The Dutch experience: Assessing the welfare impacts of two consolidation strategies using a heterogeneous-agent framework

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Between 1990 and 2010, the Dutch government pursued two successful fiscal adjustments: first, in 1995–2002, through a pure expenditure-based strategy and second, in 2004–2007, through a mixed strategy based on social transfer cuts and tax increases. In order to assess welfare and, in particular, inequality effects involved in each episode, we built a general equilibrium model with heterogeneous-agent capable of exploring the relationship between fiscal policy variables and the endogenous cross-section distribution of income, wealth and welfare. The results confirm that, for the Netherlands, a pure expenditure-based strategy is slightly superior relative a (partial) revenue-based one. In spite of positive welfare gains, the model predicts significant transition costs in both episodes due to depletion of insurance capacity, higher inequality and output losses. Moreover, as supported by the data, the model simulations show an improvement of the net foreign asset position in the sequence of the debt-consolidation processes. Finally, the two consolidation episodes, described throughout the paper strengthen the relevance of political institutions as important successful factors.

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1. Introduction

The Dutch fiscal framework represents a singular case that has kept the attention of several international organisms (IMF, 2006; OECD, 2002): it can be characterized by an intermediate centralized structure in which the budget is built through a multi-party negotiation in an institutional environment composed by several numerical rules and where independent organisms play an important role (see Bos (2010), for a comprehensive historical review). According to Hagen (1992) and Hagen et al. (2001), the Dutch budget process constitutes a typical case of the contract approach. The budgetary framework is based on a coalition agreement between the political parties that compose the Government and should cover the full period of office (European-Commission, 2001). A numerical target imposes a ceiling for real expenditure and there is a clear separation between the expenditure and the revenue sides of the budget (a windfall in revenue cannot be used to finance additional expenditure). Finally, the budgetary process is sustained on cautious macroeconomic assumptions made by independent organizations.3

This institutional framework is surely responsible for the solid fiscal policy performance in the recent past: for instance, Arghyrou and Luintel (2007) found that Dutch public finances are sustainable, satisfying the inter-temporal budget condition, and the results of Dolezalova (2011) rule out a political-budget cycle in the case of the Netherlands. Moreover, De Haan et al. (2008) conclude that most of the pursued fiscal adjustments were successful (leading to a permanent decline in the debt-to-output ratio), albeit following strategies that were not fully in line with the policy recommendations of the fiscal adjustment literature. According to, e.g., Alesina and Perotti (1997) or Alesina and Ardagna (2009), fiscal adjustments through spending contention, and in particular on public wages and social welfare spending, are more successful in permanently lower debt than adjustments that rely primarily on tax hikes, leading to smaller output losses and even to potential non-Keynesian effects on output. But the success of a consolidation process should be assessed in broader terms, capturing several dimensions of welfare. Analysis of

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3 The Bureau for Economic Policy Analysis was founded in 1945 by Jan Tinbergen. Its main task is to provide independent macroeconomic and budgetary forecasts. It also provides analysis on a broad range of issues that are relevant for policy-making.
transition costs is of most relevance when structural breaks, such as debt consolidation processes, occur. The reasoning is that, even if welfare is higher under a (steady-state) low debt environment, adjustment requires higher tax burden, lower social welfare expenditure, lower public consumption or lower public investment expenditure. Debt reduction limits the ability to smooth the (distortive) tax burden, makes borrowing constraints more active (e.g., Barro (1974, 1979)) – specially binding to the poorer – and, by pressuring the interest rate down, reduces insurance ability in face of fluctuations on earnings (Aiyagari and McGrattan, 1998). Moreover, expenditure reduction efforts reduce the (potential) welfare-enhancing provision of public goods and services (see, e.g., Coase (1974), Samuelson (1954), Buchanan (1965), on the case for state-provided goods). In contrast, positive welfare impacts emerge from debt reduction as it crowds-in private investment and leads to a permanent downward shift in the (distortive) tax effort.

In the European context, the Netherlands provides a good case study to assess whether alternative consolidation strategies also produce different results in terms of a wide-range indicator such as welfare. Unlike most of the European countries experiencing recent debt consolidation efforts, the Netherlands has experienced two recent periods of comparable successful (in the sense of permanent) correction of public finances, one relying exclusively on the reduction in social welfare spending (1995–2002) and the other through a mixed strategy between transfer and tax adjustments (2004–2007). Records of more than one fiscal consolidation periods are found only in a few European countries, most of which with mixed expenditure-tax strategies. Thus, since the case of the Netherlands provides a good example for comparing transition costs across alternative debt consolidation strategies, this paper aims at describing the Dutch consolidation experience in order to assess welfare and, in particular, the inequality effects involved. Therefore we use a general equilibrium model with heterogeneous agents capable of capturing, theoretically, the relationship between fiscal variables, welfare and inequality. Based on Aiyagari and McGrattan (1998) and Floden (2001) the model includes a continuum of infinitely-lived rational (optimizing) agents who are hit by idiosyncratic wage shocks in an incomplete capital market. In order to smooth consumption/leisure, private agents optimally accumulate savings in “good times” spending them during “bad times”. The model also includes a government subject to a dynamic budget constraint, endowed with taxes levied on labor and capital to finance transfers to private sector, and productive and unproductive spending.

The proposed model improves on related literature twofold: i) it improves on the heterogeneous-agent models applied to public finances by, instead of analyzing the optimal steady state level of debt and budget composition (as in, for instance, Aiyagari and McGrattan (1998), and Floden (2001)), enabling the assessment of the effects attached to transitions in between steady states, namely those resulting from a permanent decrease in public debt; ii) it also improves on the literature that analyses the success of debt consolidation processes, as the model allows to address two additional impacts on welfare: besides output, a heterogeneous-agent model also captures inequality and insurance effects. In particular, we provide an assessment on how consolidation affects welfare net of transition costs. In order to simulate the transition path imposed by a debt consolidation strategy, we follow the methodology of Rios-Rull (1999) and Quadrini et al. (2009). 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 the Netherlands has small influence on the international interest rate.

The paper is organized as follows. In Section 2 we identify and characterize the periods of Dutch fiscal consolidation processes. The model and the social (aggregate) welfare criterion are described in Section 3. We proceed with the simulations and discuss the main results in Section 4. Section 5 presents the final remarks.

2. Identification and characterization of the Dutch consolidation episodes

After the 1970s oil shocks, and following the path of most of the OECD countries, the Netherlands embarked in a long period of sustained budget deficits and increasing debt-to-output ratios. This path resulted from financial depletion of the welfare state due to a striking climb in the unemployment rate in the early 1980s (De Haan et al., 2008). Lower tax revenues, a fall in the natural gas revenues in early 1990s and the increase in the debt service fueled the debt-to-output to a peak in 1993. Despite the several coalition governments being committed to correct public finances since the early 1980s (De Haan et al., 2008), in the mid-1990s, the Netherlands was far from satisfying the fiscal criteria embedded in the Stability and Growth Pact as to become eligible for membership of the European and Monetary Union in 1999—debt amounted to roughly 80% of GDP and the budget deficit to 4% of GDP. From 1995 onwards, debt correction was put in place and the Netherlands fulfilled the fiscal criteria by 1999.

From 2002 onwards, the debt-to-output ratio exhibited another increasing path. According to De Haan et al. (2008) temporary expenditure windfalls financed permanent increases in health and education spending; moreover, local governments also exhibited budget deficits. In June 2004, the ECOFIN declared an excessive deficit procedure to the Netherlands. Apparently, a second round of debt correction started in the mid-2000s.

In order to identify and characterize the Dutch consolidation processes, we follow the approach in the seminal paper by Alesina and Perotti (1995) but proceed backwards to detect the episodes of successful debt reduction between 1990 and 2010. We start by identifying “successful fiscal adjustment periods” in which debt-to-output ratios decrease, at least, five percentage points relative to the level observed three years before. Then, we proceed with identifying the determinants of such positive debt dynamics—primary deficit, snowball or stock-flow adjustments. Consolidation episodes are then identified as active 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, i.e., to identify the fiscal adjustment strategy.

Fig. 1 shows the Dutch debt dynamics. Dark columns show the debt-to-output ratio and the light columns show the change comparing to 3 years before. From 1990 to 2010, we identify 8 periods of “successful” fiscal adjustments. The first six occurred between 1995 and 2002 (first consolidation process) and the last two between 2004 and 2007 (second consolidation process). From 1995 to 2002, debt-to-output ratio decreased from 75.74 % to 50.53 %. During the second consolidation process, debt-to-output ratio decreased from 52.00 % to 45.63 %.

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

\[ D_t = D_{t-1}(1 + i_t) + PD_t + SF_t \]  

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.\(^6\)

The stock-flow adjustment includes the accumulation of financial assets, the changes in the value of debt denominated in foreign currency and remaining statistical adjustments.

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\(^4\) Excluding, deliberately, the on-going public finance correction in the aftermath of the recent financial and economic crises.

Eq. (2.1) can be re-written in terms of debt-to-output dynamics as:

\[
\frac{D_t}{Y_t} - \frac{D_{t-1}}{Y_{t-1}} = \frac{(i_t - n_t)}{(1 + n_t)^2} + \frac{PD_t}{Y_t} + \frac{SF_t}{Y_t} \tag{2.2}
\]

where \(Y_t\) is GDP at current market prices and \(n\) stands for the corresponding growth rate. The first term on the right-hand side of Eq. (2.2) refers to the snow-ball effect (SB), representing the contribution of interest and nominal growth to the change in gross debt.

Fig. 2 shows, for each of the 8 successful fiscal adjustment periods, the (3-year) debt decomposition into primary deficit (P.D.), snow-ball (S.B.) and stock-flow adjustments (S.F.) as presented in Eq. (2.2). Table 1 presents the cumulative values of each effect (in % of GDP, including the cyclical, P.D.(cycle), and cyclically-adjusted, P.D.(adj), components of primary deficit) for the two consolidation periods. According to the data presented we can identify both debt adjustment processes as active consolidations since in both of them, debt reduction was mainly accomplished through the control over the cyclically-adjusted primary deficit; in fact, P.D.(adj.) accounted for practically all the debt reduction observed in both consolidation episodes.

In order to identify the consolidation strategy, we further analyze the cyclically-adjusted budget deficit reduction, by considering a single instrument on the revenue side, the overall 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)). Fig. 3 exhibits, accordingly, the cyclically-adjusted path for each of the four fiscal instruments during the first (a) and the second (b) consolidation episodes. 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 using the AMECO Database total revenue and total expenditure adjusted for the cyclical component.

The first consolidation episode (1995–2002) is profoundly marked by the coalition agreement of the Purple Cabinet\(^7\) resulting from the 1994 elections, which initiated a long period of political stability. In 1994, the Netherlands did not yet fulfill with the convergence criteria for the EMU agreed in 1991: the budget deficit was 4.2 % GDP and debt was 74 % GDP. The considerable fiscal consolidation achieved during this first period was based mainly on the expenditure side. Moreover, most of the reduction in public expenditure came from transfers to households, which decreased by more than 5 percentage points (see Fig. 3a) as a result of a series of reforms in social security (tight eligibility criteria for unemployment benefits, social assistance and sick leave, among others) in order to improve efficiency and competitiveness (European-Commission, 2000, 2007). As a consequence of this consolidation period, the Netherlands entered the EMU, fulfilling the fiscal convergence criteria.

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\(^7\) Political coalition formed by the political parties PVDA, VVD and D66, known as the “Purple Coalition” because of its social-democrat (red) and liberal (blue) components.
From 2001 onwards, the Netherlands faced more difficult economic times. The budget surplus of 2% in 2000 turned into successive deficits of 0.2% in 2001, 2.1% in 2002 and 3.1% in 2003 (AMECO database), resulting mostly from permanent increase in health and education spending (De Haan et al., 2008). The 2002 general elections, marked by the Pim Fortuyn phenomena, led to a long period of political instability, with multiple and short-lived cabinets. In order to correct the excessive deficits, the government started with a mixed consolidation strategy in 2004 characterized by a mixed strategy combining tax increases with reduction in social transfers (European-Commission, 2007). The enlargement of the tax base by limiting tax-deductibility of mortgage interest payments and of pension premium to the private system as well as an increases in public health insurance premiums, explain part of the revenue-side strategy (European-Commission, 2004). As depicted in Fig. 3a, the tax burden increased by almost 2 percentage points from 37.5% GDP in 2004 to 39.1% GDP in 2006 and decreased to 38.9% GDP in 2007 (European-Commission, 2009). As for the expenditure-side, the government reduced the unemployment benefits and froze civil servant wages (European-Commission, 2004). Total expenditure decreased by less than 1 percentage point of GDP (from 46.1% in 2004 to 45.3% in 2007), mostly due to social transfers other than in kind (European-Commission, 2009).

3. 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 unproductive and productive. 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.

Additionally, we set up an international framework composed by two regions: the Netherlands and the “rest of the world”. Capital is assumed to flow freely across borders, and thus, the Netherlands exhibits a high degree of financial openness; labor, instead, is assumed not to flow across regions. In particular, the Dutch economy is of size \( p = 0.0479 \), representing the (1990–2010) average proportion of the Dutch output in that of the European Union-15 (EU15), and the “rest of the world”, is of size \( (1 - p) \), consisting of all the remaining EU15 countries (EU15-1). While the Netherlands is committed to the consolidation program, we assume that the EU15-1 bloc acts passively. Thus, both regions are identical except for the size and the path of the fiscal policy instruments. Each region is composed of three sectors: households, firms and government.

3.1. Households

In each region, there is a continuum of infinitely-lived agents of unit mass who receive after tax wage payments, \( \tilde{w} \), after tax interest from savings, \( \tilde{f} \), and transfers, \( \tilde{t} \), from the government. Following Barro (1973) and Floden (2001, 2003), we consider that, besides private consumption, \( \tilde{c} \), and leisure, \( \tilde{l} \), unproductive government spending, \( \tilde{g}_{un} \), also contributes to households’ utility at decreasing returns depending on a parameter, \( \theta \). The motivation for including utility-augmenting public spending results from the fact that government purchases are substitutes (transfers in goods, health or education services) or complements (public goods such as defense, public parks, street cleaning and police monitoring) of private consumption. As such government can affect utility when changing government purchases (Finn, 1998; Turnovsky and Fisher, 1995). Recently, Viegas and Ribeiro (2011) have concluded that, for welfare maximization, unproductive (utility-augmented) public expenditures are rather inelastic, representing around 13% of GDP. In each period, agents are hit by idiosyncratic shocks, \( \epsilon_{it} \), which determine the productivity level. Borrowing is allowed only up to a certain limit \( \tilde{b} \) and complete capital markets are ruled out. This implies that agents have to ensure themselves by saving during “good times” \( (\tilde{a}_{it-1} - \tilde{a}_i > 0) \) while, during “bad times”, savings are negative \( (\tilde{a}_{it-1} - \tilde{a}_i < 0) \). 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.\(^{10}\)

---

\(^8\) The LPF, Pim Fortuyn List, became the second largest party, a few days after the murder of its charismatic leader.

\(^9\) General elections occurred in January 2003, November 2006 and June 2010, always preceded by resignation and always leading to different coalitions.

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Table 1
Contributions to the overall debt reduction—Netherlands.
Sources: European-Commission (2009) and AMECO database.

<table>
<thead>
<tr>
<th>Consolidation period</th>
<th>Debt Reduction</th>
<th>P.D.(adj)</th>
<th>P.D.(cycle)</th>
<th>S.B.</th>
<th>S.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004–2007</td>
<td>6.37</td>
<td>-7.25</td>
<td>-0.62</td>
<td>+0.61</td>
<td>+0.90</td>
</tr>
</tbody>
</table>

Fig. 3. Cyclically-adjusted primary deficit components (% of GDP), 1995–2002 and 2004–2007. Notes: tax burden and final consumption (left-hand scale); social transfer other than in kind and gross fixed capital formation (right-hand scale). Sources: European-Commission (2009) and AMECO database.

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\(^{10}\) In order to stabilize the model some variables are defined as a percentage of output \( Y \). Namely: \( \tilde{w} = \overline{\tilde{w}} + \gamma \tilde{c} - \beta \tilde{l} + \tilde{f} - (\beta \tilde{f} - \gamma \tilde{l} - \gamma \tilde{c}) \tilde{y} + \tilde{t} - \tilde{b} + \tilde{g}_{un} \).
In particular, for each country, each household solves the following optimization problem:

$$
\max_{\tilde{c}_t, \tilde{a}_t, \tilde{u}_t} \left[ \sum_{t=0}^{\infty} \frac{1}{\beta^{t+1}} (u_t(\tilde{c}_t, \tilde{a}_t) + \vartheta u_2(\tilde{u}_t))\right] \tilde{a}_0, \tilde{e}_0].
$$

(3.1)

Subject to:

$$
\tilde{c}_t + \tilde{a}_t = \tilde{W}_t (1 - \tilde{\tau}) + (1 + \tilde{\tau})\tilde{a}_{t-1} + \tilde{\tau}_t, \quad \tilde{c}_t \geq 0, \quad \tilde{a}_t \geq -\tilde{\beta}.
$$

(3.2)

The household’s instant utility function is specified as:

$$
u_t(\tilde{c}_t, \tilde{a}_t) = \frac{\tilde{c}_t^{1-\mu} \exp[-(1-\mu)\tilde{\xi}(1-\tilde{L}_t)^{1+\gamma}]}{1-\mu}.
$$

(3.3)

where \(\mu\) represents the degree of risk aversion, \(\tilde{\xi}\) is a constant related to average labor supply, and \(\tilde{\gamma}\) represents the labor supply elasticity, and

$$
u_t(\tilde{a}_t) = \frac{\tilde{a}_t^{1-\mu}}{1-\mu}.
$$

(3.4)

The productivity shock, \(\tilde{e}_t\), is an idiosyncratic shock that evolves stochastically over time according to the following process: the natural logarithm of \(\tilde{e}_t\) is represented by an AR(1) process with a serial correlation coefficient, \(\rho\), and a standard deviation, \(\sigma\):

$$
\log(\tilde{e}_t) = \rho \log(\tilde{e}_{t-1}) + \tilde{\epsilon}_t.
$$

(3.5)

### 3.2. Firms

The firms are characterized by a neoclassical production function. Output in each country, \(Y_t\), is produced using capital, \(K\), labor, \(L\), and productive government spending, \(Gp\).

$$
Y_t = F(\tilde{K}_t, \tilde{N}_t, \tilde{Gp}) = \left(\tilde{K}_t^\alpha \tilde{N}_t^{1-\alpha} \tilde{Gp}\right)^{\eta}.
$$

(3.6)

Productive government spending is identified with the share of public gross investment on output, in line with Barro (1990) and Auerbach and Kotlikoff (1987), and enters as an input to private production. This approach assumes that public investment can have a complementary effect (crowding-in) with respect to private investment, especially when it is made in the areas of infrastructure and the provision of public goods.11

The parameters \(\alpha\) and \(\eta\) 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, \((F_NF_K)\), and output is exhaustively distributed. Thus:

$$
\tilde{w}_t = (1 - \tilde{\tau}_t) \frac{F_N(\tilde{K}_t, \tilde{N}_t, \tilde{Gp})}{Y_t}
$$

(3.7)

$$
\tilde{r}_t = (1 - \tilde{\tau}_t) \left(\frac{F_K(\tilde{K}_t, \tilde{N}_t, \tilde{Gp})}{Y_t} - \tilde{\delta}\right)
$$

(3.8)

where \(\tau\) is a proportional income tax rate levied in each region on labor and capital and \(\delta\) is the depreciation rate of capital. The pre-tax level of interest rate, \(r\), is set in the international capital market, being the same for both regions.

### 3.3. Government

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

$$
g_{at} + g_{pt} + \tilde{r}_t + (\tilde{\tau}_t + 1)\tilde{d}_{t+1} - \tilde{d}_{t+1} = \tau_t (1 - \tilde{\delta}_k_t)
$$

(3.9)

where, \(g_{pt}\), \(k\) and \(d\) represent, respectively, public gross investment (productive expenditure), private capital and government debt, as a percentage of output.

### 3.4. Solving the model

The analysis of a debt consolidation process requires moving between two steady states. In order to simulate the transition paths imposed by the Dutch fiscal consolidation 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 an 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 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).

#### 3.4.1. General equilibrium

We consider an initial steady state characterized by policy functions that solve the agents optimization problems and clear the input markets. These functions are composed of a set of fiscal policy variables \(\{d_0, g_{at}, g_{pt}, tr_0\}\), a vector of equilibrium prices, \(\{\tilde{r}_0, \tilde{\delta}_0\}\), and a stationary distribution, \(\lambda_0(\tilde{a}, e)\) for each region.12

The general equilibrium is defined by a sequence, for each region \(i\), of: (i) government policies, \(\{d_i, g_{at}, g_{pt}, tr_i\}\); (ii) agents decisions, \(\{\tilde{c}_t(\tilde{a}_t, \tilde{e}_t), \tilde{c}_{t+1}(\tilde{a}_t, \tilde{e}_t)\}_{t=1}^\infty\); (iii) prices, \(\{\tilde{r}_i, \tilde{\delta}_i\}_{t=1}^\infty\) and (iv) distributions \(\{\lambda_i(\tilde{a}_t, \tilde{e}_t)\}_{t=1}^\infty\), such that (a) agent decisions solve Eq. (3.1) subject to Eq. (3.2); (b) government budget constraint is fulfilled; (c) asset and labor markets clear:

$$
\sum_i p_i \int \tilde{a}_t^\gamma dN_t = \sum_i p_i \left(\tilde{k}_i^\gamma (r) + \tilde{d}_i^\gamma\right)
$$

(3.10)

and

$$
\int \tilde{e}_t (1 - \tilde{\delta}_i) dN_t = N_t
$$

(3.11)

for all \(\{\tilde{a}, \tilde{e}\}\), and (d) the sequences of \(\lambda_i(\tilde{a}_t, \tilde{e}_t)\) are consistent with the initial steady state, the agent decisions and the idiosyncratic shock in each region \(i\).

#### 3.4.2. Transition path

The algorithm for solving the equilibrium transition path of the economy, given a particular parameterization, proceeds typically 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 se-
quen
ces for the common interest rate and for wages in both countries
in
each period of transition path, r and w′ i (i = 1, 2); (ii) take the se-
quen
ces w′ i (i = 1, 2) and r and solve backwards the value functions
to simulate the whole transition for the economy, updating the distribu-
tion according to the agent’s decisions, in order to obtain sequences for
aggregate asset demand and labor supply; (iii) adjust the se-
quen
ces in order to clear asset and labor markets in each period of
the transition path; (iv) repeat steps (ii) and (iii) until the three se-
quen
ces converge and all markets clear.

3.5. Social welfare computation

The utilitarian social welfare, U, is defined as the solution of
Eq. (3.1) across all households (i.e., conforming the stationary
distribution): 13

\[ U = \int E_0 \sum_{t=0}^{\infty} \beta^t u(c_t, l_t, G_{nt}) \, d\lambda_t(a, e). \]  

Since the utility function is concave, the utilitarian social welfare is
influenced by the distribution, and thus, higher inequality or uncer-
tainty will reduce welfare. Considering a policy change that moves
an economy from steady-state equilibrium A to steady-state equilib-
rium B, we define the welfare gain (W_a > 0) or loss (W_a < 0), in per-
centage of life-time consumption:

\[ \int E_0 \sum_{t=0}^{\infty} \beta^t u\left(1 + W_a, c^A_t, l^A_t, G^A_{nt}\right) \, d\lambda^A(a, e) \]  

\[ \int E_0 \sum_{t=0}^{\infty} \beta^t u\left(1 - W_a, c^B_t, l^B_t, G^B_{nt}\right) \, d\lambda^B(a, e). \]  

3.6. Calibration

3.6.1. Preferences

\mu is set at 1.5, a value of standard use in the literature. For γ we fol-
low, among others, Floden (2001) and set it to 2, which is equivalent
to a wage elasticity of labor supply equal to 0.5. The parameter ζ is set
in order to match an average labor supply of around 0.3 (ζ = 9.145).
Finally, as for the preference of public goods relative to private ones,
most of the estimates/calibrations found in the literature are rather
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Finally, as for the preference of public goods relative to private ones,
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3.6.2. Technology

The production function is inspired in Barro (1990) to incorporate
productive government spending. Recent estimates for η, such as in
Baxter and King (1993) and Rioja (2003), are substantially lower than
that provided in the seminal work of Auschauer (1989). In par-
cular, we follow Afonso and St. Aubyn (2009) with η = 0.03,
which corresponds to an average value across estimations for the
EU countries. For the capital share, α = 0.3 following (Aiyagari and

3.6.3. Discount factor and interest rate

According to our model, r = χ = δ. We set δ = 7.5 % as in Aiyagari
and McGrattan (1998) and D’Auria et al. (2010). The variable k rep-resents the capital-to-output ratio and the steady-state value is cali-
bred to match the average value of the capital to output ratio of
the EU15 countries (1990–2010). 16 Thus, the steady-state value for
the real interest rate yields 2.8 %, on a yearly base, which implies
β = 0.981.

3.6.4. Government

Governments are characterized by a set of fiscal indicators (dt,rg,g,p). Using the AMECO database, we calibrate policy variables as to match
the EU1-1 average between each consolidation period. For the Netherlands,
we have simulated, for computational purposes, a stylized path for the
two consolidation processes identiﬁed in Fig. 3. Accordingly, as shown
in Table 2, the 1995–2002 episode was treated as a pure transfer-
based consolidation (reduction from 16.37% to 11.15% of GDP) while
the 2004–2007 was treated as a mixed strategy where a reduction in
transfers (a one percentage point reduction in the transfer-to-CDP ratio)
was combined with an important adjustment in government revenue,
captured by an endogenously-determined path for taxes. Specific values for the remaining fiscal instruments characterizing the initial
and the final steady states are presented in Table 2.

3.6.5. 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).

draw on empirical data for earnings and annual hours worked to set ρ
and σ. Due to unavailable data, we follow a different procedure. As in
Rios-Rull et al. (2003) we set both parameters as to match the existent
inequality in the Netherlands, as measured by the disposable income
Gini index. According to the OECD.stat, the disposable income Gini
index varies between 0.26 and 0.28 for the period 1990–2010. Thus
we set ρ = 0.70 and σ = 0.20, which leads to a disposable income
Gini index of around 0.28. As pointed by Krusell and Smith (1998),
this category of heterogeneous-agent models, based on idiosyncratic
shock and incomplete capital market, fail to fully capture the wealth in-
equality. As such, our simulations, with the present specification, pro-
duce wealth Gini index values around 0.30 which is relatively far from
the observed data. 17

3.6.6. Robustness

The results are quite robust across alternative structural features of
the economies. In order to test the robustness of our results, we
submitted all results to different values for crucial parameters of the
model, namely, the degree of risk aversion, μ and the labor supply
elasticity. When agents become more risk-averse, simulations reveal
a slight increase in welfare gain, and a small increase of wealth and
income inequality. A lower labor supply elasticity induces a marginal
decrease of welfare gain, with no significant effect on inequality.

4. Assessment of the welfare and inequality impacts from public
debt consolidations

After having characterized both Dutch consolidation episodes, we
work with a simulation using the model presented in Section 3.
Debt and fiscal instruments (other than taxes) are adjusted to match
the Dutch consolidation process as described in Section 3.6. Tax rate is
endogenous, adjusting to satisfy the government budget constraint. As

13 The solution is represented by a sequence of consumption and leisure to infinity,
\((c, l)_{i=0}^{\infty}.

14 Moreover, this value makes the model outcomes in terms of steady-state optimal
debt (results not reported) compatible with the average European values, given actual
data on fiscal policy variables.

15 In a recent paper D’Auria et al. (2010) estimated α = 0.35 for the EU15 over the

16 Source: AMECO database, k = 2.85 for the EU15.

17 Davies et al. (2008) estimate a wealth Gini index of 0.62.
for the EU15-1 block, we kept the cross-country average values for each fiscal variable constant during the transition period.

Fig. 4 depicts the impulse response of some of the main relevant macroeconomic variables to simulated shocks including the two Dutch debt-consolidation efforts (solid and dashed lines refer, respectively, to 1995–2002 and 2004–2007). It is apparent that the dynamics of the macroeconomic and inequality variables depend strongly on the fiscal instruments mainly used during the debt adjustment. The mixed strategy used during the second consolidation period (2004–2007) can be straightforwardly distinguished by the initial tax peak. This tax effort implies a decrease in the after-tax wage during the initial phase, decreasing the disposable income (also affected by the social transfer cuts). Incentives to work and save are smaller, pushing up the interest rate, which depresses the private capital level and leads to a temporary recession. Instead, with the pure-expenditure-side strategy of the first consolidation (1995–2002), the tax peak does not appear. Disposable income remains unaffected since transfer cuts are compensated by an increase in labor supply. Despite the slight increase of the interest rate and the private investment decrease, output does not decrease due to the positive labor supply response.

In a second phase of transition, and in both consolidation periods, the economy evolves towards the final steady state: interest and tax rates decrease, converging to a lower (than initial steady state) level, while disposable income, labor supply and consumption converge to higher (than initial steady state) levels.

Regarding to capital flows, namely the asset demand and supply adjustments that have occurred during the debt consolidation process, the increase of disposable income together with the accrued need for insurance due to social transfers cuts, leads, on the one hand, to a growing demand for asset holdings. On the other hand, public debt reduction leads to a retreat of asset supply. The combination of these two effects results in an excess of asset demand, supplied by foreign assets. Capital flows outward and the Netherlands improves its net foreign asset (NFA) position, proportionally to the

<table>
<thead>
<tr>
<th>Episode</th>
<th>Initial values</th>
<th>Final values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$d_t$</td>
<td>$t_{rt}$</td>
</tr>
<tr>
<td>1995–2002</td>
<td>75.74</td>
<td>16.37</td>
</tr>
<tr>
<td>2004–2007</td>
<td>52.00</td>
<td>11.40</td>
</tr>
</tbody>
</table>

Note: all variables are expressed in percentage variation.
magnitude of the fiscal adjustment. Fig. 5 plots the effective dynamics of the short run components of the net foreign asset position as measured by portfolio investments plus other investments (which includes loans, deposits and trade credits), during the two fiscal adjustments. The data lend support to the improvement of the NFA position as predicted by the model.

Table 3 summarizes, for the whole adjustment period, the overall welfare gains (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) attached to each consolidation episode. The WGI refers to the welfare gain per percentage point of debt reduction while TSC measures the combined reduction in social transfers and unproductive expenditure per percentage point of debt reduction. Both fiscal adjustments imply a positive welfare gain measured as a net improvement of per capita life-time consumption of 3.85% for the 1995–2002 period and of 0.84% for the 2004–2007 period. The WGI is also slightly superior in the first episode, pointing to the advantage of the pure expenditure-side strategy relative to the mixed strategy based on a combination of spending cuts and tax increases. Both consolidations are painful, with transition costs representing more than 80% of the potential welfare gain. Concerning inequality, both episodes present a similar hump-shaped path (see Fig. 4). Wealth (WG) and disposable income (IG) Gini indexes increase during the first phase of transition due to transfer

<table>
<thead>
<tr>
<th>Period</th>
<th>Debt reduction</th>
<th>Welf. gain</th>
<th>Trans. cost</th>
<th>WGI</th>
<th>TSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995–2002</td>
<td>25.21</td>
<td>0.0385</td>
<td>82.4%</td>
<td>0.0015</td>
<td>0.0021</td>
</tr>
<tr>
<td>2004–2007</td>
<td>6.37</td>
<td>0.0084</td>
<td>83.4%</td>
<td>0.0013</td>
<td>0.0015</td>
</tr>
</tbody>
</table>

Table 4 Fiscal consolidation in the Netherlands—inequality effects.

<table>
<thead>
<tr>
<th>Episode</th>
<th>Initial S. state</th>
<th>Final S. state</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WG</td>
<td>IG</td>
</tr>
<tr>
<td>1995–2002</td>
<td>0.3119</td>
<td>0.2946</td>
</tr>
<tr>
<td>2004–2007</td>
<td>0.2869</td>
<td>0.2772</td>
</tr>
</tbody>
</table>

Notes: WG = Wealth Gini index; IG = Income Gini index.

Besides the insurance and inequality effects, the transition costs in the second episode (2004–2007) also include efficiency losses due to tax distortion effects and consequent output retreat.

Concerning inequality, both episodes present a similar hump-shaped path (see Fig. 4). Wealth (WG) and disposable income (IG) Gini indexes increase during the first phase of transition due to transfer


Fig. 6. Welfare gains across wealth following debt consolidations in the Netherlands.

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18 The potential welfare gain corresponds to the final steady state level of welfare compared to the initial steady state, without taking into account the transition period.
cuts, and decrease gradually afterwards, as the economy evolves towards its final steady state, reaching lower, final steady state levels (see Table 4). Thus, after an increase in inequality during transition, fiscal consolidation entails improvements in the distribution of both wealth and income. This positive effect can be explained by a mechanism operating through the labor market given that labor supply elasticity of wage is higher among the richer. Given the increase in net wages and that the substitution effect dominates (over the income effect) among the richer, the disposable income distribution becomes more compressed. Additionally, the improved wealth distribution results from the higher marginal propensity of the poorer to save.

In Fig. 6 we use a broader inequality measure covering the welfare distribution. We plot the welfare gain curve of the fiscal adjustment (solid line) across wealth (asset holdings) and also the initial distribution of wealth (dashed line). The positive slope of the welfare gain curve indicates that the richer are the ones who have benefited more in both consolidation episodes. 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. Apparently, in terms of welfare inequality, the transfer effect dominated over the debt effect during the Dutch consolidation processes: despite debt reduction, welfare inequality across wealth increased.

5. Conclusion

Between 1990 and 2010, the Dutch government pursued two successful fiscal adjustments: first, in 1995–2002 through a pure expenditure-based strategy and second, in 2004–2007 through a mixed strategy based on social transfer cuts and tax increases. By using a general equilibrium model with heterogeneous agents, we simulate the two consolidation episodes to assess the underlying welfare and inequality effects. We use the endogenous cross-section distribution to compute several inequality indexes and we also assess the aggregate welfare intensity measured as a percentage change of per capita life-time consumption. Our results confirm the advantage of the 1995–2002 pure expenditure-based strategy, relative to the mixed-strategy of the 2004–2007. This results mainly from the incentive effect of the social transfers cuts on the labor supply in the first period, in contrast with the disincentives attached to the increase in distortionary taxation operating in the 2004–2007 episode. The model also predicts that significant transition costs were involved in both episodes. Concerning the first fiscal adjustment (1995–2002), these costs reflect a lower capacity of households to smooth their utility throughout time (insurance) and also a more unequal welfare distribution. Besides insurance and inequality costs, the transition costs during the second adjustment period (2004–2007) were further amplified by the distortional impacts of the higher tax effort.

Overall (considering transition plus final steady state equilibrium), the welfare gains, although positive for all households, present a bias towards the wealthier in both episodes, which means that consolidation costs were mostly supported by the poorer. This reflects a better capacity of the wealthier to accommodate the transition impacts, reaching a better combination of labor, leisure and savings. Finally, these two consolidation episodes, as they were described throughout the paper strengthen the relevance of budgetary institutions as complement for successful consolidation. The Dutch fiscal framework represents a typical example of the contract approach which better suits electoral systems with proportional representation, leading normally to coalition governments (Hallerer and Hagen, 1999). Contrary to the Purple Cabinet, in place during the more successful 1995–2002 consolidation, the second consolidation episode (2004–2007) occurred under different and unstable coalitions. This stresses the important role for independent institutions (including the so-called “fiscal councils”) in the budgetary process, namely that of the Netherlands Bureau for Economic Policy Analysis. The influence of such bodies, not explicitly captured by our model, tends to be more relevant as new consolidation experiences are implemented in the EU (European-Commission, 2003).

References


21 They are conceived to provide independent forecasts, analyze macroeconomic and budgetary plans and issue normative reports as well as policy recommendations, among other tasks (European-Commission, 2003).

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