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Chapter Author: Adriana Arreaza, Bent E. Sgrensen, Oved Yosha

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# 3 Consumption Smoothing through Fiscal Policy in OECD and EU Countries

Adriana Arreaza, Bent E. Sørensen, and Oved Yosha

## 3.1 Introduction

There is wide agreement that large government budget deficits are undesirable. The main argument is that a deficit forces the government to borrow, raising interest rates and crowding out private-sector investment. Furthermore, accumulated government debt constitutes a potentially unfair burden on future generations and reduces a country's credit rating on international markets.

Despite these obvious drawbacks, most governments run substantial deficits. Deficit spending may be partly driven by a desire to smooth the distortion of taxes needed to finance government consumption over time (Barro 1979) but, as stressed by Velasco (chap. 2 in this volume), the magnitude of budget deficits since the early seventies has been too large to be explained by such intertemporal tax smoothing. Recently, a literature has developed seeking to explain the formation of government deficits as a consequence of a coordination failure among spending ministers or political parties (in the "tragedy of the commons" sense), or as a consequence of excessively short planning horizons of governments who do not expect to remain in office (e.g., Hallerberg and von Hagen, chap. 9 in this volume; Velasco, chap. 2 in this volume). In either case, the government does not internalize the full social cost of deficit spending, which

Adriana Arreaza is a Ph.D. student in the Economics Department at Brown University. Bent E. Sørensen is assistant professor of economics at Brown University. Oved Yosha is senior lecturer at the Berglas School of Economics, Tel Aviv University.

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results in deficits that are larger than what is socially optimal.<sup>1</sup> In other words, large deficits may be a consequence of “fiscal sinning,” reflecting deficiencies in the political decision-making process rather than long-run optimal planning. In some countries, there are legal restrictions on the size of the deficit for various levels of government. The effectiveness of such restrictions has been studied by, for example, Poterba (1994), Bohn and Inman (1996), and Poterba and Rueben (chap. 8 in this volume).

Government deficits may serve to reduce the variability of consumption over time if, for example, the government has better access to foreign credit markets than the private sector. Among the authors who have focused on the cyclical properties of government deficits, Gavin and Perotti (1997) have pointed out that deficits have been countercyclical in OECD countries, contributing to the stabilization of consumption over the business cycle,<sup>2</sup> whereas in Latin America government deficits have been procyclical (see also Gavin et al. 1996). Sørensen and Yosha (1998) have recently found that government budget deficits play a central role in smoothing consumption among OECD and EU countries. They report, for the period 1966–90, that there is virtually no cross-country income smoothing (income insurance) among OECD countries, and that the only operative mechanism for smoothing gross domestic product (GDP) shocks is through borrowing and lending. They estimate that about 40 percent of shocks to GDP are smoothed on average at the one-year frequency through this channel, with about half the smoothing achieved through government budget deficits and half through corporate saving (dividend smoothing). At the three-year frequency all the smoothing is achieved through government budget deficits, with only 25 percent of shocks to GDP absorbed.

To obtain a more complete picture of government consumption smoothing mechanisms, we measure the amount of smoothing achieved through various components of the deficit. For EU countries, we find that, at the one-year frequency, about 13 percent of shocks to GDP are smoothed on average via government consumption, 18 percent of shocks are smoothed via government transfers, and about 5 percent are smoothed via government subsidies, while taxes do not smooth consumption. The results for OECD countries are very similar.<sup>3</sup> Taxes actually dis-smooth consumption, that is, they increase less than proportionately with output, which may be due to institutional rigidities in the tax system or to increased tax evasion during booms. If excessive deficits are a result of political expedience, with deficits increasing sharply in recessions

1. The “tragedy of the commons” is a classic example of such an outcome. When economic agents possess a common resource—the grass in the commons, or a marine fishery as in Levhari and Mirman 1980—they tend to deplete the resource too quickly.

2. Evidence regarding the countercyclicality of U.S. federal debt since the 1920s is provided by Barro (1979).

3. These findings are consistent with results reported by Gavin and Perotti (1997). The main advantage of our method for studying this issue is that it allows us to estimate the fraction of shocks to GDP absorbed through each fiscal component.

but not rapidly reversed in booms, then the government deficit will absorb a larger fraction of negative shocks than of positive shocks. We examine this issue, finding that government consumption smooths positive and negative output shocks equally. Government transfers provide more smoothing of negative shocks among EU countries but not among OECD countries, which probably reflects a higher commitment to social insurance in EU countries.

Next, we investigate the relation between the level of the government deficit and the amount of consumption smoothing achieved through (government and private) saving. The level of the deficit may affect the ability of the government to use the deficit as a tool for smoothing consumption. For example, governments that during recessions provide many public services and distribute transfers generously, but tax moderately, may find it hard to reverse this pattern in booms due to institutional rigidities or political pressure. It is, therefore, conceivable that high deficits are associated with little, not much, government consumption smoothing. The level of the government deficit may also affect the ability of the private sector to smooth consumption since government borrowing may crowd out private-sector borrowers who face high interest rates or credit constraints. To investigate these issues empirically, we split our sample into high- and low-deficit countries, finding no evidence in support of such effects. There seems to be no trade-off between high government deficits in a country and the ability to smooth consumption via saving in that country.

Hallerberg and von Hagen (chap. 9 in this volume) find that fiscal institutions have a significant impact on the level of the public sector deficit. We ask whether the amount of smoothing via deficits differs according to the type of budgetary institution that determines government fiscal policy, using the classification of Hallerberg and von Hagen, to whom we are grateful for kindly providing us the data. We find that in countries where there is “delegation” of power (e.g., to a strong finance minister) or where fiscal targets are negotiated effectively by coalition members, consumption smoothing via government consumption and government transfers is considerably higher (although smoothing via government subsidies is smaller). This result is not driven by the effect of budgetary institutions on the level of the deficit since there is no apparent statistical relation between the level of the deficit and the amount of consumption smoothing in a country. We interpret this finding as evidence that effective budgetary institutions can accomplish efficient consumption smoothing via government deficit spending *and* lower average deficits.

Our findings have implications for the evaluation of the Maastricht guidelines requiring countries wishing to join the European Monetary Union (EMU) to reduce the yearly deficit to less than 3 percent of GDP and national debt to less than 60 percent of GDP. Sørensen and Yosha (1998) suggested that since much of the smoothing among EU countries is achieved via government lending and borrowing (with all the smoothing achieved via this channel at the three-year frequency), the Maastricht fiscal straitjacket should be relaxed, at

least until capital markets are sufficiently integrated to carry out this role, as they do in the United States (see Asdrubali, Sørensen, and Yosha 1996). In light of the evidence suggesting that a large deficit is not necessary for better consumption smoothing in a country (including consumption smoothing via the deficit itself), we must qualify our criticism of the Maastricht guidelines by stressing that average deficits must be kept low, but that governments should be allowed, temporarily, to run high deficits during recessions.

We realize that the enforcement of such guidelines is tricky, for example, due to potential time inconsistency in the policy of the European Commission with regard to governments that run persistent deficits,<sup>4</sup> and since capital and credit markets may not generate effective sanctions to ensure fiscal discipline. We nevertheless believe that it is important to have a clear view regarding the “ideal” fiscal policy that combines the benefits from long-run fiscal discipline with the benefits from government consumption smoothing in an incomplete markets environment.<sup>5</sup>

In the next section we briefly describe the channels through which income and consumption smoothing occur among regions or countries, and describe the methodology for measuring the fraction of shocks to GDP smoothed through each channel. In section 3.3 we update the main regression of Sørensen and Yosha (1998) to the sample used here, and then present our results regarding patterns of smoothing through fiscal policy. Section 3.4 concludes.

### **3.2 Income and Consumption Smoothing among OECD and EU Countries**

We begin by reviewing the channels through which regions and countries smooth output shocks. Government fiscal policy is but one such channel. It is not obvious that governments should use fiscal policy to smooth shocks to GDP since, in principle, consumption can be smoothed through transactions by individuals and corporations on markets. It can be argued, though, that if markets fail to provide income and consumption smoothing, governments can step in, borrowing and lending internationally on behalf of the country’s citizens to help smooth national consumption. This, however, may slow down the development of financial markets. In light of these considerations we believe that it is useful to perform the analysis of the consumption-smoothing role of government fiscal policy in a more general framework where other forms of income and consumption smoothing are analyzed. We therefore begin by presenting such a framework, developed in Asdrubali, Sørensen, and Yosha 1996.

4. For example, due to the political cost or the ex post nonoptimality of imposing sanctions on countries in recession.

5. For further discussion of EMU-related fiscal issues, see Goodhart and Smith 1993, Inman and Rubinfeld 1994, and Eichengreen and von Hagen 1995.

### 3.2.1 Channels of Income and Consumption Smoothing among Countries

There are several mechanisms for smoothing income and consumption among regions or countries. Individuals in one country can hold claims to output produced in other countries. For example, if institutional investors (e.g., pension funds) in a country invest internationally, income in that country will comove with the output in other countries. Similarly, if financial intermediaries in one country lend to borrowers in other countries, the flow of interest payments smooths income in the lending country. We refer to this mechanism as income smoothing (or risk sharing) through cross-border ownership of productive assets. It consists mainly of cross-country income smoothing via capital income flows, but, more generally, it also includes labor income flows.

Similarly, international transfers smooth income if the net transfers to a country are larger during (country-specific) recessions. Of course, the motivation for having an international tax-transfer system need not be related to income smoothing, but a tax-transfer system designed to redistribute income across countries or to finance multinational projects may contribute to international income smoothing. The empirical implication of income smoothing, whether through capital markets or via international transfers, is that cross-country income variability will be lower than cross-country output variability.

Intertemporal consumption smoothing—through saving and dis-saving—also contributes to intercountry consumption smoothing. Individuals in one country can increase or decrease their saving in response to income shocks, adjusting the amount of domestic investment or transferring funds across country borders with the help of financial intermediaries. Similarly, corporations can retain more or less profits in response to profitability shocks. The retained profits can be invested in physical assets in the country where the corporation operates, or in financial assets; the funds may then finance investment in the home country or in other countries. In any event, the empirical implication is that cross-country consumption variability will be lower than cross-country income variability.

Intertemporal consumption smoothing through government saving and dis-saving has precisely the same effect. During recessions the government runs a large deficit, borrowing internationally, and during booms it runs a surplus (or a smaller deficit), reducing its stock of debt (or the growth rate of its debt).<sup>6</sup> The government can run a countercyclical deficit by adopting a countercyclical expenditure policy, a countercyclical transfers and subsidies policy, or a procyclical tax policy. These forms of government consumption smoothing have the same empirical consequence, namely, to reduce cross-country consumption variability.

Cross-country income smoothing via factor income flows is reflected in the

6. In practice, the government may borrow domestically, crowding out private-sector borrowers who are forced to raise money internationally. The final result is the same.

National Accounts data as the difference between GDP and gross national product (GNP). The difference between the GNP and GDP of a country is precisely the net flow of capital and labor income to that country (see Atkeson and Bayoumi 1993). Net international transfers are measured as the difference between Disposable National Income (DNI) and National Income (NI).<sup>7</sup> Consumption smoothing is manifested in the National Accounts as the difference between disposable income, DNI, and total (private and government) consumption,  $C + G$ .

Patterns of capital depreciation may also contribute to cross-country income smoothing. In the National Accounts, depreciation is responsible for the discrepancy between GNP and NI. As depreciation is calculated according to fixed accounting rules, and since the capital-output ratio is typically countercyclical, depreciation in the National Accounts data will constitute a larger fraction of output in recessions and a smaller fraction in booms, resulting in higher cross-sectional variance of NI with respect to GNP (dis-smoothing).<sup>8</sup>

### 3.2.2 Measuring the Fraction of Shocks Smoothed through Various Channels

We begin with a benchmark—perfect consumption smoothing and full risk sharing. Risk is fully shared within a group of countries if the consumption of a country comoves with the aggregate consumption of the group, but does not comove with country-specific shocks.<sup>9</sup> Denote the period  $t$  total (private and public) per capita consumption of the representative consumer of country  $i$  by  $C_t^i + G_t^i$ , and the period  $t$  per capita aggregate GDP of the entire group of countries by  $GDP_t$ . Then, when individuals have the same constant elasticity utility functions and are equally impatient across countries, full risk sharing implies that

$$(1) \quad C_t^i + G_t^i = k^i GDP_t,$$

where  $k^i$  is a country-specific (time and state of the world invariant) constant representing the strength of country  $i$ 's claim to output in the risk-sharing ar-

7. The National Accounting concepts we use are those of the OECD National Accounts publications. These concepts differ slightly from those in the United States Statistical Abstract. For example, the Abstract defines Net National Income as Net National Product minus indirect taxes plus subsidies, whereas in the OECD National Accounts publications Gross National Income is obtained from Gross National Product by adding and subtracting only *international* taxes and transfers.

8. Real capital depreciation may be affected by economic activity. For example, there may be more capital depreciation during booms due to more intense utilization of productive capacity. Such effects are not likely to be reflected in the National Accounts data.

9. See, e.g., Cochrane 1991, Mace 1991, Obstfeld 1994, and Townsend 1994. For extensions of the basic framework, see, e.g., Canova and Ravn 1996 and Lewis 1996. A comprehensive survey of research on international diversification is provided in Lewis 1995 and Obstfeld and Rogoff 1996. Recent related contributions can be found in Leiderman and Razin 1994. For microstudies of risk sharing, see, e.g., Altug and Miller 1990 and Hayashi, Altonji, and Kotlikoff 1996. For an estimation of welfare gains from risk sharing, see, e.g., van Wincoop 1994 and Tesar 1995 for OECD countries, and Sørensen and Yosha 1996 for U.S. states.

rangement. In other words, when risk is fully shared, consumption in each country is a country-specific fixed proportion of aggregate output.<sup>10</sup>

The derivation of equation (1) can be found in most of the references in note 9 and is, therefore, omitted. It should be stressed, though, that expected utility maximization by the representative consumer in each country is part of this derivation, and for equation (1) to hold it is necessary that, for each country, the marginal utility of consumption in period  $t$  be equal to the expected marginal utility in period  $t + 1$ . Full risk sharing thus implies perfect consumption smoothing for each country, in the standard Euler equation sense.

Returning to our discussion of the channels of income and consumption smoothing among countries, we think of consumers in each country progressing gradually from their endowment (no intertemporal smoothing nor intercountry risk sharing) toward full risk sharing and perfect consumption smoothing, that is, toward the allocation in equation (1), which may or may not be eventually achieved. The first level of smoothing is income smoothing (income insurance) through international factor income flows. In theory, full risk sharing may be achieved already at this level of smoothing, in which case  $\text{GNP}_t^i = k^i \text{GDP}_t^i$  with no further need for income or consumption smoothing. If full risk sharing is not achieved at this level, there is scope for further income smoothing through international transfers. If full risk sharing is not achieved after the second level of income smoothing, there is scope for consumption smoothing, that is, borrowing and lending by individuals, corporations, or the government.<sup>11</sup> Then, after all channels of income and consumption smoothing have been exhausted, equation (1) may or may not hold. Even if equation (1) does not hold, it is still of interest to estimate the incremental amount of smoothing that is achieved through the various channels. We now describe how the estimation is carried out.

Consider the identity

$$\text{GDP}^i = \frac{\text{GDP}^i}{\text{GNP}^i} \frac{\text{GNP}^i}{\text{NI}^i} \frac{\text{NI}^i}{\text{DNI}^i} \frac{\text{DNI}^i}{C^i + G^i} (C^i + G^i),$$

where all the magnitudes are in per capita terms, and  $i$  is an index of countries. The national accounting identities that are relevant here are  $\text{GNP} = \text{GDP} + \text{net factor income}$ ,  $\text{NI} = \text{GNP} - \text{capital depreciation}$ ,  $\text{DNI} = \text{NI} + \text{international transfers}$ ,  $C + G = \text{NI} - \text{net saving}$ .

If there is smoothing through net factor income flows, namely, income smoothing via cross-country ownership of productive assets, then  $\text{GDP}^i/\text{GNP}^i$

10. This formulation assumes that private and public consumption are perfect substitutes. It is also assumed that GDP shocks are exogenous, which is a reasonable assumption at relatively short time horizons. At longer horizons, income and consumption smoothing patterns may affect the cross-country correlation of GDP shocks, as argued by Frankel and Rose (1998).

11. It may not be optimal for consumers to fully smooth shocks to income (i.e., output shocks that were not insured) if these shocks are highly persistent. Lack of consumption smoothing therefore need not imply any imperfections of credit markets.



should vary positively with  $GDP^i$ . Similarly, if depreciation of capital further smooths income, then  $GNP^i/NI^i$  should vary positively with  $GDP^i$ . If net transfers from abroad, for example, transfers from EU institutions, contribute to income smoothing, then  $NI^i/DNI^i$  should vary positively with  $GDP^i$ . If saving further smooths total consumption, then  $DNI^i/(C^i + G^i)$  should vary positively with  $GDP^i$ . Finally, to the extent that not all the shocks to  $GDP^i$  are smoothed,  $C^i + G^i$  will be positively correlated with  $GDP^i$ .<sup>12</sup>

The cross-sectional smoothing of income shocks may involve cross-border flows of funds as in the case of factor income flows and international transfers, or it may not, as in the case of domestic investment or capital depreciation. Accounting capital depreciation of a country's capital stock is not sensitive to GDP fluctuations since it is approximately a predetermined proportion of the capital stock that itself does not vary much with shocks to GDP. Therefore, the ratio of accounting capital depreciation to GDP will typically decline when a country is hit by a positive shock and rise in response to a negative shock, with the result that capital depreciation typically contributes to cross-sectional dis-smoothing of shocks to output.

To obtain a measure of smoothing, we use the above identity

$$GDP^i = \frac{GDP^i}{GNP^i} \frac{GNP^i}{NI^i} \frac{NI^i}{DNI^i} \frac{DNI^i}{C^i + G^i} (C^i + G^i),$$

that holds for any given year in the sample. To stress the cross-sectional nature of our derivation, we suppress the time index. Now take logs and time differences, multiply both sides by  $\Delta \log GDP^i$  (minus its mean), and take the cross-sectional average, obtaining the following variance decomposition:<sup>13</sup>

$$\begin{aligned} \text{var}\{\Delta \log GDP^i\} &= \text{cov}\{\Delta \log GDP^i, \Delta \log GDP^i - \Delta \log GNP^i\} \\ &\quad + \text{cov}\{\Delta \log GDP^i, \Delta \log GNP^i - \Delta \log NI^i\} \\ &\quad + \text{cov}\{\Delta \log GDP^i, \Delta \log NI^i - \Delta \log DNI^i\} \\ &\quad + \text{cov}\{\Delta \log GDP^i, \Delta \log DNI^i - \Delta \log(C^i + G^i)\} \\ &\quad + \text{cov}\{\Delta \log GDP^i, \Delta \log(C^i + G^i)\}. \end{aligned}$$

Dividing by  $\text{var}\{\Delta \log GDP^i\}$  we get  $1 = \beta_f + \beta_d + \beta_\tau + \beta_s + \beta_u$ , where  $\beta_f$  is the ordinary least squares estimate of the slope in the cross-sectional regression

12. Due to the more limited availability of data for U.S. states, Asdrubali, Sørensen, and Yosha (1996) considered the following channels for smoothing shocks to gross state product: "capital market smoothing," which is income smoothing through cross-state factor income flows, depreciation, and corporate saving; "federal smoothing," which is income smoothing through interstate taxes and transfers by the U.S. federal government; and "credit market smoothing," which refers to consumption smoothing through personal and state government saving.

13. In this equation "var{X}" and "cov{X,Y}" denote the statistics  $1/N \sum_{i=1}^N (X^i - \bar{X})^2$  and  $1/N \sum_{i=1}^N (X^i - \bar{X})(Y^i - \bar{Y})$ , respectively, where  $N$  is the number of countries in the sample.

of  $\Delta \log \text{GDP}^i - \Delta \log \text{GNP}^i$  on  $\Delta \log \text{GDP}^i$ ,  $\beta_d$  is the slope in the cross-sectional regression of  $\Delta \log \text{GNP}^i - \Delta \log \text{NI}^i$  on  $\Delta \log \text{GDP}^i$ , and similarly for  $\beta_\tau$  and  $\beta_s$ .  $\beta_u$  is the coefficient in the cross-sectional regression of  $\Delta \log(C^i + G^i)$  on  $\Delta \log \text{GDP}^i$ . We interpret the  $\beta$  coefficients as the incremental percentage amounts of smoothing achieved at each level, and  $\beta_u$  as the percentage of shocks not smoothed. If  $\beta_u = 0$ , there is full risk sharing and the remaining coefficients sum to 1. Otherwise, they sum to less than 1. We do not constrain any of the  $\beta$  coefficients, at any level, to be positive or less than 1. Therefore, if there is dis-smoothing at some level, it will be reflected in a negative value of  $\beta$ .

At the practical level, the following (panel) equations are estimated:

$$\begin{aligned}
 \Delta \log \text{GDP}_t^i - \Delta \log \text{GNP}_t^i &= v_{f,t} + \beta_f \Delta \log \text{GDP}_t^i + \varepsilon_{f,t}^i, \\
 \Delta \log \text{GNP}_t^i - \Delta \log \text{NI}_t^i &= v_{d,t} + \beta_d \Delta \log \text{GDP}_t^i + \varepsilon_{d,t}^i, \\
 (2) \quad \Delta \log \text{NI}_t^i - \Delta \log \text{DNI}_t^i &= v_{\tau,t} + \beta_\tau \Delta \log \text{GDP}_t^i + \varepsilon_{\tau,t}^i, \\
 \Delta \log \text{DNI}_t^i - \Delta \log (C_t^i + G_t^i) &= v_{s,t} + \beta_s \Delta \log \text{GDP}_t^i + \varepsilon_{s,t}^i, \\
 \Delta \log (C_t^i + G_t^i) &= v_{u,t} + \beta_u \Delta \log \text{GDP}_t^i + \varepsilon_{u,t}^i,
 \end{aligned}$$

where  $v_{\cdot,t}$  are time-fixed effects. The inclusion of time-fixed effects is crucial, since with time-fixed effects the  $\beta$  coefficients are weighted averages of the year-by-year cross-sectional regressions.<sup>14</sup> The time-fixed effects capture year-specific impacts on growth rates, most notably the impact of the growth in aggregate EU (or OECD) output. To take into account autocorrelation in the residuals we assume that the error terms in each equation and in each country follow an AR(1) process. Since the samples are short, we assume that the autocorrelation parameter is identical across countries and equations. We further allow for country-specific variances of the error terms. In practice, we estimate the system in equation (2) by a two-step generalized least squares (GLS) procedure. Unless we explicitly say otherwise, we use differenced data at the yearly frequency.

### 3.3 Consumption Smoothing through Fiscal Policy among OECD and EU Countries: Empirical Results

The data are from the OECD National Accounts, Detailed Tables (vol. 2), 1996 diskettes. For the series we need, there are consistent data for the majority of countries for the period 1971–93.

For the sake of consistency, and as a robustness check, we update here the relevant analysis in Sørensen and Yosha 1998 using differenced data for 1971–

14. See Asdrubali, Sørensen, and Yosha 1996, note 5, for an explicit formula.

**Table 3.1** Channels of Income and Consumption Smoothing (percent)

	EU8 1971–93	EU11 1980–93	OECD14 1971–93	OECD17 1980–93
Factor income ( $\beta_f$ )	–1 (1)	–3 (2)	–1 (1)	–1 (1)
Capital depreciation ( $\beta_d$ )	–8 (1)	–8 (1)	–8 (1)	–9 (1)
International transfers ( $\beta_t$ )	3 (2)	5 (2)	2 (1)	3 (1)
Saving ( $\beta_s$ )	50 (5)	37 (5)	48 (3)	46 (4)
Not smoothed ( $\beta_u$ )	56 (4)	69 (5)	59 (3)	62 (3)

*Note:* EU8: Austria, Belgium, Denmark, Finland, France, Greece, Germany, United Kingdom. EU11: EU8 + Italy, Netherlands, Sweden. OECD14: EU8 + Australia, Canada, Iceland, Japan, Switzerland, United States. OECD17: OECD14 + Italy, Netherlands, Sweden. Fraction of shocks absorbed at each level of smoothing. Standard errors in parentheses.  $\beta_f$  is the GLS estimate of the slope in the regression of  $\Delta \log \text{GDP}^i - \Delta \log \text{GNP}^i$  on  $\Delta \log \text{GDP}^i$ ,  $\beta_d$  is the slope in the regression of  $\Delta \log \text{GNP}^i - \Delta \log \text{NI}^i$  on  $\Delta \log \text{GDP}^i$ , and similarly for  $\beta_t$  and  $\beta_s$ .  $\beta_u$  is the coefficient in the regression of  $\Delta \log (C^i + G^i)$  on  $\Delta \log \text{GDP}^i$ . We interpret the  $\beta$  coefficients as the incremental percentage amounts of smoothing achieved at each level, and  $\beta_u$  as the percentage of shocks not smoothed.

93. In table 3.1 we display the estimated percentages of shocks to GDP smoothed through each channel, among OECD and EU countries. The results are very similar to those in Sørensen and Yosha 1998.<sup>15</sup> It is immediately apparent that there is negligible income smoothing through factor income flows, among EU as well as OECD countries. This finding is fully consistent with the Feldstein and Horioka (1980) puzzle and with the “home bias” puzzle (French and Poterba 1991; Tesar and Werner 1995).<sup>16</sup> There is also very little smoothing via international transfers, resulting in almost no income smoothing among OECD and EU countries.

The only operative smoothing mechanism is consumption smoothing through saving. For the period 1971–93 it amounts to 48 percent of shocks to GDP for OECD countries and 50 percent of shocks for EU countries. Furthermore, Sørensen and Yosha (1998) estimated the fraction of shocks smoothed by the main components of national saving, and found that personal saving contributes nothing to cross-country consumption smoothing, corporate saving absorbs 23 percent of shocks to GDP at the one-year frequency but provides no smoothing at the three-year frequency, while government saving absorbs about 25–30 percent of shocks at both frequencies. A plausible interpretation is that the longer differencing period captures the response of changes in in-

15. The estimated coefficients do not sum to 100 percent because of rounding.

16. See Gordon and Bovenberg 1996 for a recent contribution on this issue.

come and consumption to longer-lasting shocks to GDP. Thus, in a bad year, corporations decrease (on average) the fraction of earnings they retain (to avoid a sharp decrease in distributed profits), but over longer horizons corporations do not change the fraction of earnings retained. By contrast, governments respond to temporary as well as to longer-lasting shocks by adjusting the budget deficit in response to fluctuations in GDP.

As a further robustness check, we decompose  $\Delta \log$  GDP into a predicted part and an unpredicted part. As predictors we use lagged  $\Delta \log$  GDP and lagged  $\Delta \log$  WORLD GDP (two lags of each). We then estimate equation (2) using the fitted value and the innovations as regressors (each separately, in place of  $\Delta \log$  GDP), finding that the estimated coefficients are similar for the predicted and the unpredicted components of changes in GDP.<sup>17</sup>

We turn to a more detailed analysis of the patterns of consumption smoothing via government fiscal policy, which is our focus in this paper. Due to data availability, the countries included vary somewhat across regressions. They are listed in the notes to the various tables. In all regressions for the OECD group we excluded Luxembourg and Mexico.

### 3.3.1 Smoothing through Fiscal Components:

#### Tax Smoothing or Consumption Smoothing?

Table 3.2 displays the average size (across countries and across years) of the main components of the budget for the general government sector (central + local government). Most notable is the larger fraction of GDP allocated to government transfers (mainly social security benefits and social assistance) in EU countries in comparison to the entire OECD group, although also taxes are higher on average among the EU countries.<sup>18</sup>

Table 3.3 displays averages across countries of simple country-by-country time series correlations of government budget components with GDP. These correlations do not control for aggregate (world) output fluctuations and exhibit high variation across countries, but are nevertheless suggestive. It is apparent that government transfers and subsidies are acyclical or countercyclical and, therefore, are likely to play a major role in cross-country consumption smoothing, particularly in EU countries, where government transfers on average are larger relative to GDP. Furthermore, transfers and subsidies are substantially more countercyclical in the later sample period, suggesting that the

17. The amount of income smoothing via factor income flows of both types of shocks is not significantly different from zero, the amount of income smoothing via international transfers varies from 1 to 5 percent of shocks and is precisely estimated, and the fraction of shocks smoothed through saving varies from 29 to 46 percent, which is qualitatively similar to the results displayed in table 3.1.

18. We stress that transfers and taxes in tables 3.2–3.7 refer to within-country (not intercountry) transfers, subsidies, and taxes. Intercountry net transfers vary roughly proportionately with GDP (table 3.1).

**Table 3.2 The Size of Fiscal Components (percentage of GDP)**

	EU8 1971–93	EU11 1980–93	OECD14 1971–93	OECD18 1980–93
Government consumption	19 (3)	20 (4)	18 (4)	19 (4)
Government transfers	17 (4)	20 (5)	15 (4)	16 (6)
Government subsidies	3 (1)	3 (1)	2 (1)	3 (1)
Government indirect taxes	15 (2)	15 (2)	13 (3)	14 (4)
Government direct taxes	25 (5)	28 (6)	23 (5)	25 (7)

*Note:* EU8: Austria, Belgium, Denmark, Finland, France, Greece, Germany, United Kingdom. EU11: EU8 + Italy, Netherlands, Sweden. OECD14: EU8 + Australia, Canada, Japan, Norway, Switzerland, United States. OECD18: OECD14 + Iceland, Italy, Netherlands, Sweden. The sample periods for Norway are 1969–91 and 1978–91. For each country we calculated the mean over time of each fiscal component. For each group the mean of these means is displayed in the table and the standard error of the means is displayed in parentheses. Government transfers do not include interest payments, subsidies, and transfers to the rest of the world.

**Table 3.3 The Cyclicity of Fiscal Components (correlation with GDP)**

	EU8 1971–93	EU11 1980–93	OECD14 1971–93	OECD18 1980–93
Government consumption	.23 (.20)	.32 (.34)	.26 (.17)	.32 (.34)
Government transfers	-.07 (.29)	-.14 (.39)	-.13 (.26)	-.20 (.41)
Government subsidies	.06 (.27)	-.13 (.30)	.06 (.27)	-.11 (.29)
Government indirect taxes	.68 (.18)	.60 (.24)	.66 (.15)	.62 (.20)
Government direct taxes	.41 (.14)	.52 (.30)	.48 (.20)	.58 (.26)

*Note:* EU8: Austria, Belgium, Denmark, Finland, France, Greece, Germany, United Kingdom. EU11: EU8 + Italy, Netherlands, Sweden. OECD14: EU8 + Australia, Canada, Japan, Norway, Switzerland, United States. OECD18: OECD14 + Iceland, Italy, Netherlands, Sweden. The sample periods for Norway are 1969–91 and 1978–91. For each country, we calculated the correlation of the growth rate of every fiscal component with the growth rate of GDP. The mean of these correlations is displayed in the table and the standard error (across countries) of the correlations is displayed in parentheses.

macroeconomic insurance role of these budget components has increased in recent years.

Table 3.4 displays the fraction of shocks to GDP absorbed by various components of the general public budget. We measure the fraction of shocks smoothed via government consumption by estimating the coefficient in the

**Table 3.4 Smoothing by Fiscal Components (percent)**

	EU8 1971–93	EU11 1980–93	OECD14 1971–93	OECD18 1980–93
Government consumption	13 (2)	8 (2)	14 (1)	13 (1)
Government transfers	19 (2)	19 (2)	17 (1)	18 (1)
Government subsidies	4 (1)	6 (1)	3 (1)	4 (1)
Government indirect taxes	–3 (2)	–4 (2)	–2 (1)	–3 (1)
Government direct taxes	–15 (5)	–2 (6)	–9 (3)	–5 (3)

*Note:* EU8: Austria, Belgium, Denmark, Finland, France, Greece, Germany, United Kingdom. EU11: EU8 + Italy, Netherlands, Sweden. OECD14: EU8 + Australia, Canada, Japan, Norway, Switzerland, United States. OECD18: OECD14 + Iceland, Italy, Netherlands, Sweden. The sample periods for Norway are 1969–91 and 1978–91. Fraction of shocks smoothed via fiscal components. Standard errors in parentheses. For example, smoothing through government consumption is measured by estimating the coefficient in the panel regression (with time-fixed effects) of  $\Delta \log \text{DNI}^i - \Delta \log(\text{DNI}^i + \text{government consumption}^i)$  on  $\Delta \log \text{GDP}^i$ . If DNI + government consumption is less correlated with GDP cross-sectionally than DNI, then the coefficient will be positive, reflecting the fraction of shocks to DNI absorbed by government consumption. The coefficient in the regression of  $\Delta \log \text{DNI}^i - \Delta \log(\text{DNI}^i + \text{government transfers}^i)$  on  $\Delta \log \text{GDP}^i$  measures the fraction of shocks smoothed via government transfers and similarly for government subsidies. The coefficient in the regression of  $\Delta \log \text{DNI}^i - \Delta \log(\text{DNI}^i - \text{taxes}^i)$  on  $\Delta \log \text{GDP}^i$  measures the fraction of shocks smoothed via taxes (government direct or indirect taxes, according to the case).

panel regression (with time-fixed effects) of  $\Delta \log \text{DNI}^i - \Delta \log(\text{DNI}^i + \text{government consumption}^i)$  on  $\Delta \log \text{GDP}^i$ , that is, we measure the fraction of the cross-sectional variance of GDP absorbed by government consumption. If the cross-sectional correlation of (DNI + government consumption) with GDP is lower than the cross-sectional correlation of DNI with GDP, then the coefficient in this regression should be positive, measuring the fraction of shocks to GDP absorbed by government consumption. The coefficient in the regression of  $\Delta \log \text{DNI}^i - \Delta \log(\text{DNI}^i + \text{government transfers}^i)$  on  $\Delta \log \text{GDP}^i$  measures the fraction of shocks smoothed via government transfers. Similarly for government subsidies. The coefficient in the regression of  $\Delta \log \text{DNI}^i - \Delta \log(\text{DNI}^i - \text{taxes}^i)$  on  $\Delta \log \text{GDP}^i$  measures the fraction of shocks smoothed via taxes (government direct or indirect taxes, according to the case).<sup>19</sup>

The results in table 3.4 bear out the above conjecture regarding the consumption-smoothing role of government transfers, which are, indeed, the central mechanism providing consumption smoothing, although substantial

19. In relation to the decomposition displayed in table 3.1, the fraction of shocks smoothed by components of the government budget are a further decomposition of the fraction of shocks smoothed via saving.

consumption smoothing is also achieved through government consumption. Even though government consumption varies positively with GDP (table 3.3), it tends to vary less than proportionately with GDP, which reduces the correlation of  $C + G$  (total consumption) with GDP, thereby contributing to consumption smoothing. It is worth noting that although government transfers constitute a smaller fraction of GDP compared to government consumption (table 3.2), transfers provide more consumption smoothing since they are less correlated with GDP.<sup>20</sup>

Subsidies also smooth consumption, slightly more in EU countries than in the entire OECD group, and somewhat more in the later sample, as one might expect from table 3.2. It is worth noting that a small and countercyclical component, such as subsidies, can smooth consumption significantly. Direct and indirect taxes dis-smooth consumption. That is, taxes vary less than proportionally with GDP. When income increases by 1 percent, taxes typically increase by less than 1 percent (some taxes, for example taxes on property, may not depend on income in the short run). The amount of dis-smoothing from direct taxes is declining over time, reflecting that direct taxes have become closer to being proportional to income at the annual frequency. Interestingly, the amount of consumption smoothing provided by indirect taxes and subsidies taken together is close to zero. We may be picking up here cross-subsidization among different groups within countries (e.g., indirect energy taxes that help finance subsidies to farmers), while the overall consumption smoothing effect of these two fiscal components appears to be close to zero.

An important consequence of the results in table 3.4 is that consumption smoothing via government deficits is achieved through government consumption, transfers, and subsidies, not through taxes. Barro's (1979) tax-smoothing theory predicts that (if income shocks are transitory, which they may not be) optimal public finance requires that taxes be proportional to income (a constant average tax rate). In our metric, this implies that taxes should provide no consumption smoothing. Our finding that the smoothing is provided only by government consumption, transfers, and subsidies is, therefore, consistent with tax-smoothing theory, although the slight dis-smoothing of shocks by taxes may be an indication of institutional rigidities that result in an average tax rate that is not constant.

Table 3.5 displays the amount of smoothing contributed by fiscal components over three-year horizons. The main finding is that government transfers provide more consumption smoothing over longer horizons and that direct taxes provide less dis-smoothing at the three-year horizon in the EU.<sup>21</sup>

20. Sørensen and Yosha (forthcoming), in their analysis of federal insurance mechanisms for U.S. states, use the ratio of the fraction of output shocks smoothed by a fiscal component to the size of that component as a crude measure of its effectiveness in providing income smoothing.

21. Sørensen and Yosha (forthcoming) find that Social Security benefits in the United States smooth about the same fraction of shocks at different frequencies, but that personal income taxes provide considerably more smoothing at the three-year frequency than at the one-year frequency.

**Table 3.5 Smoothing by Fiscal Components (percent): Three-Year Differenced Data**

	EU8 1971–93	OECD14 1971–93
Government consumption	12 (3)	10 (2)
Government transfers	26 (3)	19 (2)
Government subsidies	2 (1)	1 (1)
Government indirect taxes	-3 (3)	-2 (2)
Government direct taxes	5 (9)	-5 (5)

*Note:* EU8: Austria, Belgium, Denmark, Finland, France, Greece, Germany, United Kingdom. OECD14: EU8 + Australia, Canada, Japan, Norway, Switzerland, United States. The sample period for Norway is 1969–91. Fraction of shocks smoothed via fiscal components. Standard errors in parentheses. See the note to table 3.4.

### 3.3.2 Positive versus Negative Shocks

In tables 3.6 and 3.7 we examine whether fiscal components smooth shocks in an asymmetric fashion, for example, contributing more to consumption smoothing in bad times.<sup>22</sup> For each level of smoothing, we estimate two  $\beta$  coefficients, one for negative shocks and one for positive shocks. To measure smoothing in good and bad times we estimate the panel regression

$$(3) \Delta \log \text{DNI}_t^i - \Delta \log (\text{DNI}_t^i + X_t^i) \\ = v_t + \beta D_t^i \Delta \log \text{GDP}_t^i + \beta^* (1 - D_t^i) \Delta \log \text{GDP}_t^i + u_t^i,$$

where  $D_t^i = 1$  if in year  $t$  the country  $i$  growth rate of GDP is above the average growth rate (across years) of country  $i$ 's GDP, and  $D_t^i = 0$  in years when the GDP growth rate of country  $i$  is below average.  $\beta$  estimates the fraction of shocks absorbed by the generic component  $X$  in good times, and similarly for  $\beta^*$  in bad times. The variable  $X$  denotes government consumption, government transfers, government subsidies, indirect taxes, and direct taxes, respectively, where taxes are measured with a negative sign.

For OECD countries (table 3.6) there is no visible asymmetry in consumption smoothing through fiscal components, but for EU countries (table 3.7) we see that transfers tend to contribute more to smoothing in recessions. It is, therefore, plausible that the large government transfers in EU countries, driven perhaps by generous social insurance policies, play an important role in generating large government deficits, since increases in transfers during recessions are not easily reversed during upturns. Our result is, of course, only suggestive,

22. These regressions do not correct for autocorrelation.



**Table 3.6 Smoothing by Fiscal Components in OECD Countries (percent):  
Negative versus Positive Shocks**

	Positive Shocks		Negative Shocks	
	OECD14 1971-93	OECD18 1980-93	OECD14 1971-93	OECD18 1980-93
Government consumption	13 (2)	12 (2)	13 (2)	13 (2)
Government transfers	18 (2)	18 (2)	17 (2)	19 (2)
Government subsidies	3 (1)	4 (1)	3 (1)	5 (1)
Government indirect taxes	-2 (2)	-1 (2)	-2 (2)	-4 (2)
Government direct taxes	-10 (4)	-6 (5)	-8 (5)	-4 (5)

*Note:* OECD14: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Japan, Norway, Switzerland, United Kingdom, United States. OECD18: OECD14 + Iceland, Italy, Netherlands, Sweden. The sample periods for Norway are 1969-91 and 1978-91. Fraction of shocks smoothed via fiscal components. Standard errors in parentheses. For example, smoothing through government consumption is measured by estimating the coefficients in the panel regression (with time-fixed effects) of  $\Delta \log \text{DNI}^i - \Delta \log(\text{DNI}^i + \text{government consumption}^i)$  on  $v_i + \beta D_i^* \Delta \log \text{GDP}_i^* + \beta^* (1 - D_i^*) \Delta \log \text{GDP}_i^* + u_i^*$ , where  $D_i^* = 1$  if in year  $t$  the country  $i$  growth rate of GDP is above the average GDP growth rate of country  $i$ , and  $D_i^* = 0$  in years when the GDP growth rate of country  $i$  is below average.  $\beta$  estimates the fraction of shocks absorbed by government consumption in good times, and  $\beta^*$  the fraction absorbed in bad times.

**Table 3.7 Smoothing by Fiscal Components in EU Countries (percent):  
Negative versus Positive Shocks**

	Positive Shocks		Negative Shocks	
	EU8 1971-93	EU11 1980-93	EU8 1971-93	EU11 1980-93
Government consumption	12 (2)	10 (3)	13 (3)	8 (3)
Government transfers	17 (2)	19 (3)	23 (3)	22 (3)
Government subsidies	3 (2)	5 (2)	5 (2)	6 (1)
Government indirect taxes	-1 (3)	-2 (4)	-3 (2)	-2 (3)
Government direct taxes	-10 (7)	-2 (10)	-17 (8)	-1 (8)

*Note:* EU8: Austria, Belgium, Denmark, Finland, France, Greece, Germany, United Kingdom. EU11: EU8 + Italy, Netherlands, Sweden. Fraction of shocks smoothed via fiscal components. Standard errors in parentheses. See the note to table 3.6.

and further research on this issue is necessary before drawing firm conclusions.<sup>23</sup>

### 3.3.3 Consumption Smoothing and the Deficit Level

We ask whether there is a relation between the level of the deficit and the amount of consumption smoothing achieved via saving. Large government deficits may render private sector and government consumption smoothing more difficult since in countries with a large government deficit, cross-country borrowing is very expensive, perhaps due to a lower credit rating on international financial markets.

In tables 3.8–3.10 we examine whether there is a relation between large government deficits<sup>24</sup> and the amount of consumption smoothing achieved through the government deficit and through private saving. We split the sample into two groups according to the average deficit level over the sample for each country, with the same number of countries in each group.<sup>25</sup> We run the panel regression (3) where the dummy variable is constructed such that  $D_i^j = 1$  for all the years in the sample if country  $i$  is in the high-deficit group; if not,  $D_i^j = 0$ , and the generic variable  $X$  is either the government deficit or the negative of private saving. The coefficients  $\beta$  and  $\beta^*$  measure the fraction of shocks to GDP smoothed for high- and low-deficit countries, respectively.

There is no evidence that the level of the deficit affects the amount of consumption smoothing provided through the deficit or through private saving. For the EU countries during 1971–93 (table 3.8), the point estimates indicate that smoothing through the government deficit is higher for low-deficit countries, but for the OECD group (table 3.9) there is more smoothing in high-deficit countries. The conflicting point estimates, as well as the high standard errors, give no evidence for a relation between the size of the average deficit and the amount of consumption smoothing obtained via the deficit.

From both tables, it appears that the amount of smoothing through the government deficit has increased during the 1980s, while smoothing through private saving has decreased during the same period. The overall amount of consumption smoothing does not show any systematic differences between the full sample and the 1980–93 sample. Over three-year horizons (table 3.10) only a small fraction of income shocks are smoothed by private saving (the point estimates are even negative for low-deficit countries) with all consumption smoothing being done by the government—confirming similar results in Sørensen and Yosha 1998.

23. See Gavin and Perotti 1997, which displays similar results.

24. All the reported results are for general government deficits. The results are similar when central government deficits are used.

25. In regressions where the number of countries is odd, we include one more country in the high-deficit group.

**Table 3.8 Consumption Smoothing (percent) through Government Budget Deficits and Private Saving: High versus Low Deficit (EU countries)**

	EU8, 1971–93		EU11, 1980–93	
	High Deficit	Low Deficit	High Deficit	Low Deficit
Government saving	16 (8)	34 (9)	35 (9)	34 (8)
Private saving	37 (9)	14 (9)	–3 (10)	8 (9)
Total saving	53 (7)	48 (6)	32 (7)	42 (8)

*Note:* EU8: Austria, Belgium, Denmark, Finland, France, Greece, Germany, United Kingdom. EU11: EU8 + Italy, Netherlands, Sweden. Fraction of shocks smoothed. Standard errors in parentheses. We run a panel regression analogous to that in table 3.6. If country  $i$  is in the high-deficit group, then  $D_i^j = 1$  for all the years in the sample; if not, then  $D_i^j = 0$ . The coefficients  $\beta$  and  $\beta^*$  measure the fraction of shocks to GDP smoothed for high- and low-deficit countries, respectively. The coefficients for government saving and private saving and have been adjusted to add up to the corresponding coefficient for total saving.

**Table 3.9 Consumption Smoothing (percent) through Government Budget Deficits and Private Saving: High versus Low Deficit (OECD countries)**

	OECD14, 1971–93		OECD17, 1980–93	
	High Deficit	Low Deficit	High Deficit	Low Deficit
Government saving	29 (5)	20 (6)	40 (6)	31 (5)
Private saving	28 (6)	14 (6)	12 (6)	6 (6)
Total saving	57 (4)	34 (5)	52 (5)	37 (6)

*Note:* OECD14: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Japan, Switzerland, United Kingdom, United States. Relative to the OECD14 sample of table 3.6, Iceland is included and Norway is dropped, due to availability of data. OECD17: OECD14 + Italy, Netherlands, Sweden. Fraction of shocks smoothed. Standard errors in parentheses. See note to table 3.8.

### 3.3.4 Consumption Smoothing and Fiscal Institutions

Hallerberg and von Hagen (chap. 9 in this volume) found that appropriate budget institutions play an important role in limiting budget deficits. Controlling for various political economy variables that may affect the deficit level, they found that countries where the budgetary process is governed by explicit targets negotiated by coalition members and in countries where power regarding fiscal matters is delegated to a strong party or person (e.g., a strong finance minister), deficits are significantly lower.

We ask whether the institutions examined by Hallerberg and von Hagen (chap. 9 in this volume) contribute to more consumption smoothing via the

**Table 3.10 Consumption Smoothing (percent) through Government Budget Deficits and Private Saving: High versus Low Deficits, Three-Year Differenced Data, 1971–93**

	EU8		OECD14	
	High Deficit	Low Deficit	High Deficit	Low Deficit
Government saving	34 (14)	53 (10)	36 (11)	32 (7)
Private saving	12 (9)	-5 (10)	10 (9)	-2 (7)
Total saving	46 (15)	48 (7)	47 (7)	30 (6)

*Note:* Samples are described in notes to tables 3.8 and 3.9. Fraction of shocks smoothed. Standard errors in parentheses. See the note to table 3.8.

budget, or if the fiscal discipline that they provide comes at a cost in terms of less ability to smooth income shocks. Using their data, we split the sample into two groups (of unequal size), with “targets or delegation” countries in one group and the rest of the countries in the other group, estimating the amount of smoothing via fiscal components in each group (using the method explained above). The interesting finding (table 3.11) is that countries in the “targets or delegation” group clearly achieve more consumption smoothing through government consumption and government transfers, suggesting that the institutions that facilitate fiscal discipline also facilitate consumption smoothing via the budget.

Subsidies smooth consumption significantly more in countries outside the “targets or delegation” group.<sup>26</sup> A potential explanation is that countries without strong institutional constraints on the budget process are less able to resist lobbying efforts by industrial and agricultural interests seeking subsidies in recessions.

Another interesting finding is that the total amount of consumption smoothing via saving is very similar across the two groups; namely, there is more consumption smoothing by the private sector in countries that are not in the “targets or delegation” group, compensating for the lower amount of consumption smoothing via the budget. This suggests that there may be some sort of “Second Moment Ricardian Equivalence,” that is, more consumption smoothing through government budget deficits crowds out consumption smoothing by households and corporations. This conjecture requires, no doubt, further scrutiny.<sup>27</sup>

Finally, there seems to be more dis-smoothing through direct taxes in coun-

26. Closer inspection of the data reveals that these countries allocate a larger fraction of GDP to subsidies and that subsidies in all these countries vary countercyclically with GDP.

27. The crowding-out phenomenon may be due to the fact that high central-government borrowing makes it harder for the private and local government sectors to obtain credit. If true, this is probably more pronounced in bad times.

**Table 3.11** Smoothing by Fiscal Components (percent): The Role of the Budgetary Process, EU 1980–93

	Targets or Delegation	
	No	Yes
Government consumption	–2 (4)	12 (2)
Government transfers	10 (4)	22 (2)
Government subsidies	10 (2)	4 (1)
Government indirect taxes	–5 (5)	–3 (3)
Government direct taxes	7 (9)	–10 (8)
Total saving	40 (8)	35 (7)

*Note:* “No”: Countries without fiscal targets or delegation (Belgium, Greece, Italy, Sweden). “Yes”: Countries with fiscal targets or delegation (Austria, Denmark, Finland, France, Germany, Netherlands, United Kingdom). Fraction of shocks smoothed via fiscal components. Standard errors in parentheses. We run a panel regression analogous to that in table 3.8. For “Yes” countries  $D_i^t = 1$  for all the years in the sample, and for “No” countries  $D_i^t = 0$ . The coefficients  $\beta$  and  $\beta^*$  measure the fraction of shocks to GDP smoothed for each group, respectively.

tries with “targets or delegation,” but this result is somewhat tentative, being marred by very large standard errors.

### 3.4 Concluding Remarks

Our results have the following implications for the Maastricht guidelines: Since governments provide a large fraction of consumption smoothing, the restrictions on the government deficit should be relaxed to allow governments to run large deficits in recessions. Since large average deficits do not make it easier for governments to smooth consumption, our results do not provide any arguments for relaxing the restrictions on government average debt levels. Wise fiscal policy can combine the benefits from long-run fiscal discipline with the benefits from government consumption smoothing, and our results provide some evidence that proper fiscal institutions will allow countries to achieve this goal.

Of course, there are substantial benefits to consumption smoothing via government fiscal policy only because income insurance on international capital and labor markets, and through international transfers, is practically nonexistent. The optimal long-run solution is probably to encourage the development of private markets for intercountry risk sharing. An important step in this direction is to allow institutional investors in EU countries, such as pension funds

and life insurance companies, to invest freely in other countries. Other steps that should contribute to international income smoothing are reductions of international banking transaction costs (to which a common currency may contribute) and harmonization of bank regulations across countries. These measures should increase the cross-country mobility of savings deposits and facilitate international diversification of private, corporate, and institutional asset portfolios. As capital market integration approaches the degree of integration of U.S. markets (see Asdrubali, Sørensen, and Yosha 1996), the need for consumption smoothing through government fiscal policy will be substantially reduced.

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