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Miguel Viegas
and
Ana Paula Ribeiro

Centro de Economia e Finanças da UP
www.fep.up.pt

Assessing welfare impacts of some debt-consolidation episodes in the European Union*

Miguel Viegas
GOVCOPP, DEGEI, Universidade de Aveiro
Ana Paula Ribeiro
CEF.UP† and Faculdade de Economia, Universidade do Porto

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Abstract

This paper aims at characterizing debt consolidation processes put forward by some European countries in order to assess welfare and, in particular, the inequality effects involved. For that we built a general equilibrium heterogeneous-agent model capable of exploring the relationship between fiscal policy variables and the endogenous cross-section distribution of income and wealth.

Results show that, with the exception of the Belgian case, all consolidation strategies entail positive welfare gains. The transition costs affect all episodes and are determinant in sorting among the welfare-enhancing strategies. Our results confirm the superiority of the adjustments based on unproductive expenditures over those based on tax increases or social transfer reductions. Finally, all strategies involve lower welfare inequality costs.

JEL Classification: E17, E60, H60, I30.

Keywords: fiscal consolidation dynamics, European Union, heterogeneous agent model, inequality, welfare.

1 Introduction

Developed economies, as those belonging to the European Union (EU), have exhibited a sustained growth of the debt-to-output ratios in the recent past. This results from governments permanently incurring in fiscal deficits. However, countries have recently made efforts to correct this trajectory by pursuing fiscal consolidations. This was the case of the late 1990s, in the awake of the European and Monetary Union (EMU), and of the recent decade, before the current crisis.

This paper aims at characterizing debt consolidation processes put forward by some of the EU countries (EU15) in order to assess welfare and, in particular, the inequality effects involved. For that we built a general equilibrium heterogeneous-agent model capable of exploring the relationship between fiscal policy variables and the endogenous cross-section distribution of income and wealth.

We use a dynastic heterogeneous-agent model that includes a continuum of infinitely-lived rational agents who are hit by idiosyncratic wage shocks in an incomplete capital market, following seminal works by Bewley (1983), Imrohoroglu (1989), Huggett (1993) and Aiyagari (1995), among others. The model, based on Aiyagari and McGrattan (1998) and Floden (2001), includes government and the corresponding dynamic budget constraint. Besides including taxes levied on labour and capital, we additionally decompose government expenditure into transfers to private sector, and productive and unproductive spending. While productive expenditure is included in the production function and, through this channel, increases the global productivity of the economy, unproductive spending is only utility-augmenting. The model also includes optimizing firms endowed with a neoclassical Cobb-Douglas productive function and optimizing households that accumulate savings during "good times" while spending them during "bad times".

The analysis of a debt consolidation process requires transition between two steady states. Thus, besides steady-state analysis, transition paths are crucial for the comparison of welfare effects across debt consolidation strategies. In order to simulate transition paths imposed by a debt consolidation

strategy we follow the Rios-Rull (1999) and Quadrini et al. (2009) methodology. The simulations are conducted under an open economy framework, assuming the existence of a global market for assets, and hence, a common interest rate. This international mobility of capital implies that each country may have either a positive, negative or balanced foreign asset position.

Using the AMECO database for the EU15 countries, we apply the criteria proposed by Alesina and Perotti (1995) in order to detect the successful debt consolidation process in each country between 1990 and 2008. Afterwards, consolidation episodes are identified as active if a permanent debt reduction results mainly from the control of the cyclically-adjusted primary deficit. We further analyze the composition of the cyclically-adjusted primary deficit in order to detect the main sources for consolidation. Finally, we use our model to mimic each consolidation process while assessing the welfare and inequality costs involved.

The paper is organized as follows. In section 2 we describe the model, and define the social (aggregate) welfare criterion. The successful active consolidation strategies are identified throughout section 3. Simulations and discussion of the main results is performed in section 4 and section 5 concludes.

2 Model

The model is built from a standard growth model modified to include a role for government together with an uninsured idiosyncratic risk and liquidity/ borrowing constraints. We modify the original models of Aiyagari and McGrattan (1998) and Floden (2001) by breaking the government expenditure into productive and unproductive. The former is introduced in the utility function and the latter in the production function. We also use a different approach for the calibration of the idiosyncratic shock.

We set up an international framework composed by two countries or regions, in which capital is assumed to flow freely across borders; labour, instead, is assumed not to flow across countries. In particular, we analyze consolidation processes for each of the European Union (EU15) countries as-

suming a domestic block formed by the consolidation country with weight, p, given by the GDP weight in overall EU15 GDP and a foreign block, consisting of all the others EU15 countries (EU15-1) which acts passively (defined in this paper as "the rest of the world"). Both regions are identical except for the size and for the path of the fiscal policy instruments. Each country is composed by three sectors: households, firms and government.

The model intends to provide an adequate analytical tool to assess welfare gains from consolidation processes. Moreover, since the model relies on an heterogeneous-agent framework, it will also be able to produce results in terms of inequality effects.

2.1 Households

There is a continuum of infinitely-lived agents of unit mass who receive after-tax wage payments, $\tilde{w}$, after tax interest from savings, $\overline{r}\tilde{a}$, and transfers, tr, from the government. Following Barro (1973), Floden (2001) and Floden (2003), we consider that, besides private consumption, $\tilde{c}$, and leisure, l, unproductive government spending, g_u, also contributes to households' utility at decreasing returns depending on a parameter, ϑ. In each period, agents are hit by idiosyncratic shocks, e_t , which determines the productivity level. Borrowing is allowed only up to a certain limit $\tilde{b}$ and complete capital markets is ruled out. This implies that agents have to ensure themselves by saving during "good times" ($\tilde{a}_{t+1} - \tilde{a}_t > 0$) while, during "bad times", savings are negative ($\tilde{a}_{t+1} - \tilde{a}_t < 0$). Each agent is endowed with one unit of time and solves the double problem of choosing between labor and leisure, and between consumption and saving.[1]

In particular, for each country, each household solves the following optimization problem:

$$\max_{\tilde{c}_t, l_t, \tilde{a}_{t+1}} E\left[\sum_{t=0}^{\infty} \beta^t (Y_t)^{1-\mu}(u_1(\tilde{c}_t, l_t) + \vartheta u_2(g_{ut}))|\tilde{a}_0, e_0\right] \tag{2.1}$$

[1]In order to stabilize the model some variables have to be defined as a percentage of output (Y) Namely: $\tilde{w_t} = \frac{\overline{w}_t}{Y_t}$, $\tilde{c}_t = \frac{c_t}{Y_t}$, $\tilde{a}_t = \frac{a_t}{Y_t}$, $tr_t = \frac{TR_t}{Y_t}$, $g_{ut} = \frac{G_{ut}}{Y_t}$, and $\tilde{b_t} = \frac{b_t}{Y_t}$.

Subject to:

$$\tilde{c}_t + \tilde{a}_{t+1} = \tilde{w}_t(1 - l_t)e_t + (1 + \overline{r_t})\tilde{a}_t + tr_t \ , \ \tilde{c}_t \geq 0, \ \tilde{a}_t \geq -\tilde{b} \tag{2.2}$$

The household's instant utility functions are specified as:

$$u_1(\tilde{c}_t, l_t) = \frac{\tilde{c}_t^{1-\mu} \exp(-(1-\mu)\zeta(1-l_t)^{1+\gamma})}{1-\mu} \tag{2.3}$$

where μ represents the degree of risk aversion, ζ is constant related to average labor supply, and $\frac{1}{\gamma}$ represents the labor supply elasticity, and

$$u_2(g_u) = \frac{g_u^{1-\mu}}{1-\mu} \tag{2.4}$$

The productivity shock, e_t, is an idiosyncratic shock that evolves stochastically over time according to the following process: the natural logarithm of e_t is represented by an AR(1) process with a serial correlation coefficient ρ and a standard deviation σ:

$$\log(e_t) = \rho \log(e_{t-1}) + \epsilon_t \tag{2.5}$$

2.2 Firms

The firms are characterized by a neoclassic production function. Output in each country, Y , is produced using capital, K , labour, N , and productive government spending, G_p.

$$Y_t = F(K_t, N_t, G_{pt}) = (K_t)^{\alpha}(N_t)^{1-\alpha}(G_{pt})^{\eta} \tag{2.6}$$

Productive government spending is identified with the share of public gross investment on output, in line with Barro (1990) and Auschauer (1989), and enters as an input to private production.[2]

[2]In a seminal paper, Barro (1990) incorporates a public sector into a simple, constant return, model of economic growth. The ratio of real public gross investment to real GDP is assumed to correspond to a flow of services identified as the measure of infrastructure services and enters directly to the production function.

The parameters α and η represent, respectively, the output elasticities relative to private capital and to productive government expenditure. The production function exhibits constant returns to scale over private inputs but increasing returns over all inputs. Assuming competitive markets of goods and inputs, private factors are paid according to their marginal productivity and output is exhaustively distributed. Thus:

$$\tilde{w_t} = (1 - \tau_t)\frac{F_N(K_t, N_t, G_{pt})}{Y_t} \tag{2.7}$$

$$\overline{r_t} = (1 - \tau_t)(F_K(K_t, N_t, G_{pt}) - \delta) \tag{2.8}$$

where τ is a proportional income tax rate levied in each country on labour and capital and δ is the depreciation rate of capital. We must point that the pre-tax level of interest rate, r, is fixed in the international capital market.

2.3 Government

Each government promotes both productive and unproductive expenditures, collects taxes and pays lump-sum transfers to households, facing the following budget constraint in real terms:

$$g_{ut} + g_{pt} + tr_t + (\overline{r}_t + 1)d_t - d_{t+1} = \tau_t(1 - \delta k_t) \tag{2.9}$$

where, g_{pt} , k_t and d_t represent respectively, public gross investment (productive expenditure), private capital and government debt as a percentage of output for each country.

2.4 Asset market equilibrium

Finally, the expression (2.10) represents the international asset market clearing condition when the output-weighed sum of aggregate asset holdings in each country i, $\overline{a}^i$, equal the output-weighed sum of private capital demand plus public debt of both countries (domestic country together with "the rest of the world" block). As before, all variables are expressed as a percentage

of output.

$$\sum_i p_i \overline{a}_t^i = \sum_i p_i (k_t^i + d_t^i), \quad i = 1, 2. \tag{2.10}$$

2.5 Solving the model

The analysis of a debt consolidation process requires moving between two steady states. Transition paths are thus in need to compare the dynamics of alternative debt consolidation strategies, expenditure or revenue-based, namely in terms of eventual aggregate transition costs as well as how these spread across households. In order to simulate transition paths imposed by a debt consolidation strategy we closely follow Quadrini et al. (2009), Ljungqvist and Sargent (2004), Rios-Rull (1999) and Auerbach and Kotlikoff (1987).

We consider a planner who inherits at time t a predetermined state vector, including initial debt-to-output ratio, chooses a vector of control or decision variables for each period within a given horizon in order to reach a new state vector that includes a previously announced target for the the debt-to-output ratio at the end of the planning period (Fuente (2000)). We present the expected life time utility maximization problem in a recursive form, using the principle of optimality and the Bellman equation as in Quadrini et al. (2009).

For each country, let $\{r_t, \tilde{w}_t\}_{t=0}^T$ be a deterministic sequence of prices (interest rate and wage). Let $\{d_t, g_{ut}, g_{pt}, tr_t\}_{t=0}^T$ be a sequence of government policy. The optimal choice for the single agent is to maximise (2.1) subject to (2.2), (2.7), (2.8), (2.9) and (2.10).

The solution to the agent's problem of each country delivers all agents decision rules, namely for consumption, $\tilde{c}_t(e_t, \tilde{a}_t)$, leisure, $l_t(e_t, \tilde{a}_t)$, and savings, $\tilde{a}_{t+1}(e_t, \tilde{a}_t)$. These decision rules determine the evolution of the distribution of wealth over e and $\tilde{a}$, denoted $\lambda_t(e, \tilde{a})$.

General equilibrium: consider an initial steady state composed by a set of fiscal policy variables $\{d_0, g_{u0}, g_{p0}, tr_0\}$, a vector of equilibrium prices,

$\{r_0, \tilde{w}_0\}$, and a stationary distribution, $\lambda_0(\tilde{a}, e)$ for each country.[3]

The general equilibrium is defined by a sequence, for each country i, of: (i) government policies, $\{d_t^i, g_{ut}^i, g_{pt}^i, tr_t^i\}_{t=1}^{\infty}$; (ii) agents decisions, $\{\tilde{c}_t^i(\tilde{a}_t, e_t), l_t^i(\tilde{a}_t, e_t), \tilde{a}_{t+1}^i(\tilde{a}_t, e_t)\}_{t=1}^{\infty}$; (iii) prices, $\{r_t, \tilde{w}_t^i\}_{t=1}^{\infty}$ and (iv) distributions $\{\lambda_t^i(\tilde{a}_t, e_t)\}_{t=1}^{\infty}$. Such that (a) agent decisions solve (2.1); (b) government budget constraint is fulfilled; (c) assets and labour markets clear, $\sum_i p_i \int \tilde{a}_t^i \, d\lambda^i = \sum_i p_i (k_t^i(r) + d_t^i)$ and $\int e_t (1 - l_t^i) \, d\lambda^i = N^i$, for all $\{t, i\}$; and (d) the sequences of $\lambda_t^i(\tilde{a}_t, e_t)_{t=1}^{\infty}$ are consistent with the initial steady states, the agent decisions and the idiosyncratic shock in each country i.

Transition path: the algorithm for solving the equilibrium transition path of the economy, given a particular parameterization, typically proceeds in three stages (Auerbach and Kotlikoff (1987)). First we solve for the long-run initial steady state of the economy (before the implementation of the fiscal consolidation strategy). Second, we solve for the long-run steady state towards which the economy will eventually converge after full-effects of the fiscal consolidation. Third, we solve for the transition path of the economy between the two steady states.

In particular, the algorithm for running the third step follows Rios-Rull (1999) and involves the following steps: (i) choose the sequences for the common interest rate and for wages in both countries in each period of transition period r_t and $\tilde{w}_t^i$ $(i = 1, 2)$; (ii) take the sequences $\tilde{w}_t^i (i = 1, 2)$ and r_t and solve backwards the value functions to simulate the whole transition for the economy, updating the distributions according to agent's decisions as to obtain sequences for aggregate asset demand and labour supply; (iii) adjust the sequences in order to clear asset and labour markets for each period of the transition path; (iv) repeat steps (*ii*) and (*iii*) until the three sequences converge and all markets clear.

[3]Remember that r_0 must be equal for both countries.

2.6 Social welfare computation

The utilitarian social welfare, U, is defined as the solution of (2.1) across all households (i.e, conforming the stationary distribution):[4]

$$U = \int E_0 \sum_{t=0}^{\infty} \beta^t u(c_t, l_t, G_{ut})\, d\lambda_t(a, e) \tag{2.11}$$

Since the utility function is concave, the utilitarian social welfare is influenced by the distribution, and thus, higher inequality or uncertainty will reduce welfare. Considering a policy change that moves an economy from equilibrium A to equilibrium B, we define the welfare gain ($w_u > 0$) or loss ($w_u < 0$), in percentage of life-time consumption:

$$\int E_0 \sum_{t=0}^{\infty} \beta^t u((1+w_u)c_t^A, l_t^A, G_{ut}^A)\, d\lambda^A(a, e) = \int E_0 \sum_{t=0}^{\infty} \beta^t u(c_t^B, l_t^B, G_{ut}^B)\, d\lambda^B(a, e) \tag{2.12}$$

2.7 Calibration

Preferences: μ is set at 1.5, a value of standard use in the literature. For γ we follow, among others, Floden (2001) and set it to 2 which is equivalent to a wage elasticity of labour supply equal to 0.5. The parameter ζ is set in order to match an average labour supply of around 0.3 ($\zeta = 9.145$). Finally, for the preferences towards public goods and services relative to private goods, the baseline calibration sets $\vartheta = 0.1$.[5]

Technology: the production function is inspired in Barro (1990) to incorporate productive government spending. For our baseline model we follow Auschauer (1989) and set $\eta = 0.3$. For the capital share, $\alpha = 0.3$ (Aiyagari

[4]The solution is represented by a sequence of consumption and leisure to infinity $\{c_t, l_t\}_{t=0}^{\infty}$.

[5]It is not usual to find across the literature g_u as an argument in the utility function. Moreover, for the few studies where it is considered there is no homogeneous value for the calibration. In our model, values larger than $\vartheta = 0.1$ are not compatible with meaningful values for policy variables observed in EU in most of developed countries.

and McGrattan (1998) and Floden (2001)).[6]

Discount factor and interest rate: according to our model, $r = \frac{\alpha}{k} - \delta$. We set $\delta = 7.5\%$ as in Aiyagari and McGrattan (1998) and D'Auria et al. (2010). The variable k represents the capital-to-output ratio and the steady-state value is calibrated as to match the average value of the capital to output ratio of the EU15 countries (1990-2008).[7] Thus, the steady-state value for the real interest rate yields 2.8%, in a yearly base which implies $\beta = 0.981$.

Government: governments are characterized by a set of fiscal indicators $\{d, tr, g_u, g_p\}$. Using the AMECO database, we calibrate policy variables as to match each of the consolidation episodes that occurred between 1990 and 2008 in the EU15 countries. Specific values will be released throughout section 3.[8]

Idiosyncratic shock: following the procedure of Tauchen (1986), the idiosyncratic shock is replicated as a first order Markov chain specification with seven states to match a first order autoregressive representation as followed by, among others, Aiyagari (1994).

Aiyagari (1994), Aiyagari and McGrattan (1998) and Floden (2001) draw on empirical data for earnings and annual hours worked to set ρ and σ. Due to unavailable data for the EU15 average, we follow a different procedure. As in Rios-Rull et al. (2003) we set both parameters as to match the existent inequality in the EU15, as measured by the disposable income Gini index. According to the AMECO database, the disposable income Gini index varies between 0.26 and 0.34 during the period 1991-2008. Thus we set $\rho = 0.8$ and $\sigma = 0.27$ which leads to a disposable income Gini index of around 0.28.

[6] In a recent paper D'Auria et al. (2010) estimated $\alpha = 0.35$ for the EU15 over the period 1960-2003.

[7] Source: AMECO database, $k = 2.9$ for the EU15.

[8] See Table 3.

3 Identification of successful consolidation strategies

In order to characterize debt consolidation processes, we proceed following the approach in the seminal paper by Alesina and Perotti (1995) which identifies "significant fiscal impulses" in OECD countries between 1960 and 1992, in order to study the determinants of "successful" budget consolidation processes. In particular, they define "significant" changes in fiscal policy stance using a cyclically adjusted measure of government primary balance and set several cut-off points. Moreover, a fiscal adjustment in year t is defined as "successful" if the gross debt/GDP ratio in year $t+3$ is at least 5 percentage points lower than in year t.

In our approach, we apply the criteria used by Alesina and Perotti (1995), but proceed backwards to detect all episodes of "successful" debt consolidation in each of the EU15 countries between 1990 and 2008. We start by identifying the periods where debt-to-output ratios are, at least, five percentage points below the value observed three years before. Then, we proceed with identifying the determinants leading to such positive debt dynamics - primary deficit, snow-ball and stock-flow adjustments (for more details on the definitions, see European-Commission (2009)). Consolidation episodes are identified as successful if the reduction in the cyclically-adjusted primary deficit dominates. We further analyze the budget composition in order to detect the main sources of primary balance adjustment. Finally, we use our model to mimic each consolidation process while assessing the welfare costs involved.

From 1990 to 2008, we identify debt reduction episodes in eleven of the EU15 countries (see shadowed lines in Table 1b). The exceptions are Germany, Greece, France and Luxembourg. As it would be expected, debt control episodes show significant differences. We can find debt control relying on the expenditure side but, for most of the countries, we find mixed strategies including cuts in public spending together with some tax effort. On the expenditure side, we also distinguish cuts in current spending from cuts in public investment. Finally, some debt reduction episodes were mainly

achieved through snow-ball or stock-flow adjustments.

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Austria	60,95	64,10	68,27	68,29	64,41	64,77	67,19	66,42	67,01	66,36	65,43	64,75	63,71	61,98	59,45	62,52
Belgium	134,16	132,16	129,79	126,97	122,29	117,10	113,61	107,77	106,55	103,41	98,63	94,32	92,21	87,88	83,96	89,57
Denmark	80,06	76,50	72,46	69,17	65,19	60,81	57,39	51,70	47,42	46,84	45,81	44,46	37,07	31,28	26,84	33,34
Finland	55,29	57,83	56,67	56,88	53,78	48,19	45,53	43,79	42,29	41,31	44,39	44,19	41,42	39,24	35,08	33,38
France	46,24	49,36	55,48	58,00	59,28	59,43	58,81	57,33	56,88	58,82	62,91	64,87	66,36	63,66	63,80	68,01
Germany	45,84	48,01	55,60	58,43	59,65	60,29	60,85	59,69	58,75	60,33	63,82	65,63	67,84	67,59	65,07	65,88
Greece	100,51	98,51	99,20	101,60	104,06	102,60	102,51	101,82	102,91	101,45	97,85	98,55	98,83	95,87	94,83	97,63
Ireland	94,11	88,66	81,11	72,48	63,72	53,06	48,11	37,70	35,45	32,17	31,07	29,44	27,48	24,91	24,96	43,23
Italy	115,66	121,84	121,55	120,89	118,06	114,94	113,75	109,18	108,78	105,66	104,35	103,81	105,83	106,51	103,50	105,81
Luxembourg	5,99	5,50	7,44	7,78	7,73	7,40	6,69	6,40	6,53	6,52	6,24	6,33	6,07	6,72	6,90	14,67
Netherlands	78,48	75,74	76,08	74,10	68,18	65,71	61,13	53,78	50,73	50,53	52,00	52,45	51,82	47,39	45,63	58,23
Portugal	56,13	58,96	61,03	59,95	56,14	52,10	51,37	50,35	52,95	55,54	56,86	58,30	63,57	64,67	63,55	66,41
Spain	57,16	59,83	62,71	66,82	65,30	63,18	61,50	59,24	55,49	52,53	48,74	46,18	43,03	39,64	36,24	39,49
Sweden		72,40	72,09	72,07	69,15	69,09	64,79	53,57	54,44	52,59	52,27	51,22	51,03	45,87	40,50	38,02
United Kingdom	44,54	47,71	50,75	50,97	49,78	46,66	43,68	41,02	37,73	37,46	38,70	40,63	42,26	43,37	44,15	52,00

(a) Gross debt.

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Austria	4,80	7,76	12,00	7,34	0,31	-3,50	-1,09	2,01	2,24	-0,83	-0,99	-2,26	-2,65	-3,44	-5,30	-1,20
Belgium	8,52	5,14	1,20	-7,19	-9,86	-12,69	-13,36	-14,53	-10,55	-10,20	-9,13	-12,23	-11,20	-10,75	-10,36	-2,65
Denmark	18,07	13,68	4,48	-10,89	-11,30	-11,65	-11,78	-13,49	-13,39	-10,55	-5,89	-2,97	-9,77	-14,53	-17,61	-3,73
Finland	41,31	35,66	16,63	1,59	-4,05	-8,48	-11,35	-9,99	-5,90	-4,22	0,60	1,90	0,11	-5,15	-9,11	-8,04
France	11,04	13,37	15,76	11,76	9,92	3,94	0,81	-1,94	-2,55	0,01	5,58	7,99	7,54	0,74	-1,07	1,66
Germany		8,47	13,53	12,59	11,65	4,70	2,43	0,03	-1,54	-0,52	4,14	6,88	7,51	3,76	-0,56	-1,96
Greece	27,87	23,50	19,06	1,09	5,54	3,39	0,91	-2,24	0,32	-1,06	-3,97	-4,36	-2,62	-1,98	-3,72	-1,21
Ireland	0,94	-5,88	-10,44	-21,63	-24,94	-28,05	-24,36	-26,02	-17,61	-15,94	-6,63	-6,01	-4,69	-6,16	-4,48	15,76
Italy	21,01	23,80	16,35	5,23	-3,78	-6,61	-7,14	-8,88	-6,15	-8,09	-4,82	-4,97	0,17	2,15	-0,31	-0,01
Luxembourg	1,30	1,44	2,64	1,79	2,24	-0,03	-1,09	-1,33	-0,88	-0,18	-0,16	-0,20	-0,45	0,48	0,57	8,60
Netherlands	1,63	-0,83	-1,27	-4,38	-7,56	-10,36	-12,97	-14,40	-14,98	-10,60	-1,78	1,72	1,29	-4,61	-6,81	6,40
Portugal	0,80	1,29	9,34	3,82	-2,82	-8,93	-8,58	-5,79	0,84	4,18	6,51	5,36	8,02	7,81	5,24	2,85
Spain	14,52	16,42	16,86	9,66	5,47	0,47	-5,32	-6,06	-7,69	-8,97	-10,51	-9,31	-9,51	-9,09	-9,94	-3,53
Sweden					-3,25	-3,00	-7,28	-15,58	-14,65	-12,20	-1,30	-3,22	-1,56	-6,40	-10,73	-13,01
United Kingdom	11,28	14,06	12,24	6,43	2,07	-4,09	-7,30	-8,76	-8,94	-6,22	-2,32	2,91	4,80	4,67	3,52	9,73

(b) Debt dynamics: $\delta(d_t) = d_t - d_{t-3}$.

Table 1: Debt reduction in EU15 countries.

In order to extract (active) fiscal consolidation processes, we decompose debt dynamics as usual (see, among others, European-Commission (2009)):

$$D_t = D_{t-1}.(1 + i_t) + PD_t + SF_t \tag{3.1}$$

Where, D stands for government debt, PD for general government primary deficit, SF for the stock-flow adjustment and i for nominal interest rate paid by the government.

Equation (3.1) can be re-written in terms of debt-to-output dynamics as:

$$\frac{D_t}{Y_t^n} - \frac{D_{t-1}}{Y_{t-1}^n} = \frac{D_{t-1}}{Y_{t-1}^n}.\frac{(i_t - n_t)}{(1 + n_t)} + \frac{PD_t}{Y_t^n} + \frac{SF_t}{Y_t^n} \tag{3.2}$$

Where Y^n is GDP at current market prices and n stands for the corresponding growth rate. The first term of the right part in equation 3.2 refers to the snow-ball effect (SB).

Table 2 shows debt decomposition into primary deficit (including its cyclically-adjusted component), snow-ball effect (impact on the debt service due to the difference between nominal interest and output growth rates) and stock-flow adjustments as presented in Equation 3.2. We identify active fiscal consolidations with debt reduction processes that are mainly driven by cyclically-adjusted primary deficit control. Using this criterion we have restricted our sample to only nine countries (see shadowed cells in Table 2). Furthermore, we have identified for Finland, Netherlands and Sweden two consolidation processes. Portugal and Italy were excluded as debt reduction was mainly achieved through stock-flow adjustments and snow-ball effects, respectively. From Table 2 the primary deficit has been apparently responsible for a significant part of debt reduction in Italy. However, a more careful examination shows that, during 1995 to 2002, Italy has exhibited constant and significant primary balance surplus. Thus, surpluses have been cancelled out by the snow-ball effect resulting from an adverse combination of high interest rates and low growth rates (see Figure 1). The true origin of debt reduction comes from the decreasing snow-ball effect along the whole period, visible in the red column.

To characterize the cyclically-adjusted budget deficit composition, we consider a single instrument on the revenue side, the tax burden, and three instruments on the expenditure side: final consumption, social transfers other than in kind and gross capital formation, as in European-Commission (2009). Figures 2 and 3 exhibit, for each consolidation episode, the cyclically-adjusted evolution of each of the four fiscal instruments. Spending was adjusted for the cyclical component by applying the elasticity of total expenditure (excluding interest rate) relative to the cycle to all items. Similarly, for the tax burden, we used the total government revenue elasticity. Elasticities were calculated from the AMECO Database series).

By analyzing budget decomposition we proceed with classifying fiscal consolidation as a pure expenditure or revenue-based, or a mixed strategy.

Country	Debt Reduction	P.D.(adj)	P.D.(cycle)	S.B.	S.F.
Austria	5.30 (2004-2007)	-3.72	-0.93	-1.01	+0.35
Belgium	50.20 (1993-2007)	-63.68	-5.76	+27.73	-8.49
Denmark	53.76 (1993-2007)	-59.03	-6.24	+16.42	-4.37
Finland1	14.38 (1995-2001)	-24.15	-6.41	+1.77	+14.38
Finland2	11.01 (2003-2008)	-18.41	-7.58	-2.31	+17.29
Ireland	69.63 (1991-2006)	-51.91	-4.73	-36.82	+23.82
Italy	17.74 (1995-2004)	-34.95	+2.40	+18.16	-1.51
Netherlands1	25.21 (1994-2002)	-23.22	-2.90	+4.34	-3.43
Netherlands2	6.81 (2004-2007)	-6.98	-0.47	-0.35	+0.98
Portugal	10.68 (1995-2000)	+1.66	-2.71	-1.46	-8.17
Spain	30.58 (1996-2007)	-21.43	-3.87	-11.17	+5.89
Sweden1	19.48 (1996-2002)	-28.09	+0.14	+6.02	+2.45
Sweden2	14.25 (2003-2008)	-11.19	-9.06	-2.48	+8.48
UK	13.51 (1996-2002)	-14.09	-3.60	+2.82	+1.35

Table 2: Contributions to the debt reduction.
P.D.(adj)=Cyclically-adjusted primary deficit, P.D.(cycle)=Cyclical component of primary deficit, S.B.=Snow-ball effect, S.F.=Stock-flow adjustment.
Source: European-Commission (2009) and AMECO database.

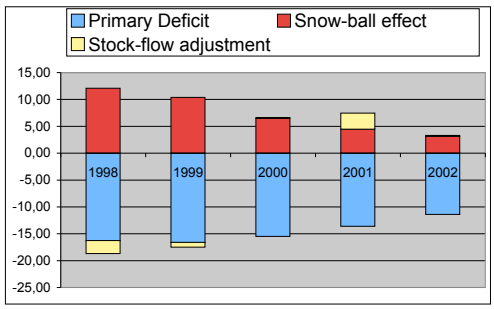
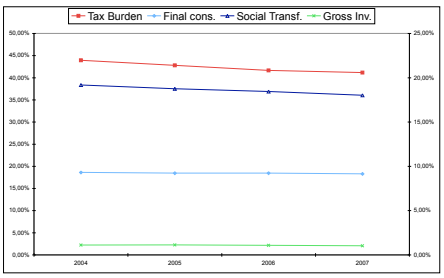
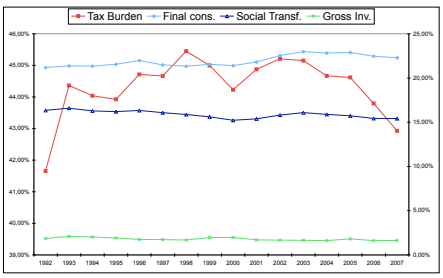


Figure 1: (3-year) Contribution to debt reduction - Italy.
Source: European-Commission (2009) and AMECO database.

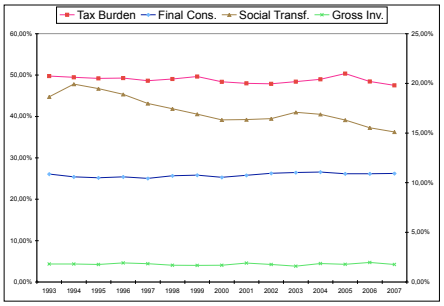
The twelve successful consolidation episodes are characterized in detail in Table 3. We identify four pure strategies: one revenue-based (Belgium), two expenditure-based relying on social transfers (Austria and Netherlands 1994-2002) and an expenditure-based strategy combining transfer and final consumption reductions in Finland (1995-2001). The remaining eight episodes are characterized by mixed strategies. Five of them are based on taxes and social transfers (Denmark, Finland 2003-2008, Netherlands 2004-2007, Sweden 2003-2008 and UK), one is based on taxes, social transfers and unproductive expenditures (Sweden 1996-2002) and the last two (Spain and Ireland) are mixed strategies relying on taxes and a reallocation of social transfer (and final consumption) towards public investment expenditure.



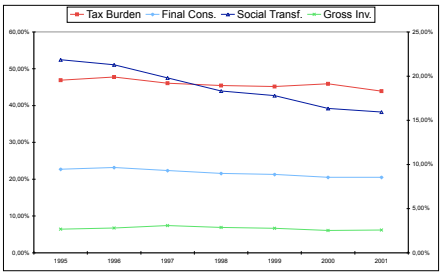
(a) Austria



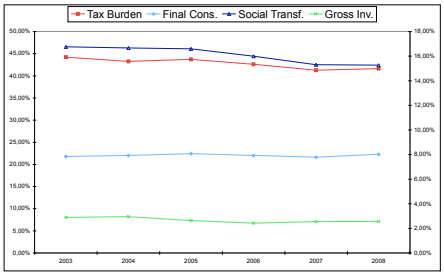
(b) Belgium



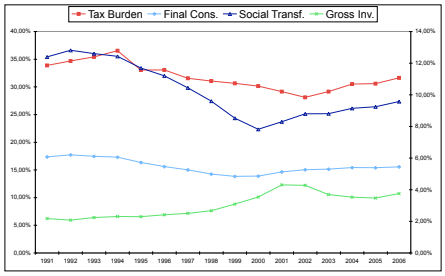
(c) Denmark



(d) Finland1

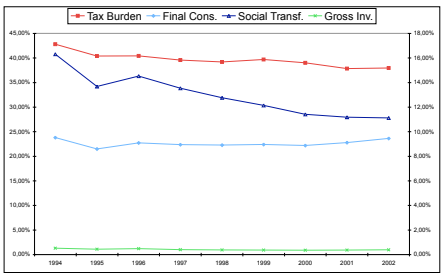


(e) Finland2

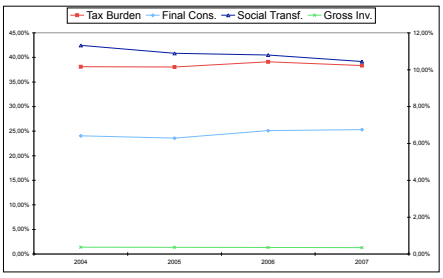


(f) Ireland

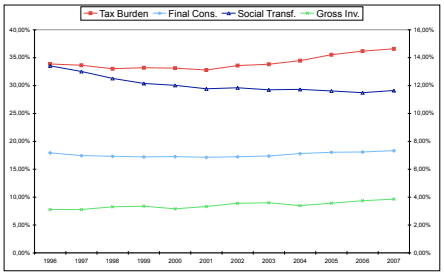
Figure 2: Budget decomposition - tax burden and final consumption (left scale); social transfer other than in kind and gross fixed capital formation (right scale).



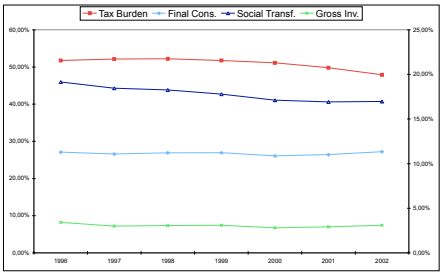
(a) Netherlands1



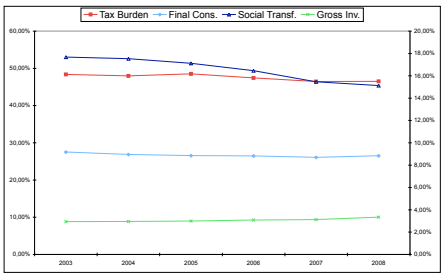
(b) Netherlands2



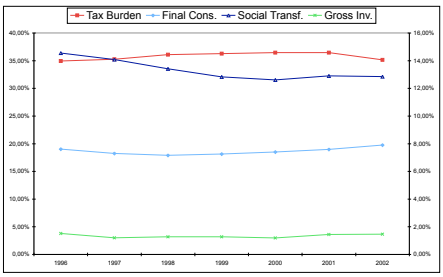
(c) Spain



(d) Sweden1



(e) Sweden2



(f) UK

Figure 3: Cyclically-adjusted primary deficit components (% of GDP) - tax burden and final consumption (left-hand scale); social transfer other than in kind and gross fixed capital formation (right-hand scale).
Source: European-Commission (2009) and AMECO database.

			Initial values				Final values				
Country	**Weight**	**Period**	d_t	tr_t	g_u	g_p	d_t	tr_t	g_u	g_p	**Strategy Classification**
Austria	0.0242	2004-2007	64.75	19.20	18.50	1.05	59.45	17.99	18.50	1.05	Pure: $\searrow tr$
Belgium	0.0294	1993-2007	134.16	15.89	21.82	1.80	83.96	15.89	21.82	1.80	Pure revenue
Denmark	0.0198	1993-2007	80.60	19.00	25.00	1.80	26.84	15.00	25.00	1.80	Mixed: $\searrow tr$, $\nearrow tax$
Finland1	0.015	1995-2001	56.67	21.94	22.78	2.60	42.29	15.86	20.41	2.60	Pure: $\searrow tr$, $\searrow g_u$
Finland2	0.015	2003-2008	44.39	16.76	22.00	2.60	33.38	15.16	22.00	2.60	Mixed: $\searrow tr$, $\nearrow tax$
Ireland	0.0122	1991-2006	94.54	12.50	17.00	2.44	24.91	09.50	15.50	3.50	Mixed: $\searrow tr$, $\searrow g_u$, $\nearrow g_p$, $\nearrow tax$
Netherlands1	0.0479	1994-2002	75.74	16.37	22.84	3.18	50.53	11.15	22.84	3.18	Pure: $\searrow tr$
Netherlands2	0.0479	2004-2007	52.45	11.40	24.50	3.25	45.63	10.40	24.50	3.25	Mixed: $\searrow tr$, $\nearrow tax$
Spain	0.0787	1996-2007	66.82	13.50	17.50	3.10	36.24	11.60	17.50	3.80	Mixed: $\searrow tr$, $\nearrow g_p$, $\nearrow tax$
Sweden1	0.0293	1996-2002	72.07	19.26	26.50	3.20	52.59	16.34	26.50	3.20	MIxed: $\searrow tr$, $\nearrow tax$
Sweden2	0.0293	2003-2008	52.27	17.68	27.50	3.20	38.02	15.07	26.50	3.20	Mixed: $\searrow tr$, $\searrow g_u$, $\nearrow tax$
UK	0.1391	1996-2002	50.97	14.50	19.50	1.50	37.46	12.80	19.50	1.50	Mixed: $\searrow tr$, $\nearrow tax$

Table 3: Classification of successful consolidation strategies.

4 Simulation and assessment of welfare gains

After having identified twelve consolidation episodes that were mainly driven by the control of the cyclically-adjusted primary deficit, we proceed with the simulations using the model presented in section 2. Debt and fiscal instruments are adjusted to match each consolidation process.[9] As for the "rest of the world" block, we use the average values for each fiscal variables of the EU15-1 countries for the same period. Tax rate is, as before, endogenous, adjusting to satisfy the government budget constraint.

The dynamics of the macroeconomic and inequality variables depend on the instruments used in the fiscal adjustment. However, all processes exhibit some common features. The initial phase is characterized by a temporary recession due to the increase in the interest rate. Disposable income falls and both wealth and disposable Gini indexes increase. In the second phase, the economy evolves towards its final steady state: interest and tax rates decrease, converging to a lower level in relation to the initial steady state; disposable income and asset holdings converge to higher than initial levels. Wealth and disposable Gini indexes decrease gradually to final lower, steady state levels (see Table 6). Thus, after an increase in inequality during transition, fiscal consolidation entails improvements in the distribution of wealth and income. As an example of the dynamic process explained above, Figure 4 exhibits the transition dynamics for the second Swedish consolidation episode (2003-2008).

Table 4 summarizes for each country the period of debt consolidation, debt reduction effort, debt consolidation strategy, overall welfare gain (transition plus steady state), the magnitude of transition costs as a percentage of final relative to initial steady-state welfare gain, the Welfare Gain Intensity (WGI) and the Total Spending Cut (TSC). Information in Table 4 is sorted by the WGI in a decreasing order. The WGI is an indicator built in order to compare debt consolidation welfare gains across countries when consolidation efforts are of different magnitudes. In particular, WGI equals the welfare gain

[9]For each simulation we calibrate our model according to section 2.7 and using the values presented in Table 3 for debt and fiscal instruments

per percentage point of debt reduction. TSC refers to the combined reduction in social transfers and unproductive expenditure per percentage point of debt reduction.

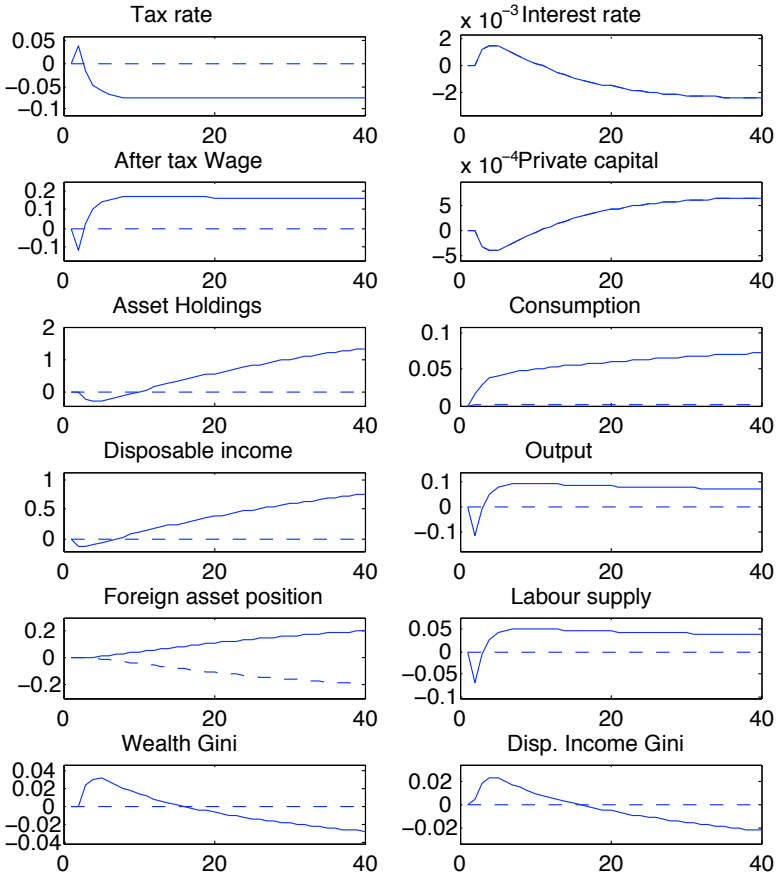


Figure 4: Dynamics of macroeconomic variables during fiscal consolidation in Sweden (2003-2008) - Sweden (solid line) *versus* EU15-1 (dashed line). Note: All variables are expressed in percentage variation.

In spite of overall positive welfare gains, all consolidations strategies involve positive welfare transition costs. The most successful strategies appear to present lower transition costs. Transition costs, in turn, also seem to be positively associated with tax effort. Higher tax peaks depress strongly the disposable income which, in turn, decreases the asset demand, increasing interest rate and thus prolonging the recession. In Belgium, the only country

following a pure tax-based strategy, debt consolidation exhibited the highest transition cost, thus implying the lowest (almost null) welfare gains. The results on WGI show that: (1) debt-reduction processes that involved reduction in unproductive spending were clearly welfare superior (Finland 1995-2001, Ireland, 1991-2006, and Sweden 2003-2008) and, among these, welfare is further enhanced (2) the lower the tax effort (Finland) and (3) the more public expenditure is biased towards investment (Ireland). Another stylized feature is that, with the exception of the Irish and the Spanish processes, the higher TSC the more welfare enhanced consolidation strategies were. The cases of Ireland (1991-2006) and Spain (1996-2007) show that, when a successful consolidation involves shifting towards productive expenditure, it requires smaller unproductive spending and social transfer cuts. Moreover, as productive expenditures have no effect on inequality, since its effects are homogeneous across the economy, these strategies involve lower inequality costs during the initial consolidation periods.

The impacts on the EU15-1 from each country consolidation are rather small, although positive in all cases, except for the Belgian, the Spanish and the Irish consolidation processes. The higher positive impacts on the EU15-1 were produced by the consolidation efforts of the larger countries, namely the UK. Table 5 sorts the EU15 by size (as measured by GDP weight in overall EU15 GDP) and reports the respective consolidation spillovers on the EU15-1 countries.

Country	**Debt Reduction**	Strategy Classification	Welf. Gain	Trans Cost	WGI(*)	TSC (**)
Finland1	14.38 (1995-2001)	Pure: $\searrow tr$ and $\searrow g_u$	0.1064	39.9%	0.0074	0.0059
Ireland	69.63 (1991-2006)	Mixed: $\searrow tr$, $\searrow g_u$, $\nearrow g_p$ and $\nearrow tax$	0.4362	39.6%	0.0063	0.0006
Spain	30.58 (1996-2007)	Mixed: $\searrow tr$, $\nearrow g_p$ and $\nearrow tax$	0.1936	25.4%	0.0063	0.0006
Sweden2	14.25 (2003-2008)	Mixed: $\searrow tr$, $\searrow g_u$ and $\nearrow tax$	0.0495	33.5%	0.0035	0.0025
Austria	5.30 (2004-2007)	Pure: $\searrow tr$	0.0125	54.2%	0.0024	0.0023
Netherlands1	25.21 (1994-2002)	Pure: $\searrow tr$	0.0462	61.2%	0.0018	0.0021
Sweden1	19.48 (1996-2002)	Mixed: $\searrow tr$ and $\nearrow tax$	0.0348	36.7%	0.0018	0.0015
Finland2	11.01 (2003-2008)	Mixed: $\searrow tr$ and $\nearrow tax$	0.0165	52.9%	0.0015	0.0015
Netherlands2	6.81 (2004-2007)	Mixed: $\searrow tr$ and $\nearrow tax$	0.0096	61.0%	0.0014	0.0015
UK	13.51 (1996-2002)	Mixed: $\searrow tr$ and $\nearrow tax$	0.0181	57.3%	0.0013	0.0013
Denmark	53.76 (1993-2007)	Mixed: $\searrow tr$ and $\nearrow tax$	0.0386	56.6%	0.0007	0.0007
Belgium	50.20 (1993-2007)	Pure revenue	0.0010	94.6%	0.0000	0.0000

Table 4: Consolidation strategies: welfare analysis,
(*) WGI: welfare gain intensity,
(**) TSC: total spending cut per percentage point of debt reduction.

The positive spillover effects are mainly explained by the costless welfare gains obtained by the passive country that benefits from the interest rate decrease and by the capital flowing out of the consolidating country. However, in the Belgium tax-based case, the interest rate increased significantly during transition; the severe recession also affected the EU15-1 countries, canceling out the benefit of the lower level of the final steady state interest rate. The Irish and Spanish cases are also peculiar as they involved a huge flow of assets from the EU15-1 countries to the domestic economy, which explains the negative spillover effects.

Country	Weight	EU15-1 global welfare gain
United Kingdom	0.1391	0.0014
Spain	0.0787	-0.0006
Netherlands 1	0.0479	0.0009
Netherlands 2	0.0479	0.0002
Belgium	0.0294	-0.0000
Sweden1	0.0293	0.0003
Sweden 2	0.0293	0.0002
Austria	0.0242	0.0001
Denmark	0.0198	0.0002
Finland 1	0.0150	0.0003
Finland 2	0.0150	0.0000
Ireland	0.0122	-0.0003

Table 5: Welfare effects from domestic consolidations on the EU15-1.

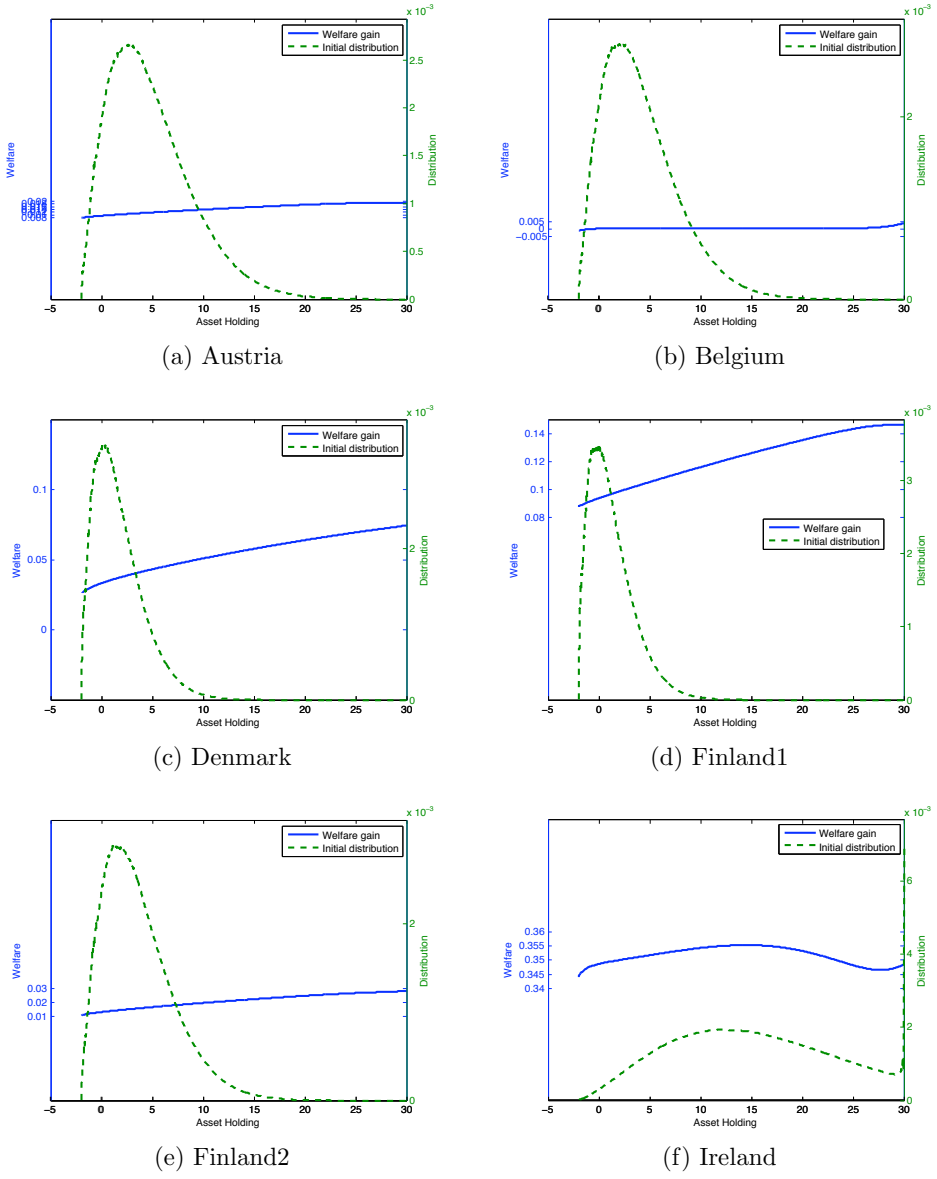
Figures 5 and 6 show for each consolidation episode the welfare gain curve (solid line) across wealth (asset holdings); it also shows the initial distribution of wealth (dashed line). Viegas and Ribeiro (2011) have shown that the welfare distribution moves negatively with debt and positively with transfer and unproductive expenditures while productive expenditures are neutral. Decreasing social transfers as well as unproductive expenditures leads to a worse welfare distribution. Differently, debt reduction should improve the

welfare distribution. Apparently, in terms of welfare inequality, transfer and unproductive spending effects have dominated over the debt effect during the European consolidation processes: despite debt reduction, welfare inequality across wealth increased, although not very significantly. Through all consolidation processes (except for the Irish case) the welfare gain curve across wealth is positively sloped. However, with the exception of Denmark, Finland (1995-2001) and Netherlands (1994-2002), welfare gain curves are almost horizontal (see Figures 5 and 6).

Results not reported show that all inequality measures (wealth and income) present similar paths to the ones shown in Figure 4.[10] They first rise sharply during the debt reduction period, decreasing smoothly afterwards. Wealth and disposable income Gini index end at a lower level relative to the initial steady sate level (see Table 6) due, essentially, to capital flows across borders. The consolidation process leads to an excess of asset demand in the domestic country supplied with foreign assets, bought, essentially by the lower-wealth classes to whom marginal propensity to save is higher. Thus, the disposable income Gini index follows.

Table 7 shows the effective disposable income Gini coefficients observed during the identified consolidation periods. In eight out of the twelve consolidation processes, the disposable income Gini index increased during the debt-reduction period (Denmark, Finland 1997-2001, Finland 2003-2008, Ireland, Netherlands 2005-2007, Spain, Sweden 1996-2002 and UK) supporting the prediction of our model. Although income distribution depends on the dynamics of multiple variables, some of which are missing from our model, actual evolution of Gini coefficients may be, at least partially, induced by the debt consolidation processes. The long run tendency towards the new (lower) steady state value is, obviously, much more difficult to observe.

[10] This regularity is common to all Gini indexes across all the other consolidation processes.

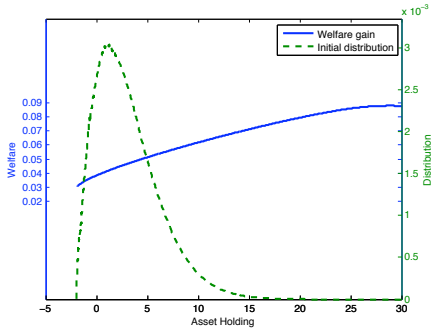


(a) Austria (b) Belgium

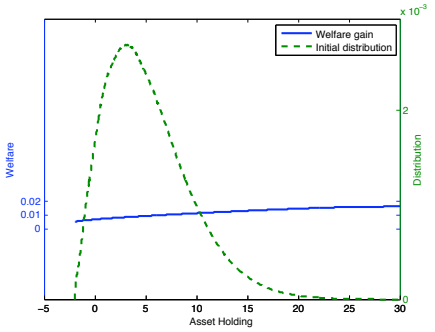
(c) Denmark (d) Finland1

(e) Finland2 (f) Ireland

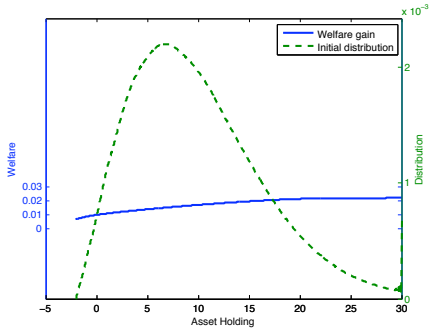
Figure 5: Welfare gains across wealth following debt consolidations.



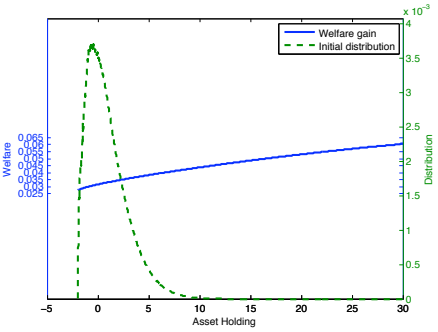
(a) Netherland1



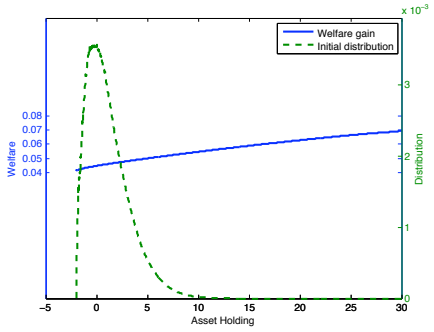
(b) Netherland2



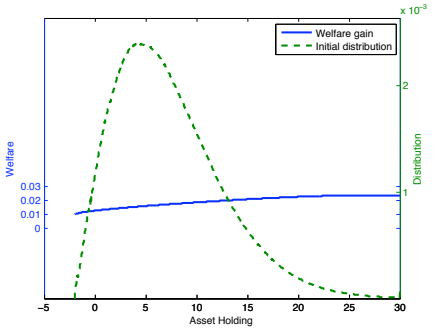
(c) Spain



(d) Sweden1



(e) Sweden2



(f) UK

Figure 6: Welfare gains across wealth following debt consolidations (continuation).

	Initial S. State		Final S. State	
Country	**WG**	**IG**	**WG**	**IG**
Austria	0.3804	0.3657	0.3708	0.3577
Belgium	0.3812	0.3657	0.3782	0.3634
Denmark	0.4170	0.3943	0.3844	0.3681
Finland 1	0.4320	0.4063	0.3725	0.3587
Finland 2	0.3874	0.3709	0.3749	0.3606
Ireland	0.3019	0.2959	0.1226	0.1223
Netherlands 1	0.3925	0.3748	0.3545	0.3433
Netherlands 2	0.3643	0.3514	0.3572	0.3454
Spain	0.3384	0.3297	0.3206	0.3134
Sweden1	0.4332	0.4065	0.4093	0.3879
Sweden 2	0.4243	0.3995	0.3992	0.3798
United Kingdom	0.3588	0.3474	0.3487	0.3386

Table 6: Debt consolidation effects on inequality.
Notes: WG = Wealth Gini index; IG = Income Gini index.

Country	1990	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Austria		0,24	0,25	0,24	0,26	0,25	0,24		0,27	0,26	0,26	0,25	0,26	0,26
Belgium		0,29	0,27	0,27	0,29	0,29	0,28		0,28	0,26	0,28	0,28	0,26	0,28
Denmark	0,23	0,21	0,20		0,21	0,23	0,22		0,25	0,24	0,24	0,24	0,25	0,25
Finland		0,23	0,22	0,22	0,24	0,26	0,27	0,26	0,26	0,25	0,26	0,26	0,26	0,26
Ireland		0,32	0,33	0,34	0,32	0,30	0,29		0,31	0,32	0,32	0,32	0,31	0,30
Netherlands	0,28	0,28	0,26	0,25	0,26	0,28	0,27	0,27	0,27		0,27	0,26	0,28	0,28
Spain	0,34	0,34	0,35	0,34	0,33	0,34	0,33	0,31	0,31	0,31	0,32	0,31	0,31	0,31
Sweden	0,21	0,21	0,21		0,22	0,24	0,24	0,23		0,23	0,23	0,24	0,23	0,24
United Kingdom	0,37	0,35	0,30	0,32	0,32	0,37	0,35	0,35	0,34		0,34	0,32	0,33	0,34

Table 7: Effective disposable income Gini coefficient during consolidation processes (grey cells). Source: OECD.Stat; blank cells correspond to years for which no data is available.

Because capital flows freely across borders, the financial account depends on the international level of interest rate relative its autarky level.[11] If the equilibrium interest rate on the international markets exceeds the autarky level, there is an excess of asset demand in the domestic country and residents

[11]The one that would prevail in the domestic country in a closed economy simulation.

will buy foreign assets. Capital flows outwards and the domestic country ends with a positive net foreign asset position. Conversely, if the equilibrium interest rate is set below the autarky level, the domestic asset supply surpasses asset demand and the excess of domestic assets will be acquired by foreign households. Capital flows inwards and the domestic country ends up with a negative net foreign asset position.

During the consolidation processes, two adjustments occur in the capital market, as illustrated in Figure 7. First, the asset supply (government plus private sector) curve moves to the left as the government reduces public debt. Second, the asset demand curve moves to the right because of the income effect. Thus, there is an excess demand for assets and the net foreign asset (NFA) position improves. Results not reported show that, only in four cases (Belgium, Ireland, Spain and UK),[12] and temporarily for the first years of transition, the asset demand curve retreat dominates over the shift in the asset supply curve, depressing the NFA position.

Table 8 presents the short run components of the NFA as measured by portfolio investments plus other investments (which includes debt investments such as loans, deposits and trade credits) during the twelve consolidation processes. As we have mentioned before, relative to actual Gini indexes, capital flows depend on many other factors which the model fails to capture.

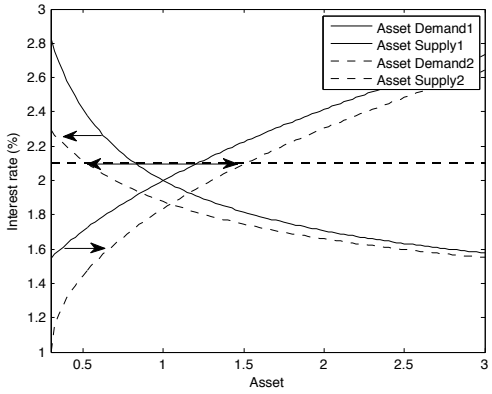


Figure 7: International asset market.

[12]Precisely those countries exhibiting higher fiscal efforts.

As it can be seen from the table, during the twelve active consolidation processes, the NFA position improves in nine out of the twelve cases (Austria, Belgium, Denmark, Ireland, Netherlands 1994-2002, Netherlands 2004-2007, Sweden 1996-2002, Sweden 2003-2002 and UK). In the remaining consolidation processes (Finland 1995-2001, Finland 2003-2008 and Spain), there is a reduction in the NFA position during the consolidation period. In particular, during the Spanish consolidation process the NFA position improves during the first seven years while it decreases during the final adjustment periods.[13]

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Austria	0,27	0,23	0,18	0,16	0,17	0,14	0,15	0,15	0,13	0,22	0,30	0,27	0,29	0,36	0,41	0,46	0,63	0,69
Belgium	1,38	1,36	1,25	1,35	1,43	1,41	1,46	1,60	1,78	1,90	1,87	1,91	2,03	2,22	2,38	2,44	2,75	3,01
Denmark	nd	0,14	0,07	0,01	0,05	-0,01	0,01	0,01	0,10	0,22	0,31	0,21	0,20	0,33	0,36	0,42	0,57	0,69
Finland	-0,08	-0,12	-0,17	-0,32	-0,41	-0,29	-0,28	-0,29	-0,65	-1,54	-1,38	-0,64	-0,27	-0,15	0,06	0,01	0,13	0,01
Ireland	nd	nd	nd	nd	nd	nd	nd	1,70	2,63	3,27	3,21	3,24	3,54	3,77	3,55	3,25	4,06	4,59
Netherlands	0,62	0,62	0,52	0,52	0,26	0,25	0,21	0,23	0,29	0,51	0,56	0,74	0,81	0,94	1,07	0,85	1,06	1,55
Spain	0,05	0,03	0,07	0,09	0,13	0,14	0,11	0,12	0,17	0,12	0,17	0,15	0,18	0,19	0,09	0,05	-0,11	-0,20
Sweden	0,23	0,20	0,18	0,11	0,12	0,16	0,15	-0,29	-0,23	-0,20	-0,09	0,02	0,07	0,13	0,18	0,18	0,36	0,55
United Kingdom	1,07	1,02	0,99	1,28	1,20	1,21	1,28	1,38	1,28	1,08	1,23	1,43	1,46	1,60	1,74	1,97	2,21	2,52

Table 8: Portfolio investment plus other investments (source: Lane and Milesi-Ferretti (2006)).

5 Conclusion

We use a model to simulate the twelve active consolidation episodes that have occurred in European Union between 1990 and 2008 (one pure revenue-based, three pure expenditure-based and eight mixed strategies). In order to compare debt consolidation welfare gains across countries in which consolidation efforts were of different magnitudes, we compute a welfare gain intensity measure (WGI) - welfare gain per percentage point of debt reduction -, and the total spending cuts (TSC) - combined reduction in social transfers and unproductive expenditures involved per each percentage point of debt reduction.

Results show that, with the exception of the Belgian case, all consolidation strategies entail positive welfare gains. The transition costs affect all episodes and are determinant to the rank of the consolidation strategies in

[13]Results are similar even if we consider NFA as a whole (i.e. including foreign direct investment, financial derivatives and reserve assets).

terms of welfare gains. Our results confirm the superiority of the adjustments based on the reduction of unproductive expenditures over those based on tax increases or on social transfer reductions. As for the mixed strategies, welfare is further enhanced the lower the tax effort and the higher the spending cuts are. Also, switching unproductive for productive expenditure results in significant welfare improvements (Ireland and Spain). Finally, all strategies involve lower welfare inequality costs. As for the wealth and income inequality in particular, the outcomes of the model replicate the data for the corresponding Gini index paths: namely, an initial hump-shaped dynamic towards a more compressed distribution. This improvement on both asset and disposable income distributions is closely related to the changes in the net foreign asset position produced by consolidation episodes in an open-economy framework. For the latter, model results are also supported by the data.

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