.002)	(0.099)	(0.040)	(0.035)	(0.002)	(1.069)	(0.359)	(0.305)	(0.020)
ΔEXP (t-1)	0.2403**	-0.0039	0.0021	0.0018	0.2470**	-0.0043	0.0014	0.0015	-0.8265	0.3656	-0.4965*	0.0382**
	(0.105)	(0.042)	(0.037)	(0.002)	(0.103)	(0.043)	(0.038)	(0.003)	(1.018)	(0.343)	(0.291)	(0.019)
ΔEXP (t-2)	0.1150	0.0360	0.0157	0.0005	0.1108	0.0400	0.0220	0.0001	1.1020	-0.0583	0.7816**	-0.0444*
	(0.097)	(0.039)	(0.034)	(0.002)	(0.095)	(0.041)	(0.036)	(0.002)	(1.036)	(0.441)	(0.374)	(0.025)
ΔTAX	-0.0191	0.0107	-0.0078	0.0054**	-0.0192	0.0100	-0.0055	0.0057**	0.5017	-0.0346	0.2361	0.0339*
	(0.097)	(0.043)	(0.037)	(0.002)	(0.096)	(0.043)	(0.037)	(0.003)	(0.697)	(0.318)	(0.261)	(0.018)
ΔTAX (t-1)	-0.0100	0.0413	-0.0428	0.0019	-0.0156	0.0411	-0.0404	0.0022	0.2428	-0.0495	0.1452	0.0032
	(0.121)	(0.053)	(0.046)	(0.003)	(0.119)	(0.053)	(0.046)	(0.003)	(0.515)	(0.238)	(0.198)	(0.013)
ΔTAX (t-2)	-0.0213	0.0356	0.0006	0.0010	-0.0260	0.0353	0.0010	0.0012	-0.8919	0.0188	-0.3141	-0.0229
	(0.101)	(0.044)	(0.038)	(0.003)	(0.100)	(0.044)	(0.038)	(0.003)	(0.689)	(0.315)	(0.261)	(0.018)
lnDEBT (t-1)					0.5477***	-0.1039	-0.0776	0.0023	0.5263***	-0.1033	-0.0469	0.0021
					(0.163)	(0.073)	(0.064)	(0.004)	(0.171)	(0.077)	(0.066)	(0.004)
lnDEBT * ΔEXP									-0.0681	0.0290	0.0799	-0.0025
									(0.257)	(0.084)	(0.071)	(0.005)
lnDEBT * ΔEXP (t-1)									0.1973	-0.0539	0.1955**	-0.0106*
									(0.254)	(0.108)	(0.092)	(0.006)
lnDEBT * ΔEXP (t-2)									-0.0319	-0.0201*	0.0063	-0.0002
									(0.023)	(0.010)	(0.009)	(0.001)
lnDEBT * ΔTAX									-0.1293	0.0084	-0.0564	-0.0066
									(0.165)	(0.074)	(0.061)	(0.004)
lnDEBT * ΔTAX (t-1)									-0.1958	0.0270	-0.0959	-0.0068
									(0.172)	(0.078)	(0.065)	(0.004)
lnDEBT * ΔTAX (t-2)									0.0064	0.0172	-0.0104	-0.0007
									(0.025)	(0.012)	(0.010)	(0.001)
ΔlnGNI	3.9151	3.3848	-9.1857*	0.4781	17.1169	0.7493	-10.5202*	0.5832	19.2696	-0.0321	-11.4032**	0.6317*
	(14.229)	(6.414)	(5.453)	(0.373)	(14.536)	(6.681)	(5.720)	(0.390)	(14.724)	(6.781)	(5.798)	(0.380)
ΔlnGNIPC	41.4650***	-4.5727	7.9278	-0.5681	27.8753*	-1.8498	9.2295	-0.6803*	25.4518*	-1.0096	9.9976*	-0.6983*
	(14.252)	(6.381)	(5.451)	(0.372)	(14.593)	(6.673)	(5.739)	(0.389)	(14.795)	(6.777)	(5.824)	(0.380)
ΔGDP Growth (t-1)	0.0026	-0.0222**	0.0028	-0.0001	-0.0012	-0.0222**	0.0032	-0.0002	-0.0064	-0.0254**	0.0054	-0.0003
	(0.025)	(0.011)	(0.009)	(0.001)	(0.025)	(0.011)	(0.010)	(0.001)	(0.026)	(0.012)	(0.010)	(0.001)
ΔINVESTMENT	0.5517***	-0.0305	0.0598***	-0.0043***	0.5483***	-0.0294	0.0645***	-0.0039***	0.5501***	-0.0249	0.0625***	-0.0037***
	(0.046)	(0.020)	(0.017)	(0.001)	(0.045)	(0.020)	(0.018)	(0.001)	(0.047)	(0.021)	(0.018)	(0.001)
ΔINFLATION	0.0309	-0.0173	0.0169*	0.0005	0.0242	-0.0170	0.0157	0.0004	0.0278	-0.0168	0.0137	-0.0000
	(0.026)	(0.012)	(0.010)	(0.001)	(0.026)	(0.012)	(0.010)	(0.001)	(0.027)	(0.012)	(0.011)	(0.001)
ΔlnTrade	0.4176	0.0325	-0.4981	0.2826***	0.2486	0.0937	-0.5061	0.2777***	0.5539	0.1114	-0.5609	0.2646***
	(0.848)	(0.375)	(0.324)	(0.022)	(0.838)	(0.378)	(0.328)	(0.022)	(0.867)	(0.395)	(0.341)	(0.022)
ΔEX. BALANCE	0.7150***	-0.0321*	0.0860***	-0.0029***	0.7193***	-0.0299*	0.0892***	-0.0027***	0.7212***	-0.0254	0.0895***	-0.0023**
	(0.038)	(0.016)	(0.014)	(0.001)	(0.037)	(0.017)	(0.015)	(0.001)	(0.038)	(0.017)	(0.015)	(0.001)
ΔRESOURCE	0.0583**	0.0038	0.1228***	0.0007	0.0648**	0.0022	0.1221***	0.0007	0.0630**	0.0034	0.1199***	0.0006
	(0.028)	(0.012)	(0.011)	(0.001)	(0.027)	(0.012)	(0.011)	(0.001)	(0.028)	(0.013)	(0.011)	(0.001)
ΔAGE	0.1937*	-0.0377	-0.0723*	-0.0051*	0.1156	-0.0338	-0.0614	-0.0046	0.1065	-0.0244	-0.0633	-0.0041
	(0.104)	(0.048)	(0.039)	(0.003)	(0.105)	(0.050)	(0.041)	(0.003)	(0.108)	(0.052)	(0.042)	(0.003)
Observations	449	455	471	460	446	449	465	454	434	432	448	437
R-squared	0.830	0.165	0.536	0.684	0.837	0.173	0.539	0.678	0.838	0.194	0.544	0.706
Number of country	17	17	17	17	17	17	17	17	17	17	17	17

Standard errors in parentheses
*** p<0.01, ** p<0.05

Time Effects are included; Coefficients not shown

Appendix 1. List of Countries		
Australia	France	Portugal
Austria	Germany	Spain
Belgium	Ireland	Sweden
Canada	Italy	United Kingdom
Denmark	Japan	United States
Finland	Netherlands	

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