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Fiscal Consolidation During Times of High Unemployment: The Role of Productivity Gains and Wage Restraint

by Ruy Lama and Juan Pablo Medina

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Abstract

This paper studies the Swedish fiscal consolidation episode of the 1990s through the lens of a small open economy model with distortionary taxation and unemployment. We argue that the simultaneous reduction in the fiscal deficit and unemployment rate in this episode stems from two factors: (i) high growth rates of total factor productivity (TFP), experienced after the implementation of structural reforms; and (ii) a sustained wage restraint that occurred during the 1990s. The model simulations show that economic growth, accounted for mostly by TFP gains, improved the fiscal balance by 8 percentage points of GDP through an expansion of the tax base and fiscal revenues. Moreover, the combination of stable wages and higher TFP boosted net exports and led to a reduction in the unemployment rate. A counterfactual simulation assuming stagnant TFP shows that fiscal consolidation measures alone would have generated a double-digit unemployment rate without eliminating the fiscal deficit.

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1. Introduction

Fiscal consolidation programs have been recently implemented in several advanced economies with the objective of reducing fiscal deficits and achieving a sustainable path of public debt. While there are tangible benefits of preserving the sustainability of public finances, fiscal consolidation programs have negative short-run effects on economic activity and employment.[1] Moreover, critics of consolidation plans argue that these can be self-defeating as a fiscal tightening may reduce output and worsen the overall fiscal position. In this context, a key policy question is how to implement a fiscal consolidation that ensures a reduction in fiscal deficits while at the same time minimizes output and employment losses. To shed light on this question, we analyze the Swedish fiscal consolidation episode of the early 1990s, where the government was able to achieve a simultaneous reduction of the fiscal deficit and the unemployment rate.

Between 1990 and 1993 Sweden experienced one of the worst recessions since the Great Depression as a result of a global downturn and a subsequent banking crisis. As shown in Panel A of Figure 1, GDP declined by 4 percent between 1990 and 1993. In terms of detrended output, the contraction was 10 percent. The impact of the recession on the labor market was striking. The unemployment rate soared, going from 1.7 percent to 9.1 percent. Moreover, the primary fiscal balance suffered a significant deterioration, reaching a deficit of 12 percent of GDP. Not only did government consumption as a share of GDP increase but also net taxes (tax revenues minus transfers) deteriorated sharply in response to the cyclical conditions in the economy.[2]

In this context, the Swedish government faced a very difficult choice. On the one hand, a fiscal consolidation could restore the health on the public finances at the expense of higher unemployment. On the other hand, delaying the consolidation could prevent short-run negative effects on aggregate demand and employment at the potential cost of a debt overhang. In 1992 the government decided to implement a fiscal consolidation program, encompassing tax increases and spending cuts, and structural reforms to boost productivity. The macroeconomic outcomes during the fiscal consolidation episode (1992-2000) were extremely positive: the fiscal deficit was turned into a surplus within a few years, the unemployment rate declined dramatically, and the economy experimented robust economic growth.[3] The main goal of the paper is to analyze the key driving factors behind these macroeconomic outcomes during the fiscal consolidation episode.

[1] Using an action-based database, Guajardo et al. (2011) find that fiscal consolidations have negative effects on GDP and employment in the short-run.

[2] The banking crisis that occurred during 1992-93 also contributed to the widening of the fiscal deficits. Floden (2013) estimates that the fiscal costs associated with the banking crisis were around 4 percent of GDP. In this paper we take as given the initial conditions in 1992 and do not model the banking crisis. We focus our analysis on the recovery period when the fiscal consolidation and structural reforms take place.

[3] Although the unemployment rate declined to 5.6 percent by the year 2000, it was still higher than the pre-crisis level of 1.7 percent. Since the unemployment rate remained close to 6 percent during the following decade, it seems plausible to assume that an unemployment rate of 5–6 percent became the new long term equilibrium for the Swedish economy.

With that objective in mind we develop a small open economy model with distortionary taxation, unemployment, and real wage rigidities. We focus our analysis on three types of shocks that were important during the fiscal consolidation episode: (i) government consumption; (ii) tax rates; and (iii) productivity shocks. We calibrate the model to the Swedish economy and conduct a business cycle accounting decomposition (Chari et al., 2007) to quantify the contributions of each shock to the fiscal and macroeconomic outcomes during the period 1992-2000.[4]

We find that the most important factor accounting for the simultaneous reduction in the fiscal deficit and the unemployment rate during the 1990s was the increase in total factor productivity (TFP). The boost in TFP (see figure 3), which materialized in the aftermath of the implementation of structural reforms, lead to higher output, an expansion of the tax base, and an increase in fiscal revenues of 8 percentage points of GDP. Furthermore, the unemployment rate declined by 4 percentage points as a result of a combination of higher productivity and stable real wages induced in part by policies of wage restraint. We also find that in the absence of TFP gains, the fiscal consolidation efforts would have induced a double-digit unemployment rate without eliminating the fiscal deficit.

While the results from our model show that output growth was crucial for the success of the Swedish fiscal consolidation, still there is debate about the sources of growth during this episode. Calmfors (2012a, 2012b) points to two key sources of growth during this period: the increase in potential growth as a result of several structural reforms and the exchange rate devaluation of 1992. The small open economy model considered in the paper captures the first factor through changes in measured TFP, but abstracts from variations in the real exchange rate. Since the model features only one good, the real exchange rate in the model is constant. While the exchange rate depreciation contributed to the recovery in the early phase of the consolidation, we argue that sustained gains in productivity were crucial for the success of the fiscal consolidation in the medium term.[5]

This paper is related to the large literature on the macroeconomic effects of fiscal policy. Our starting point is a neoclassical growth model with fiscal policy as in Ohanian (1997), McGrattan and Ohanian (2010), and Uhlig (2010). We depart from the standard neoclassical model by incorporating two features. First, we include frictional unemployment and real wage rigidities as in Shimer (2010, 2012), Mortensen and Pissarides (1994), Merz (1995), and Andolffato (1996). Second, we consider a small open economy setting as in Mendoza (1991). These two features allow us to reproduce the dynamics of unemployment rate and the external balance, two variables that exhibited a sharp improvement during this episode.

[4] In order to implement the business cycle accounting methodology we add additional shocks, so the model predictions fully reproduce the macroeconomic data during the sample period 1992-2000. These additional shocks, labeled *other demand shocks*, play a minor role in explaining business cycle fluctuations during the sample period.

[5] It is important to note that in 1981 Sweden experienced a real exchange rate depreciation comparable to the one occurred in 1992 (23 percent) with a limited impact on output growth and the trade balance. The limited effect could be attributed to the fact that the depreciation was temporary and occurred in a period characterized by high wage inflation and stagnant productivity growth, factors that prevented a sustained reduction in unit labor costs.

This paper contributes to the literature by analyzing the potential role of productivity gains and wage dynamics in offsetting the negative effects of a fiscal adjustment on output and employment. We validate empirically our model by conducting a business cycle accounting analysis as in Chari et al. (2007).

The remainder of the paper is organized as follows. In section II we describe the main factors shaping the macroeconomic fluctuations during the Swedish fiscal consolidation episode. Section III lays out the small open economy model. Section IV summarizes the calibration and empirical strategy for analyzing the fiscal consolidation episode. Section V discusses the simulation results. Section VI presents several counterfactual experiments. Section VII concludes.

2. Macroeconomic Conditions in Sweden (1992-2000): Fiscal Consolidation Measures, Productivity Gains and Wage Restraint

Three factors were of key importance in influencing the Swedish business cycle during the period 1992-2000. First, discretionary increases in tax rates and a reduction of government spending implemented during the fiscal consolidation. Second, large and sustained productivity gains driven, in part, by the implementation of structural reforms. Third, policies of wage restraint, which contained labor costs during the recovery phase of the cycle. Next, we explain in detail each of these factors and their relevance for our analysis.

2.1. Fiscal Consolidation Measures

During the period 1991-1993 the centre-right coalition government initiated a fiscal consolidation program. Although the initial fiscal measures were not successful in reducing the fiscal deficit in the early 1990s, the government implemented a tax reform that broadened the tax base and reduced the marginal tax rates, improving the efficiency of the tax system. During the period 1994-1998, a centre-left coalition government continued with the fiscal consolidation efforts, achieving great success in the reduction of fiscal deficits in a context of high economic growth.

Throughout the second phase of the consolidation, drastic spending and revenue measures were implemented. Central government spending and transfers to sub-central governments were frozen between 1994 and 1997. Moreover, the government introduced several changes to social security transfers by reducing pensions, unemployment, sickness and child and family benefits. On the revenue side, social security contributions and income and capital tax rates were increased. According to Borg (2009), the increase in capital and income tax rates were implemented not only to raise fiscal revenues, but also to preserve the distribution of income and to build legitimacy for the fiscal consolidation program.

The total discretionary fiscal consolidation measures were 11 percent of GDP during the period 1992-1998, half of which was concentrated on 1992-1995. Moreover, about 40 percent of the consolidation came from higher revenues and the rest from lower government spending.[6] According to Henriksson (2012), the front-loading of the fiscal consolidation was a deliberate strategy of government authorities to provide reassurance to financial markets about the sustainability of public finances.

In 1996 the government adopted a new fiscal framework that made it possible, going forward, to secure the gains of the discretionary fiscal measures. First, a top-down budget process was implemented by setting expenditure ceilings three years in advance. Once the spending ceiling was defined, resources were allocated across 27 expenditure areas. Second, a cyclically-adjusted fiscal surplus target of 1 percent was adopted in 1997 in order to anchor the new fiscal policy regime. Third, a balanced-budget requirement for local governments was implemented in 2000 with the objective of eliminating the spending bias at the sub-central level.[7]

Figure 2 shows how the fiscal consolidation measures resulted in an increase in the effective average tax rates on consumption, labor, and capital and a reduction in detrended government consumption.[8] The effective consumption tax increased as a result of higher taxes on alcohol, tobacco, and energy, as well as a broadening of the tax base. The increase in the labor tax rate was a result of higher personal income tax and social security contributions. The effective capital tax rate increased in response to higher taxation on dividends, capital gains, and property. Finally detrended real public consumption decreased as a result of discretionary measures as well as the adoption of the new fiscal framework which ensured that government spending increased at a rate below GDP growth.

2.2. Productivity Gains

TFP in Sweden was stagnant before the 1990s (see figure 3). The average annual growth in TFP was only 1.2 percent per year from 1960 to 1990. In 1991, a government-appointed commission focused on improving productivity (Produktivitetsdelegationen) indicated that the lack of competition was one of the main factors behind the low productivity growth in the preceding decades.[9] During the 1990s Sweden experienced a substantial increase in the productivity growth. Between 1993 and 2000, TFP growth was 2.6 percent per year. The increase in productivity was highly persistent, suggesting that structural factors played an important role in accounting for the trajectory of TFP. In this section, we discuss some of the policies that contributed to this structural shift in TFP growth.

In the early 1990s most sectors in the Swedish economy were insulated from competi-

[6] See Devries et al. (2011) for a detailed description of the consolidation measures during this episode.

[7] For a discussion on the impact of the fiscal framework on the improvements in public finances see Floden (2013).

[8] The effective tax rates were calculated following the methodology described in Mendoza et al. (1994). See Appendix B for more details on the estimation of these tax rates.

[9] See Berg (2012).

tion. In fact, cartels and competition-restraining arrangements were commonplace in Sweden provided that they do not introduce large distortions in the economy. By 1992 there were 1250 active cartel agreements which were publicly registered in the Swedish National Price and Cartel Board (SPK). The lack of competition was so pervasive in the Swedish economy that about 80 percent of consumption goods were affected by restrictions on competition, resulting in prices that were substantially higher than the OECD average.[10] Restrictions to competition, in particular in the retail sector, also originated from building and planning regulations included in the "Planning and Building Act." Municipalities restricted the issuance of building permits to big retailers, and imposed a ceiling on the maximum floor space in shops in order to protect small retailers.

Several structural reforms were implemented aimed at enhancing competition and improving the functioning of markets. In 1991 the government submitted the formal application to the European Union membership, which was approved in a referendum in 1994. With the new membership, the government complied with more market-oriented EU regulation and removed trade barriers. As a result of an increase in external competition, Swedish firms had the incentives to become more efficient.

In 1993 a new "Competition Act" was introduced, and the Swedish Competition Authority (SCA) was reformed in order to enforce the new law. The new act prohibited the abuse of dominant positions, and agreements that restrained competition and prevented industry concentration. Moreover, several network industries were deregulated including rail transport, taxi services, air traffic, postal services, telecommunications, and electricity generation and distribution. Many state-owned companies were privatized in steel production, telecommunications, banking, and forestry sectors. In addition, new laws were introduced at the local level to strengthen competition and enhance the efficiency of the public sector. Municipalities were allowed to outsource the provision of public services to the private sector such as health care and schooling, and new planning regulations were enacted to encourage competition at the retail sector by granting licenses to new entrants.

The McKinsey Global Institute (2006) analyzed the impact of deregulation and trade liberalization on productivity growth in five sectors of the Swedish economy: automotive, retail banking, retail, processed food, and construction. In 1995 productivity in the Swedish automotive sector was 21 percent lower than in the US, while in the retail, retail banking, processed foods sectors, and construction were, 16, 20, 42, and 23 percent lower, respectively. After the implementation of structural reforms, the improvement in efficiency was dramatic. During the period 1990-2003, productivity in the retail and retail banking sectors increased by 4.6 percent per year, while in the processed food sector productivity increased by 3.1 percent per year. In these three industries the productivity gains were higher than in the US. The most substantial improvement in productivity was in the automotive sector, where the productivity gains were 8 percent per year during the same period. By 2003 the automotive sector productivity level was comparable to the one in Japan, and 5 percent higher than in the US. On the contrary, sectors that were insulated from deregulation and trade

[10] See Folster and Petzman (1997) and OECD Economic Surveys - Sweden (1992).

liberalization experienced sluggish productivity growth. The construction sector, exposed to limited competition, experienced an average productivity gain of 0.7 percent per year, and by 2003 its labor productivity was 15 percent below the one existing in the US.[11]

To what extent the productivity gains were driven by the implementation of structural reforms? Several authors have estimated the effects of structural reforms on growth and productivity. Bouis and Duval (2011) estimate that structural reforms (including reforms to the product and labor markets) increase GDP by 10% in the average OECD economy over a horizon of 10 years. Anderson et al. (2013) simulate the implementation of structural reforms and find that euro area countries can increase their GDP between 3 and 11 percent over 10 years. Finally, Barkbu et al. (2012) estimate that half of the labor productivity gains experienced in Sweden during the 1990s were attributed to structural reforms.[12]

Figure 3 shows that during the period of structural reforms TFP in Sweden increased by 20 percent, while productivity in the EU increased only by 10 percent. In section V of the paper we quantify the macroeconomic impact of the observed improvements in TFP during the fiscal consolidation episode.

2.3. Wage Restraint[13]

During the 1980s the Swedish labor market was characterized by high unionization rates, exceeding 80 percent of the workforce. Moreover, the collective bargaining process with the unions was highly centralized. The Swedish Employers Confederation (SAF) and the three labor organizations (LP, TCO, and SACO) representing the blue-collar, white-collar, and professional workers unions, respectively, participated in the process of collective bargaining.[14]

In 1990, in an effort to stabilize the economy, a government-appointed commission (Förhandlingsgruppen) negotiated an economy-wide wage restraint for the period 1991-1993. After negotiating with 120 organizations, the government achieved a wage agreement affecting the whole labor market. The policy was successful, and wage inflation declined dramatically from 10 percent in 1989 to 3 percent in 1993. Between 1994 and 1996 annual wage inflation increased from 4 to 7 percent, threatening to reduce the competitiveness of

[11] While the Mackinsey Global Institute (2006) emphasizes the role of deregulation in driving productivity gains, Pilat et al. (2002) provide evidence that the expansion of the information and communications technology sector also was responsible for broader productivity gains experienced during the 1990s in Sweden. Both views can be reconciled considering that deregulation and trade liberalization provided the incentives for the adoption of new technologies that lead to sustained productivity gains.

[12] Barkbu et al. (2012) estimate that structural reforms increased labor productivity by 15 percentage points, about half of the 31 percent increase in productivity that occurred between 1990 and 2000. If labor productivity had followed the pre-crisis trend during the 1990s, it would have increased by just 11 percent (far lower than the observed increase of 31 percent). The gap between the observed productivity gains and the pre-crisis trend, 20 percent, could be interpreted as an upper bound estimate of the effects of structural reforms.

[13] This sub-section is based on the work of Fredriksson and Topel (2010), Elvander (2003), and Holmlund (2003).

[14] Each of the labor organizations (LP,TCO, SACO) groups represented several labor unions.

the manufacturing export sector. In response to these developments, six unions from LP, TCO, and SACO proposed a new institutional arrangement for labor relations, called the Industrial Agreement (IA).[15]

The IA was implemented in 1997 and defined new rules in the process of wage bargaining. An industry committee, integrated by leaders from unions and employer organizations, was created to facilitate the wage bargaining rounds. The Committee appointed economists, supported by both parties, as members of the Economic Council (EC). The EC was in charge of informing both parties about the state of the economy at the beginning of the wage bargaining process. The Industry Committee enforced a new rule in which new wage agreements should be reached before the expiration of current wage contracts. Moreover, mediators ("impartial chairs") were appointed by the Committee to assist the negotiation process. The mediators had the faculty to propose new arrangements in situations where the negotiation stalled. If a strike was declared, they had the right to order a delay in the negotiations for up to 14 days. The goal of these changes in industrial relations was to minimize disruptions in the production process, and to build consensus in the wage setting process. As a result wage inflation was reduced to an average of 3 percent during the period 1997-2000.

Figure 3 illustrates the extent of wage restraint during the consolidation episode. The periods in which real wages were stabilized coincided with the implementation of the wage restraint agreement by the Förhandlingsgruppen (1991-1993) and the adoption of the Industrial Agreement (1997). Moreover, the wage restraint, occurred during a period of raising labor productivity, lead to a decline in unit labor costs. We argue that the combination of wage restraint and productivity gains were key factors that contributed to the observed boost in net exports and the reduction in the unemployment rate during the 1990s.

3. The Small Open Economy Model

In this section we lay out the model used to analyze the Swedish fiscal consolidation episode. The core of the model is a one sector neoclassical growth model with distortionary taxation. We extend this model by considering a small open economy setting, search frictions, and real wage rigidities in order to analyze the dynamics of the unemployment rate and the trade balance. Goods are produced with a constant returns to scale technology that requires capital and labor. The goods market is competitive with flexible prices, whereas the labor market exhibits search frictions and real wage rigidities. The government finances its spending with distortionary taxation and issuing debt. We decentralize the economy and the labor market transactions following Shimer (2010, 2012). The model is calibrated to the Swedish economy

[15] Blanchard et al. (2013) argue that the best approach to contain wage inflation is through a national wage agreement among social partners. Alternatively, the adoption of a flexible wage-setting process can contribute to set wages consistent with firm-level productivity. In Sweden both approaches were implemented during the 1990s in order to improve competitiveness.

and then simulated in order to analyze the Swedish business cycle during the period 1992-2000.

3.1. Matching and Labor Flows

Labor markets exhibit search frictions modeled as in Diamond (1982), Mortensen (1982), Pissarides (1985), Mortensen and Pissarides (1994), and Shimer (2010). At the beginning of each period, household's members are either working (n_t) or unemployed searching for a job (u_t). Firms allocate workers in production ($(1-v_t)n_t$) and recruitment activities ($v_t n_t$), where v_t is the share of workers assigned to recruitment. We assume a constant participation rate $u_t + n_t = 1$. New employment relationships, or matches, are created according to a constant returns to scale matching function m_t:

$$m(u_t, v_t n_t) = \omega_\pi (u_t)^{1-l} (v_t n_t)^l,$$

were ω_π determines the search efficiency and l is the elasticity of the matching function with respect to the mass of recruiters. New matches become active next period and a fraction $1-\rho$ of current workers are dismissed by the firm such that employment next period is determined by,

$$n_{t+1} = \rho n_t + \omega_\pi (u_t)^{1-l} (v_t n_t)^l, \tag{1}$$

From the matching function we can specify the probability of finding a match for an unemployed worker $\pi(\theta_t)$ and the probably of recruiters finding workers $q(\theta_t)$:

$$\pi(\theta_t) = \frac{m(u_t, v_t n_t)}{u_t} = \omega_\pi (\theta_t)^l \qquad q(\theta_t) = \frac{m(u_t, v_t n_t)}{v_t n_t} = \omega_\pi (\theta_t)^{l-1} \tag{2}$$

where $\theta_t = (v_t n_t)/u_t$ is the labor market tightness ratio.

3.2. Households

The economy is populated by a mass of infinitely long-lived individuals with identical preferences. Following Merz (1995) and Andolfatto (1996), we assume all individuals live in a representative household that maximizes the sum of its members' utility function. The household's utility function is given by $uf(c_t, n_t, g_t)$, where c_t, n_t, and g_t are the household's consumption, the mass of households' members having a job, and government consumption, respectively. Each period households' consume and save into three different assets: capital, domestic and foreign bonds. The household budget constraint is given by

$$\begin{aligned} (1+\tau_t^c)c_t + inv_t + b_{t+1} - b_{t+1}^* &= (1-\tau_t^n) w_t n_t + (1-\tau_t^k) r_t^k k_t + \tau_t^k \delta p_{k,t} k_t \\ &\quad R_{t-1} b_t - R^* \Xi_{t-1} b_t^* + tr_t, \end{aligned} \tag{3}$$

where b_t is the one-period government debt, b_t^* is the external debt, $R_t^*$is the risk-free interest rate, and Ξ_t is the endogenous risk premium on external debt. τ_t^n, τ_t^k, and τ_t^c denote the labor income, capital income and consumption tax rates. The market value of the physical capital depreciation, $\delta p_{k,t} k_t$, represents a tax credit on capital income. tr_t denotes government lump-sum transfers. The capital stock, owned by the representative household, evolves according to the following law of motion:

$$k_{t+1} = (1-\delta)k_t + \phi\left(\frac{inv_t}{k_t}\right)k_t, \tag{4}$$

where $\phi(\cdot)$ is the capital adjustment cost. In equilibrium, the market price of one unit of additional capital stock, $p_{k,t}$, satisfies:

$$p_{k,t}\phi'\left(\frac{inv_t}{k_t}\right) = 1. \tag{5}$$

As in Shimer (2010, 2012), households' take as given the path of employment defined by the law of motion:

$$n_{t+1} = \rho n_t + \pi\left(\theta_t\right)\left(1-n_t\right), \tag{6}$$

The households' dynamic optimization problem is represented in a recursive form:

$$H\left(\mathcal{S}_t\right) = \max_{k_{t+1}, b_{t+1}, b_{t+1}^*} \left\{uf\left(c_t, n_t, g_t\right) + \beta \mathbf{E}_t\left[H\left(\mathcal{S}_{t+1}\right)\right]\right\}, \tag{7}$$

subject to (6), (3), and (4).Where $\mathcal{S}_t = \{k_t, b_t, b_t^*, n_t\}$ is the list of state variables of the decision problem in period t, $H(\mathcal{S}_t)$ is the expected present discounted value of the households' utility, $\mathbf{E}_t\left[\cdot\right]$ denotes the expectation operator conditional on the information in the period t, and $\beta \in (0,1)$ is the discount factor.

3.3. Firms

Output (y_t) is produced with a constant return to scale technology that combines capital and labor:

$$y_t = a_t G(k_t, \Gamma_t(1-v_t)n_t) \tag{8}$$

where a_t is the time-varying productivity shock, k_t the stock of physical capital, $((1-v_t)n_t)$ is the mass of workers involved in the production process, and Γ_t is a labor augmenting productivity trend that grows at the rate $\Gamma_t/\Gamma_{t-1} = 1+\gamma_g$. The productivity shock follows an auto-regressive process:

$$log(a_t/\bar{a}) = \rho_a log(a_{t-1}/\bar{a}) + \varepsilon_{a,t} \tag{9}$$

The mass of workers in the firm evolves according to the law of motion:

$$n_{t+1} = \rho n_t + q\left(\theta_t\right) v_t n_t \tag{10}$$

The representative firm decides the mass of workers n_t, the fraction of recruiters v_t, and the stock of capital k_t that maximizes the expected present value of profits. The firm's optimization problem is defined in a recursive form:

$$F(n_t) = \max_{n_t, k_t, v_t} \left\{ y_t - w_t n_t - r_t^k k_t + \mathbf{E}_t \left[\Lambda_{t,t+1} F(n_{t+1}) \right] \right\}, \tag{11}$$

subject to (8) and (10). Where $F(n_t)$ is the expected present value of profits of the firm and $\Lambda_{t,t+1} = \beta u f_{c,t+1}(1+\tau_t^c)/(u f_{c,t}(1+\tau_{t+1}^c))$ is the stochastic discount factor.

3.4. Wages

In the presence of search frictions the matching of an unemployed worker with recruiters generates a surplus. We follow the literature and assume that under flexible wages the surplus is divided between the firm and workers following a Nash bargaining process. The bargaining power of the workers is defined by the parameter η and the equilibrium wage under the assumption of Nash bargaining is determined by the equilibrium condition:[16]

$$\eta F_{n,t} u f_{c,t} \frac{1-\tau_t^n}{1+\tau_t^c} = (1-\eta) H_{n,t} \tag{12}$$

where $H_{n,t}$ and $F_{n,t}$ are the marginal benefits for households and firms of having one additional member working at the firm. We will denote w_t^* the target wage rate that prevails when this equilibrium condition is satisfied. In our simulation we follow Shimer (2010), and assume that real wages are rigid and the effective wage rate w_t evolves according to the following equation:[17]

$$w_t = (w_{t-1})^{\chi_w} (w_t^*)^{1-\chi_w} \tag{13}$$

where χ_w controls the degree of real wage rigidity.

3.5. Government

The primary balance of the government is defined as:

$$ps_t = \tau_t^n w_t n_t + \tau_t^k (r_t^k - \delta p_{k,t}) k_t + \tau_t^c c_t - tr_t - g_t \tag{14}$$

where government consumption, labor, capital and consumption taxes follow the autoregressive processes:

$$log(g_t/(\Gamma_t \bar{g})) = \rho_g log(g_{t-1}/(\Gamma_t \bar{g})) + \varepsilon_{g,t} \tag{15}$$

$$log((1+\tau_t^c)/(1+\bar{\tau}^c)) = \rho_{\tau^c} log((1+\tau_{t-1}^c)/(1+\bar{\tau}^c)) + \varepsilon_{\tau^c,t} \tag{16}$$

$$log((1+\tau_t^k)/(1+\bar{\tau}^k)) = \rho_{\tau^k} log((1+\tau_{t-1}^k)/(1+\bar{\tau}^k)) + \varepsilon_{\tau^k,t} \tag{17}$$

[16] For more details see Shimer (2010).

[17] The importance of assuming real wages to match the data has been emphasized by Shimer (2005) and Hall (2005).

$$log((1+\tau_t^n)/(1+\bar{\tau}^n)) = \rho_{\tau^n} log((1+\tau_{t-1}^n)/(1+\bar{\tau}^n)) + \varepsilon_{\tau^n,t} \tag{18}$$

The government transfers are defined as follows:

$$log(tr_t/(\Gamma_t \bar{tr})) = log(tr_{t-1}/(\Gamma_{t-1}\bar{tr})) - \varrho_G log\left(\frac{b_{t+1}}{\Gamma_t \bar{b}}\right). \tag{19}$$

We include $\varrho_G > 0$ above in order to guarantee that the government debt is stationary along the balance growth path. The government budget constraint is given by:

$$ps_t + b_{t+1} = R_{t-1} b_t. \tag{20}$$

3.6. Closing the Model

The balance of payments identity states that the current account should be equal to the change in foreign bonds:

$$nx_t - \left[R^* \Xi_{t-1} - 1\right] b_t^* = -\left(b_{t+1}^* - b_t^*\right) \tag{21}$$

Where $nx_t = y_t - (c_t + g_t + inv_t)$ are the net exports. We follow Uribe and Schmitt-Grohé and set $\Xi_{t-1} = \left(\frac{b_t^*}{\bar{b}}\right)^{\varrho}$ in order to ensure stationarity in the model.

A detailed description of the model equilibrium conditions is included in appendix A.

4. Calibration

We calibrate the model to an annual frequency. We set the growth rate of the labor augmenting technology factor at 2 percent ($\gamma_g = 1.02$). Consistent with an annual real interest of 4 percent, we set $\beta = 0.98$.[18]

The average monthly job-finding rate is set to 0.148 consistent with the evidence from Perez and Yao (2012). The steady state unemployment rate in set to 5.5 percent, and the corresponding monthly separation rate is 0.0086. Based on this data, we calculate the monthly transition probability matrix for employment and unemployment as:

$$P_m = \begin{bmatrix} 1 - 0.0086 & 0.148 \\ 0.0086 & 1 - 0.148 \end{bmatrix}$$

The annual transition probability matrix can be computed as $P_a = (P_m)^{12}$. Thus, on annual basis we obtain $\pi(\bar{\theta}) = P_a(1,2) = 0.8226$ and $\rho = 1 - P_a(2,1) = 1 - 0.0479$. For the matching function we choose $l = 0.5$, which corresponds to the midpoint of the range of values typically used in the literature. We set the efficiency parameter in the matching function to $\omega_\pi = 9.75$ and the share of recruiters to $v = 0.004$ consistent with Shimer (2010). Given the calibration of the matching function, we obtain in the steady state $\bar{\theta} = 0.0071$, $\pi(\bar{\theta}) = 0.8226$, and $q(\bar{\theta}) = 115$.

[18] Notice that $\beta = (1+\gamma_g)/(1+r)$.

We assume a Cobb-Douglas production function:

$$y_t = a_t k_t^{\alpha_p} (\Gamma_t (1 - v_t) n_t)^{1-\alpha_p}$$

with $\bar{a} = 1$ and $\alpha_p = 0.30$. We calibrate the depreciation rate to $\delta = 0.04$ which is consistent with an investment to GDP ratio of 18.5 percent. To determine the equilibrium flexible wages, we follow the literature and impose $\eta = 1 - l$, which states that the bargaining power of workers is equal to the elasticity of the *matching function* with respect to the mass of unemployed workers. Regarding the wage rigidity, we calibrate $\chi_w = 0.95$ as in Gorodnichenko et al. (2012), to capture the degree of wage rigidity in Nordic countries. The capital adjustment costs are modeled as

$$\phi(x) = (x - \phi_2 (x - \delta - \gamma_g)^2 / 2).$$

Using an elasticity of price of capital relative to investment-capital ratio of 0.15 we obtain $\phi_2 = 0.15/(\delta + \gamma_g) = 2.58$. The elasticity of the external debt premium is set to $\varrho = 0.001$. In steady state, we assume a value for the ratio of net exports to GDP of 1 percent ($nx/y = 0.01$).

Households' preferences are represented by the following functional form:

$$uf_t = log(c_t g_t^{\psi} - (1 + \gamma_g)^t \xi_N \frac{n_t^{1+\sigma_L}}{1 + \sigma_L})$$

we calibrate $\sigma_L = \psi = 1$ and the presence of g_t in the utility function introduces a complementarity between private and public consumption.[19] The leisure preference parameter is set to $\xi_N = 0.1421$ to be consistent with the equilibrium conditions in the model.

The productivity a_t series are calculated using data on GDP, total employment and capital from Haver Analytics. The tax rates time series are constructed with data from Haver Analytics, AMECO and OECD following the methodology in Mendoza et al. (1994).[20] Government consumption series g_t are obtained from Haver Analytics. Based on these series we set the steady state, consumption, labor, and capital taxes to 21, 50 and 33 percent. The steady state government consumption to GDP ratio is set to 29 percent. AR(1) coefficient for the government, consumption, taxes, and productivity are estimated with OLS regressions: $\rho_a = 0.75$, $\rho_g = 0.80$, $\rho_{\tau^c} = 0.82$, $\rho_{\tau^n} = 0.77$ $\rho_{\tau^k} = 0.62$. Table 1 summarizes the calibrated parameters of the model.

[19] The baseline calibration $\psi = 1$ generates a fiscal spending multiplier of 0.5. This fiscal multiplier is consistent with the estimates for a small open economy like Sweden. See IMF Fiscal Monitor (2012).
[20] The methodology is explained in Appendix B.

Table 1: Calibrated Parameters

Parameter	Value	Description
β	0.98	Discount Factor
γ_g	1.02	Technological Progress
$1-\rho$	0.05	Separation Rate
l	0.50	Elasticity of Matching Function
α_p	0.30	Capital Share
δ	0.04	Depreciation Rate
η	0.50	Workers' Bargaining Power
χ_w	0.95	Real Wage Rigidity
ϕ_2	2.58	Capital Adjustment Costs
$1/\sigma_L$	1.00	Frisch Elasticity of Labor Supply
ψ	1.00	Elasticity of Government Consumption
ξ_N	0.14	Disutility of Labor
ρ_a	0.75	AR(1) Productivity Shock
ρ_g	0.80	AR(1) Government Consumption Shock
ρ_{τ^c}	0.82	AR(1) Consumption Tax Shock
ρ_{τ^n}	0.77	AR(1) Labor Tax Shock
ρ_{τ^k}	0.62	AR(1) Capital Tax Shock

5. Accounting for the Fiscal Consolidation Episode

In this section we conduct a business cycle accounting decomposition (Chari et al., 2007) with the small open economy model and analyze the most important factors driving the macroeconomic outcomes during the fiscal consolidation episode. We rely on a set of observable shocks τ_t^c, τ_t^n, τ_t^k, g_t, and a_t. We also rely on additional shocks to avoid the problem of stochastic singularity.[21] Those additional shocks are grouped into a single category labeled *other demand shocks* and include exogenous variables such as interest rate, preference and investment shocks. As it will be shown in the simulations, *other demand shocks* play a minor role in explaining the Swedish business cycle during the sample period. We focus our analysis on four macroeconomic variables: the unemployment rate, the primary fiscal balance, the trade balance, and GDP. We also group all shocks into four factors: tax shocks, government consumption shocks, TFP shocks, and *other demand shocks*. By construction, the simulation of all shocks considered in the model reproduces the dynamics of all observable macroeconomic variables.

Figure 4 shows the contribution of each factor in explaining the four macroeconomic variables considered in the simulation. To better understand the contribution of each factor, we analyzed them sequentially: first, we consider a baseline simulation where only *other demand shocks* are operating; second, we add the government consumption shocks; third, we add the tax shocks; finally, we add TFP shocks. In the last simulation, since all shocks are considered, the model predictions fit perfectly the data.[22]

When only the rest of factor shocks are operating (red line), the simulation indicates that the Swedish economy would have remained depressed without being able to consolidate its fiscal accounts. The unemployment rate would have exceeded 10 percent during most of the 1990s. Detrended GDP would have declined by 10 percent in 1996 and it would have remained depressed until the year 2000. Moreover, the primary fiscal deficit would have remained in the range between 9 and 15 percent of GDP. The trade balance would have deteriorated reaching a deficit of 5 percent of GDP by the year 2000.

When we add government consumption shocks (green line), we observe a slight improvement in the fiscal and trade balances during the initial years of the consolidation. However, by the end of the period, both variables remain the same as if only the *other demand shocks* were operating. These dynamics can be explained by the fact that the contraction in government consumption was front-loaded, and most of the negative shocks occurred in the first half of the sample. Government consumption shocks had a significant impact on the unemployment rate and detrended GDP. The unemployment rate would have remained above 10 percent while detrended GDP would have declined 6 percent at the end of the sample period. The simulation suggests that government consumption played a limited role in consolidating

[21] To avoid the problem of stochastic singularity the number of shocks should be greater or equal to the number of observable variables. The implementation of the business cycle accounting decomposition is explained in appendix A.

[22] The business cycle accounting methodology is akin to a historical decomposition of time series models, where the model predictions fit perfectly the data when all shocks are taken into account.

the public finances. Most of the improvement in the primary fiscal balance occurred in the early 1990s, but by the end of the sample period the net impact on the primary balance was close to zero.

If we additionally consider the effects of tax shocks (blue line), we observe an increase in primary fiscal balance. At the end of the sample period, the fiscal deficit would have reached 4 percent of GDP instead of the 9 percent obtained in the previous simulation. The trade balance would have experimented a modest improvement as a result of a decline in domestic demand (consumption and investment) relative to output. By the year 2000 the trade balance would have reached a deficit of 4 percent. Both the unemployment rate and GDP would have responded dramatically to the effects of tax shocks. The unemployment rate would have reached 19 percent, while detrended GDP would have declined by 15 percent in the year 2000.

Two comments are in order. First, this simulation (blue line) shows the implications of a fiscal consolidation in the absence of TFP gains. In such macroeconomic environment, the fiscal consolidation measures would have lead to an increase in the unemployment rate without eliminating the fiscal deficits. Second, even though the average tax rate increased by 10 percentage points (average increase of consumption, capital, and labor tax rates), the primary fiscal balance would have improved by only 5 percentage points of GDP. The increase in revenue from higher tax rates is partially offset by a decline in the tax base (lower consumption, employment and investment) which highlights the trade-off of closing the fiscal deficit with only tax measures.

The combined effect of all shocks (black line), including TFP, fits perfectly the data in the accounting exercise. The contribution of TFP can be measured by the difference between the blue and black line in figure 4. As a result of the improvement in TFP occurred in the 1990s detrended GDP increased by 6 percent. Furthermore, the expansion in the tax base as a result of higher productivity resulted in a primary fiscal balance of 5 percent of GDP by the year 2000. At the same time, the combination of stable real wages and productivity gains enabled the Swedish economy to regain competitiveness and to boost net exports and employment. By the end of the sample, the trade balance increased to 6 percent of GDP and the unemployment rate declined to 6 percent. [23]

Table 2 summarizes the results of the business cycle accounting decomposition and shows the percentage change of the unemployment rate, GDP, primary fiscal balance and trade balance as percent of GDP during the simulation sample period. The first column shows the percentage change of all four variables observed in the data and the last four columns shows the contributions of the shocks to each observable variable. By construction the sum of the contributions in each row is equal to the observed data. The simulations show that TFP shocks played a preponderant role in explaining the business cycle and the path of the primary fiscal balance during the fiscal consolidation episode. Notice that among the fiscal consolidation measures adopted by the government, the increase in tax rates rather than

[23] In the next section we relax the assumption of real wage rigidity and evaluate the implications of productivity gains on the trade balance and the unemployment rate.

the reduction in government consumption played a crucial role in the improvement of the primary fiscal balance.

One of the lessons from analyzing the Swedish episode is that the implementation of a fiscal consolidation in isolation can depress economic activity and cause a sharp increase in the unemployment rate. Moreover, the business cycle accounting exercise illustrates that drastic fiscal consolidation measures generate a limited improvement in the primary fiscal balance as a result of a countervailing decline in the tax base.

On the contrary, improvements in TFP in an environment of stable wages can offset the negative effects of a fiscal consolidation, making it feasible a simultaneous reduction in the fiscal deficit and the unemployment rate. The policy implication derived from the Swedish episode is that fiscal consolidations should be implemented in a macroeconomic environment of high TFP growth in order to achieve desirable macroeconomic outcomes. To the extent that structural reforms have a sizable impact on TFP gains, governments should adopt these reforms in conjunction with a fiscal consolidation.[24] In the next section we analyze the business cycle implications of the fiscal consolidation under alternative scenarios.

Table 2. Accounting for the Fiscal Consolidation Episode. 1992-2000.

Variables	**Data**	**Model**			
		Taxes	Govt Cons	TFP	Demand Shocks
Unemployment rate (%)	-3.5	7.3	2.9	-13.4	-0.3
GDP (%)	10.3	-6.2	-2.5	20.2	-1.2
Primary fiscal balance (% of GDP)	16.4	5.2	-1.5	8.2	4.5
Trade balance (% of GDP)	5.0	1.2	-0.1	10.2	-6.3

Note: For the trade balance the change is for the period 1992-2000.
For the rest of the variables the changes are for the period 1993-2000.

6. Counterfactual Scenarios

In this section we conduct counterfactual simulations of the fiscal consolidation episode under four alternative scenarios: (i) low fiscal multiplier; (ii) higher wage flexibility; (iii) reduction in risk premium; and (iv) deterioration in the terms of trade. Next we show the simulations for each of these scenarios and discuss in more detail their implications for our analysis.[25]

[24] Calmfors (2012a) mentions that high output growth derived from structural reforms was necessary for the successful implementation of the fiscal consolidation in Sweden.

[25] In each of the simulations presented in this section we take as given the shocks estimated in the baseline business cycle accounting exercise and add one additional feature to each scenario.

6.1. Low Fiscal Multiplier

In this scenario we assume $\psi = 0$, which generates a fiscal spending multiplier close to zero. Under this assumption government consumption absorbs resources from the economy but it does not provide any benefits in terms of higher utility or production as is standard in the neoclassical growth model. In the small open economy setting this assumption generates a fiscal multiplier close to zero since households can insure against fiscal shocks by borrowing or saving in the rest of the world with limited effects on output.

Figure 5 shows that with a low fiscal multiplier the fiscal consolidation would have generated more benign macroeconomic outcomes. The unemployment rate would have reached 2 percent, GDP would have been 3 percent higher than in the baseline model and the fiscal and trade balances would have improved by 1 percent of GDP. Notice that in spite of the gains in output and employment the improvement in the fiscal balance is relatively modest. This experiment illustrates that the size of the spending fiscal multiplier matters for the output and unemployment dynamics, but has a limited effect on the path of the primary fiscal balance.[26]

6.2. Higher wage flexibility

In this scenario we assume that wages are more flexible than in the baseline scenario and calibrate the wage rigidity parameter ($\chi_w = 0.85$) consistent with the empirical evidence before the fiscal consolidation episode (1960-1990).[27] This scenario illustrates the implications of the fiscal consolidation in the absence of the wage restraint observed during the 1990s. As a result of assuming higher wage flexibility, in equilibrium there is an increase in the unemployment rate during the episode. This outcome is the combination of two driving forces. First, under higher wage flexibility and positive productivity shocks the adjustment in the labor market is tilted toward prices rather than quantities. This implies that the initial response from higher productivity will result in higher wages and a smaller increase in labor demand relative to the baseline simulation. Second, the combination of taxes and government consumption shocks depresses the labor supply. Under higher wage flexibility the effects of the fiscal shocks more than offsets the modest employment gains induced by higher productivity, resulting in a net increase in the unemployment rate.

Figure 6 shows the outcomes of the fiscal consolidation under the assumption of higher wage flexibility. In the absence of wage restraint the unemployment rate would have reached

[26] We also conducted a robustness check by simulating the model with $\psi = 2.4$ which is consistent with a fiscal multiplier of 1. In that experiment the fiscal consolidation has a larger negative impact on GDP and the unemployment rate, but a limited effect on the fiscal balance.

[27] The inertia parameter $\chi_w = 0.85$ is consistent with an elasticity of real wages to total factor productivity of 0.3. This elasticity was estimated for the period 1960-1990, before the fiscal consolidation and the implementation of wage restraint policies. We use the following specification $w_t = \rho w_{t-1} + \phi tfp_t + \varepsilon_t$, where w_t and tfp_t denote the logarithm of real wages and TFP and ϕ is the elasticity of real wages to TFP. The data was obtained from the AMECO database published by the European Commission. For the sample 1960-1990 we obtain the following coefficients $w_t = 0.84 w_{t-1} + 0.34 tfp_t$ with $R^2 = 0.99$.

double digits. By the year 2000 the unemployment rate would have reached 16 percent rather than the 6 percent observed in the data. At the end of the sample period GDP would have declined by 2 percent, and the fiscal balance would have reached 1 percent of GDP. Notice that the trade balance would have reached only 2 percent of GDP, as a result of high unit labor costs in a scenario where wages grow faster relative to productivity.

6.3. Reduction in Risk Premium

In this scenario we study the implications of assuming an endogenous risk premium that depends on the stock of public debt as in Corsetti et al. (2013). The goal is to evaluate the quantitative effects of the fiscal consolidation in a situation where a reduction in public debt stimulates aggregate demand through a decline in interest rates. [28] In particular we assume:

$$\Omega_t = \left(\frac{b_{t+1}}{\bar{b}} \right)^{\varrho_{b_g}}$$

where $\varrho_{b_g} = 0.002$. Under this specification, a reduction in public debt lowers the effective interest rate boosting consumption, investment and GDP.

Figure 7 summarizes the results from the simulation. By the year 2000 the decline in the risk premium would have increased GDP by 2 percentage points. The fiscal balance would have reached 6 percent of GDP, while the trade balance would have been 2 percent of GDP. While the reduction in the endogenous risk premium would have facilitated the fiscal consolidation as a consequence of an expansion in the tax base and tax revenue, at the same time it would have prevented an improvement in the trade balance. The lower interest rate would have resulted in higher domestic demand, an import boom, and a decline in the trade balance relative to the baseline scenario. This simulation shows the challenges of improving simultaneously the fiscal and the trade balance in response to a decline in the risk premium associated to lower public debt.

6.4. Deterioration in Terms of Trade

In this experiment we evaluate the model dynamics when there is a deterioration in the terms of trade occurring during the fiscal consolidation episode.[29] The goal of simulating this scenario is to analyze the implications of an adverse external environment in the implementation of a fiscal adjustment. We assume that the terms of trade p_t follow an AR(1) process:

[28] This is akin to the mechanism of Giavazzi and Pagano (1990) of an "expansionary fiscal consolidation". These authors analyze episodes in Ireland and Denmark, countries that experienced a reduction in interest rates and a consumption boom in the aftermath of a fiscal consolidation.

[29] Flodén (2012) argued that the Swedish economic recovery during the 1990s was driven, in part, by a robust external demand. In this section we evaluate the importance of external demand in influencing the path of fiscal consolidation. We consider a counterfactual scenario where the terms of trade fall by the same magnitude as the one observed during the Great Recession (2009-2012) and analyze the implications for the fiscal consolidation.

$$log(p_t/\overline{p}) = \rho_p log(p_{t-1}/\overline{p}) + \varepsilon_{p,t}, \quad \varepsilon_{p,t} \sim N(0, \sigma_p^2) \tag{22}$$

We simulate a deterioration in the terms of trade similar to the one experienced by the Swedish economy during the Global Financial Crisis (2009-2012). At the beginning of the Global Financial Crisis terms of trade declined by 2 percent on impact and the effect gradually dissipated after 3 years. This path is consistent with $\rho_p = 0.5$. In the model we simulate the decline of terms of trade for the period 1994-1997.[30]

Figure 8 shows the outcomes under this scenario. In 1994 GDP declines by 3 percentage points relative to the baseline model. The effects of the negative terms of trade shock dissipate by 1997. As a result of a decline in aggregate demand, the unemployment rate reaches 13 percent in 1994 and then gradually converges to the baseline path by 1997. There is also a temporary deterioration in the trade and fiscal balances close to 3 percent of GDP. This experiment sheds light on the role of external conditions in the implementation of a fiscal consolidation. During the 1990s terms of trade were stable in Sweden which facilitated the adoption of fiscal measures. If alternatively there were headwinds coming from the external sector, the fiscal adjustment would have been more challenging for the policymakers at the time.

7. Conclusions

In this paper we studied the Swedish fiscal consolidation episode through the lens of a small open economy model with distortionary taxation and unemployment. We analyzed the driving forces of the macroeconomic outcomes during this episode by conducting a business cycle accounting decomposition. We draw two key lessons from this analysis. First, sustained gains in TFP, spurred in part by the implementation of structural reforms, were crucial in order to achieve a reduction in fiscal deficits. Second, stable real wages, driven in part by policies of wage restraint, in combination with positive productivity shocks made possible a sustained increase in net exports and a reduction of the unemployment rate to single digits. In the absence of productivity gains and stable real wages, the fiscal adjustment would have generated a double-digit unemployment rate without eliminating the fiscal deficit.

Our model does not evaluate the direct contribution of other factors that could have influenced the Swedish business cycle during the fiscal consolidation period. The model abstracts from the effects of adopting an inflation targeting regime, the banking crisis and its resolution, and fluctuations in the exchange rate. If one or more of these factors were crucial in accounting for the business cycle then they would be reflected in *other demand shocks* included in the model. However, we found that productivity and fiscal shocks account for most of the macroeconomic fluctuations during the sample period.

There are important avenues for future research. It would be relevant to evaluate the role of government's credibility in shaping macroeconomic outcomes during the fiscal con-

[30] In this scenario fluctuations in the terms of trade affect the value of domestic production in the rest of the world $p_t y_t$.

solidation. In addition, it would be useful to conduct a cross-country analysis and evaluate the contribution of TFP gains and wage dynamics in facilitating fiscal consolidations during other episodes.

Figure 1. Macroeconomic Fluctuations in Sweden (1980-2000)

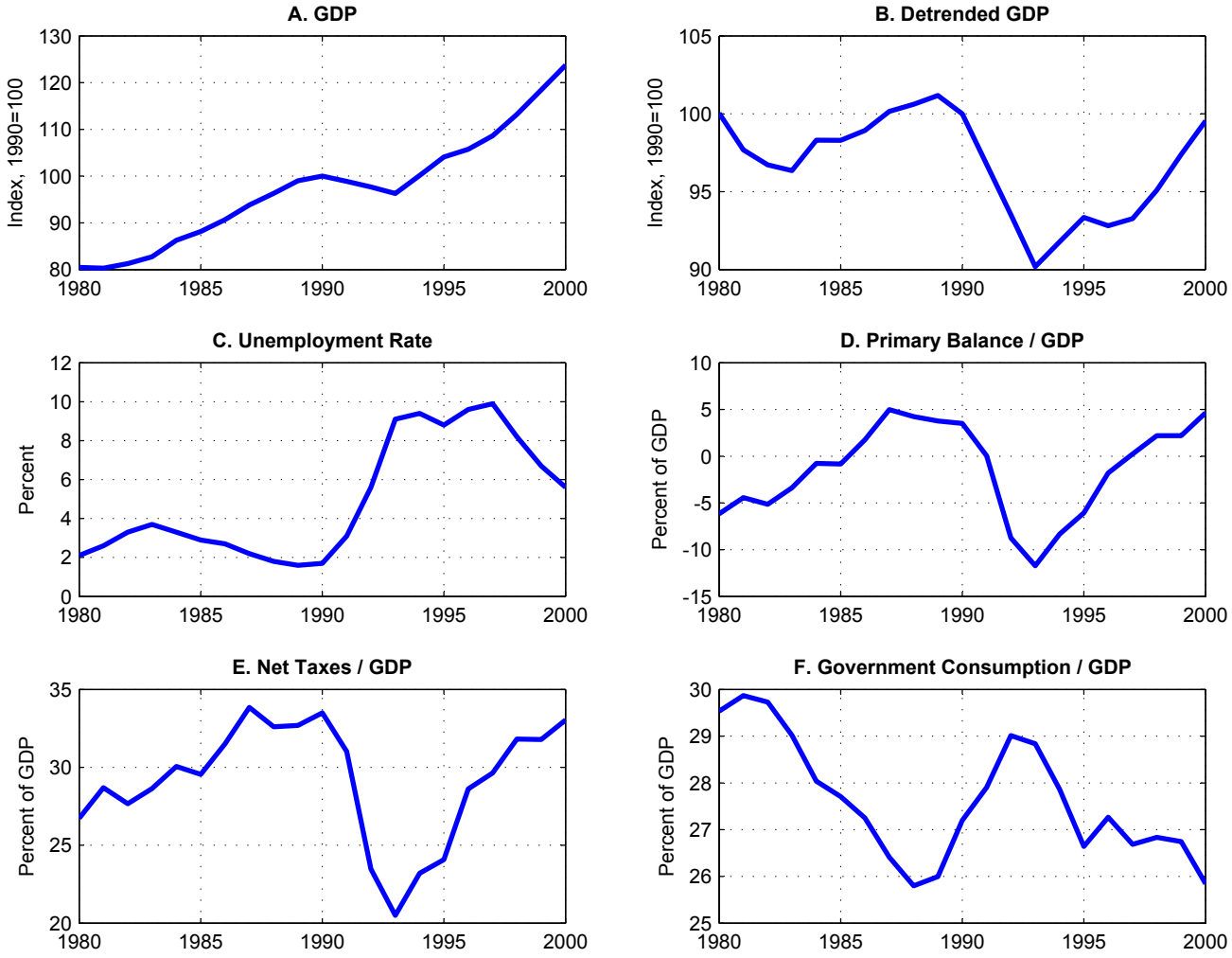


Figure 2. Swedish Fiscal Consolidation Episode: 1992-2000

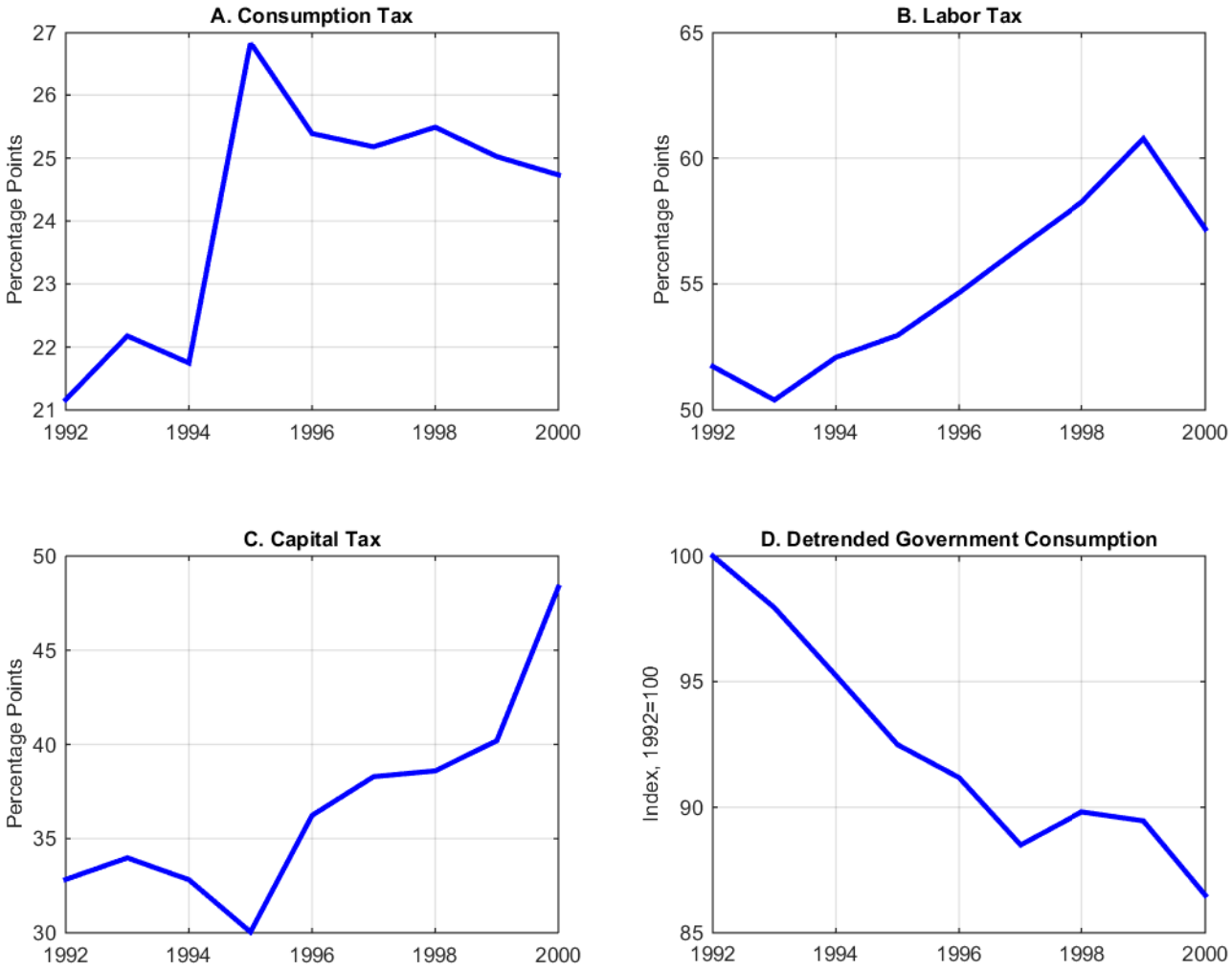


Figure 3. Total Factor Productivity and Wage Moderation in Sweden: 1960-2000

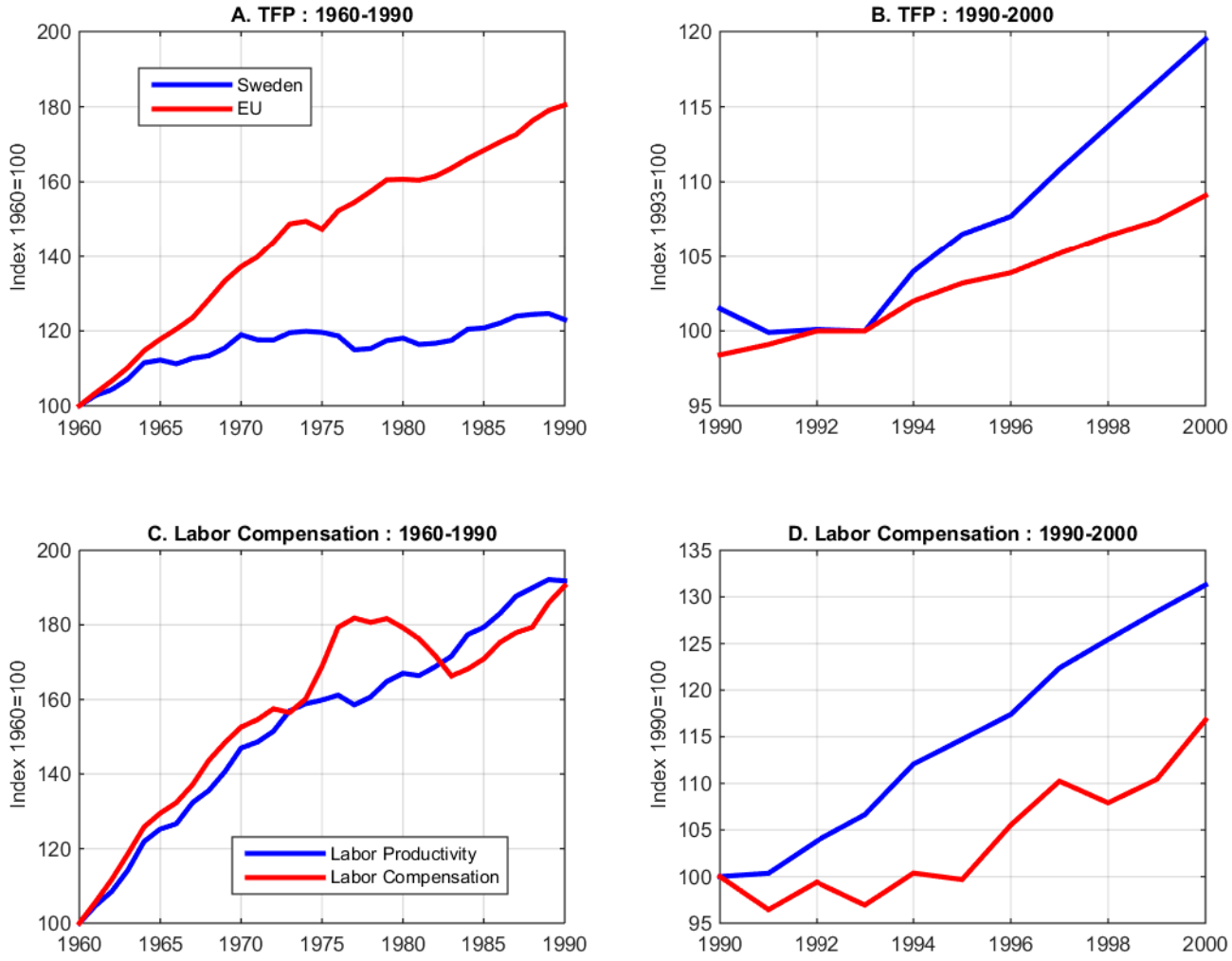


Figure 4. Business Cycle Accounting Decomposition (1992-2000)

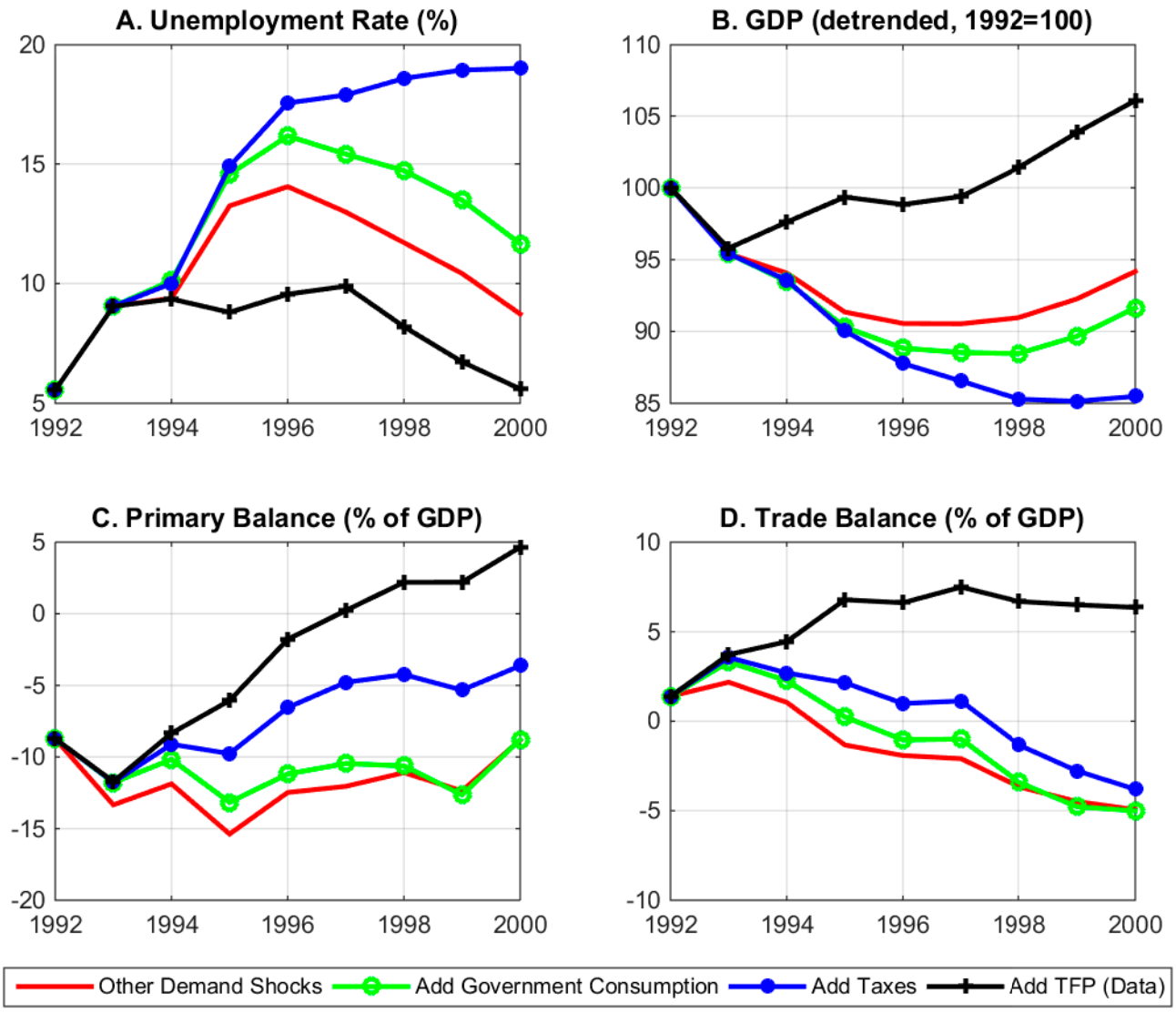


Figure 5. Low Fiscal Multiplier Scenario

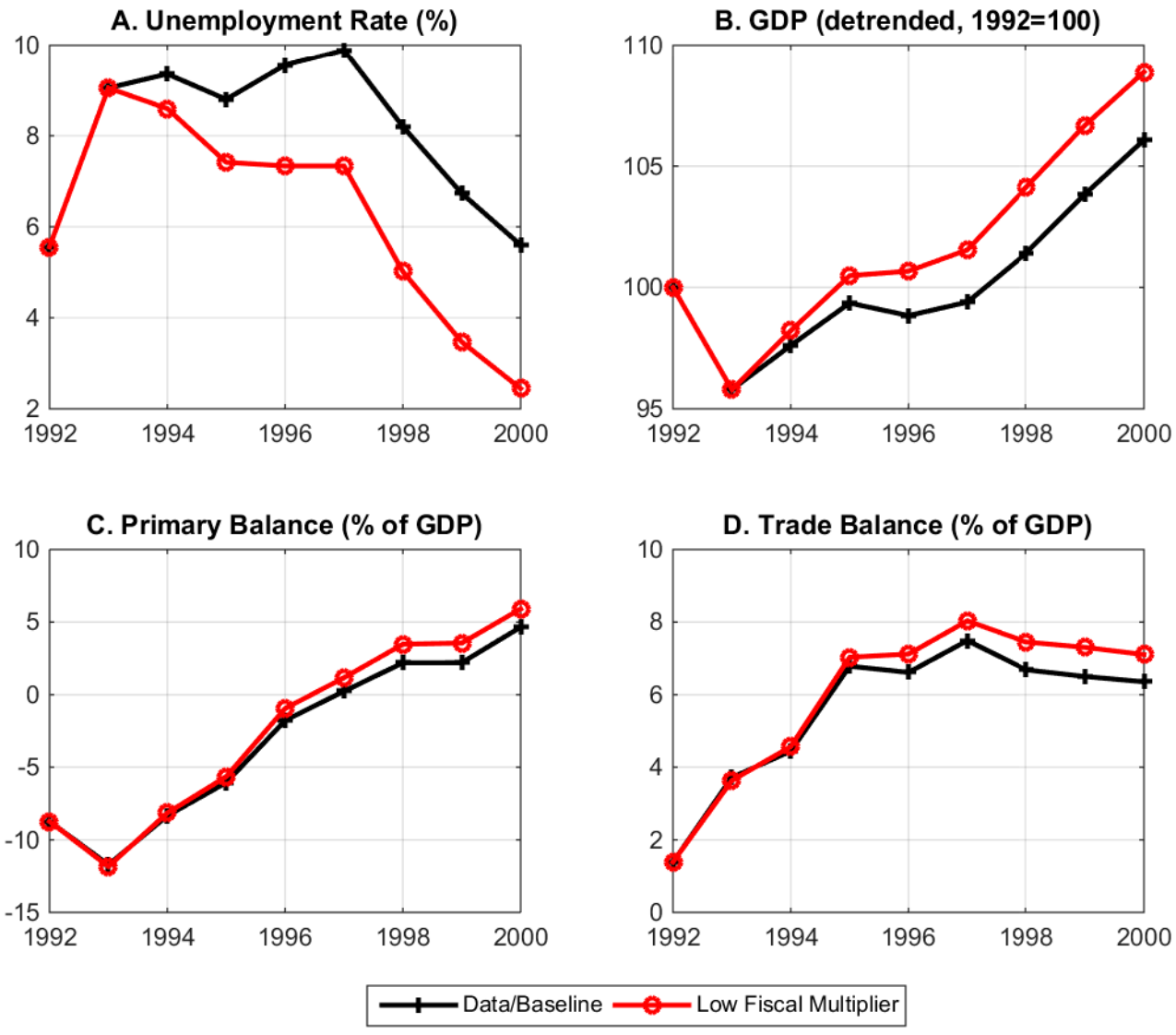


Figure 6. Higher Wage Flexibility Scenario

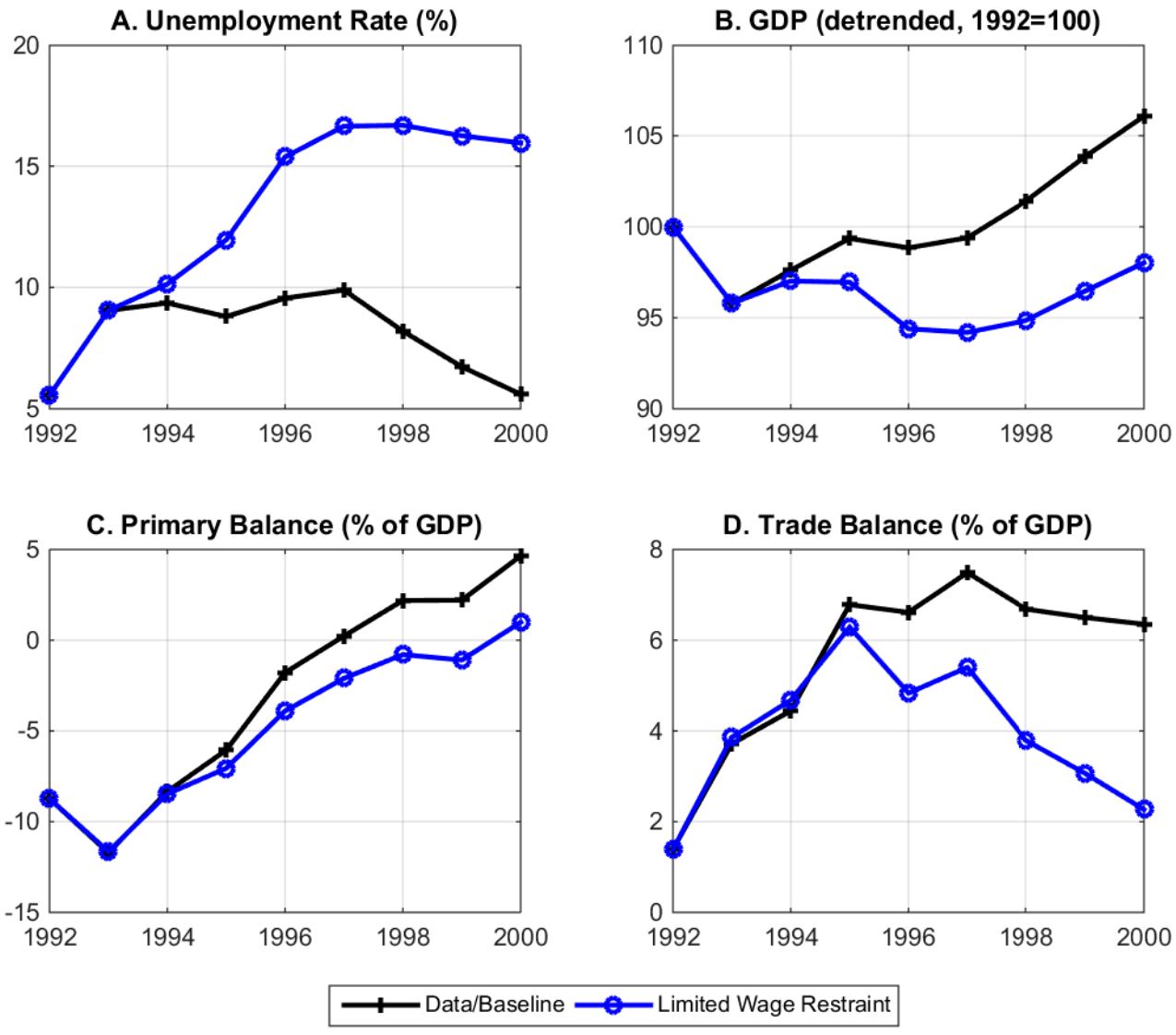


Figure 7. Lower Risk Premium Scenario

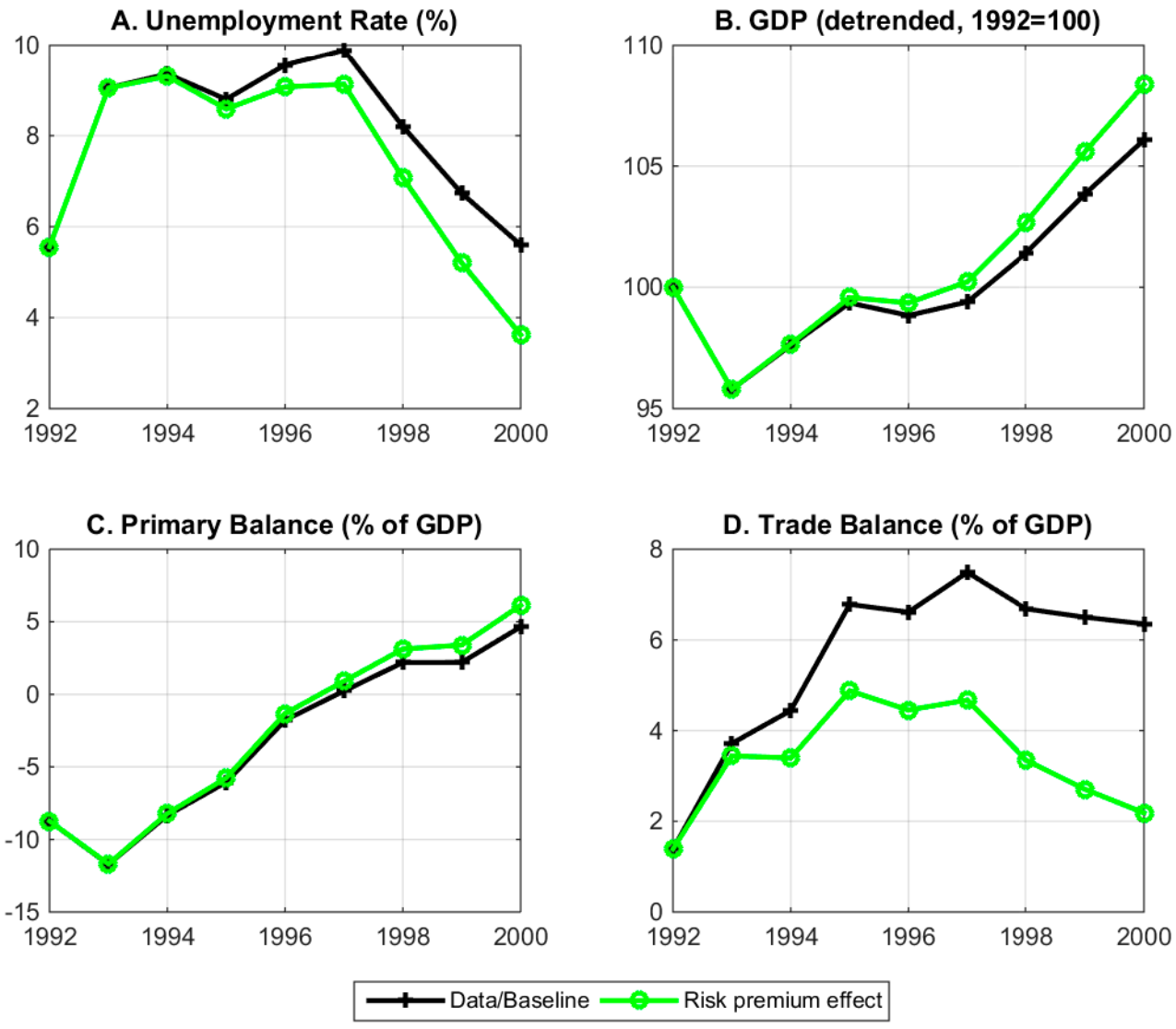
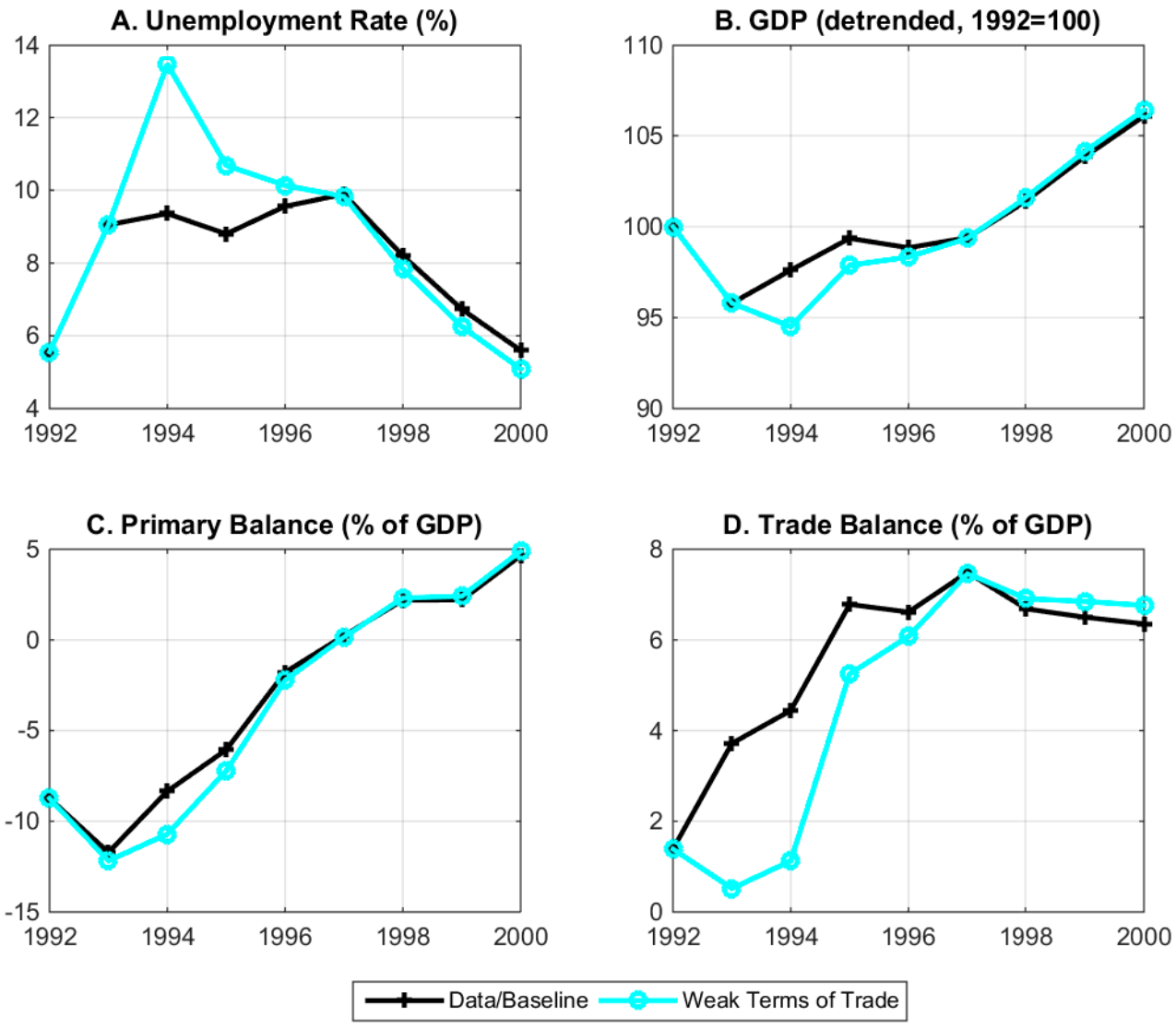


Figure 8. Weak Terms of Trade Scenario



Appendix A: Small Open Economy Model and Business Cycle Accounting

To perform the accounting exercise of the Swedish fiscal consolidation episode we first log-linearize the equilibrium condition of the model . We then rely on the Kalman Filter algorithm for the implementation of the business cycle account exercise. The variables used for the accounting exercise are: (i) the unemployment rate; (ii) the detrended GDP; (iii) Government consumption-to-GDP ratio; (iv) consumption-to-GDP ratio; (v) investment-to-GDP ratio; (vi) government primary balance-to-GDP ratio; (vii) Consumption tax; (viii) labor income tax; (ix) capital income tax; (x) detrended total factor productivity. From these variables we infer the underlying shocks affecting the economy from 1992 to 2000 by applying the Kalman filter algorithm.

The equilibrium conditions of the model require five additional shocks in order to avoid the problem of stochastic singularity: (i) job destruction rate shock; (ii) government transfer shock; (iii) investment shock; (iv) foreign interest rate shock; and (v) preference shock. These additional shocks are grouped in *other demand shocks* and allow us to identify the model and to obtain the historical decomposition of the observable variables. The model's equilibrium conditions are the following:

- Labor market tightness:

$$\theta_t = (v_t n_t)/u_t \tag{23}$$

- Definition of unemployment rate:

$$u_t = 1 - n_t \tag{24}$$

- Evolution of total employment:

$$n_{t+1} = \rho_t n_t + \pi\left(\theta_t\right)\left(1 - n_t\right) \tag{25}$$

- Exogenous evolution of the job destruction rate:

$$\log((1-\rho_t)/(1-\rho)) = \rho_{DES}\log((1-\rho_{t-1})/(1-\rho)) + \varepsilon_{DES,t}, \varepsilon_{DES,t} \sim iidN(0,\sigma^2_{DES}) \tag{26}$$

- Evolution of the capital stock:

$$k_{t+1} = \left((1-\delta)k_t + \phi\left(\frac{inv_t exp(\lambda_{i,t})}{k_t}\right)k_t\right) \tag{27}$$

  where $\lambda_{i,t}$ is an investment shock that follows an AR(1) process:

$$\log(\lambda_{i,t}/\lambda_i) = \rho_i \log(\lambda_{i,t-1}/\lambda_i) + \varepsilon_{i,t}, \varepsilon_{i,t} \sim iid\ N(0,\sigma_i^2) \tag{28}$$

- The Tobin's Q for the investment demand:

$$p_{k,t}\phi'\left(\frac{inv_t exp(\lambda_{i,t})}{k_t}\right) = 1 \tag{29}$$

- The marginal benefit of household of having one additional member working:

$$H_{n,t} = uf_{n,t} + \frac{1-\tau_t^n}{1+\tau_t^c} w_t uf_{c,t} + (\rho_t - \pi(\theta_t))\,\mathbf{E}_t\left[\beta_{t+1} H_{n,t+1}\right] \tag{30}$$

where $\beta_t = \beta exp(\lambda_{d,t})/exp(\lambda_{d,t-1})$ and $\lambda_{d,t}$ is an intertemporal disturbance that follows an AR(1) process:

$$\log(\lambda_{d,t}/\lambda_d) = \rho_d \log(\lambda_{d,t-1}/\lambda_d) + \varepsilon_{d,t}, \varepsilon_{d,t} \sim iid\ N(0, \sigma_d^2) \tag{31}$$

- Households' Euler equation for capital:

$$p_{k,t}\frac{uf_{c,t}}{1+\tau_t^c} = E_t\left[\beta_{t+1}\frac{uf_{c,t+1}}{1+\tau_{t+1}^c}\left(\begin{array}{l} p_{k,t+1} + (1-\tau_{t+1}^k)(r_{t+1}^k - \delta p_{k,t+1}) \\ +p_{k,t+1}\phi\left(\frac{inv_{t+1}exp(\lambda_{i,t+1})}{k_{t+1}}\right) - \frac{inv_{t+1}exp(\lambda_{i,t+1})}{k_{t+1}} \end{array}\right)\right] \tag{32}$$

- Households' Euler equation for government bonds:

$$\frac{uf_{c,t}}{1+\tau_t^c} = R_t E_t\left[\beta_{t+1}\frac{uf_{c,t+1}}{1+\tau_{t+1}^c}\right] \tag{33}$$

- Households' Euler equation for foreign bonds:

$$\frac{uf_{c,t}}{1+\tau_t^c} = R_t^*\left(\frac{b_{t+1}^*}{\bar{b}^*}\right)^{\varrho} E_t\left[\beta_{t+1}\frac{uf_{c,t+1}}{1+\tau_{t+1}^c}\right] \tag{34}$$

where R_t^* is the foreign interest rate that follows an AR(1) process:

$$\log(R_t^*/R^*) = \rho_{R^*}\log(R_{t-1}^*/R^*) + \varepsilon_{R^*,t}, \varepsilon_{R^*,t} \sim iid\ N(0, \sigma_{R^*}^2) \tag{35}$$

- Production function:

$$y_t = a_t k_t^{\alpha_p}(\Gamma_t(1-v_t)n_t)^{1-\alpha_p} \tag{36}$$

where a_t is a technology shock that evolves according to an AR(1) process:

$$\log(a_t/a) = \rho_a \log(a_{t-1}/a) + \varepsilon_{a,t}, \varepsilon_{a,t} \sim iidN(0, \sigma_a^2) \tag{37}$$

- Rental rate of capital:

$$a_t\alpha_p\left(\frac{\Gamma_t(1-v_t)n_t}{k_t}\right)^{1-\alpha_p} = r_t^k \tag{38}$$

- The fraction of recruiters satisfies the optimality condition:

$$\Gamma_t a_t(1-\alpha_p)\left(\frac{k_t}{\Gamma_t(1-v_t)n_t}\right)^{\alpha_p} = q(\theta_t)E_t\left[\beta_{t+1}\frac{uf_{c,t+1}}{uf_{c,t}}\frac{1+\tau_t^c}{1+\tau_{t+1}^c}F_{n,t+1}\right] \tag{39}$$

- The marginal benefit of having one additional worker for the firms is given by:

$$\begin{aligned} F_{n,t} &= \Gamma_t a_t(1-v_t)(1-\alpha_p)\left(\frac{k_t}{\Gamma_t(1-v_t)n_t}\right)^{\alpha_p} - w_t \\ &\quad +(\rho_t + q(\theta_t)v_t)E_t\left[\beta_{t+1}\frac{uf_{c,t+1}}{uf_{c,t}}\frac{1+\tau_t^c}{1+\tau_{t+1}^c}F_{n,t+1}\right] \end{aligned} \tag{40}$$

- Government primary balance:

$$ps_t = \tau_t^n w_t n_t + \tau_t^k(r_t^k - \delta p_{k,t})k_t + \tau_t^c c_t - tr_t - g_t \tag{41}$$

- Evolution of government consumption:

$$log(g_t/(\Gamma_t\bar{g})) = \rho_g log(g_{t-1}/(\Gamma_{t-1}\bar{g})) + \varepsilon_{g,t}, \varepsilon_{g,t} \sim iddN(0,\sigma_g^2) \tag{42}$$

- Evolution of consumption taxes:

$$log((1+\tau_t^c)/(1+\bar{\tau}^c)) = \rho_{\tau^c} log((1+\tau_{t-1}^c)/(1+\bar{\tau}^c)) + \varepsilon_{\tau^c,t}, \varepsilon_{\tau^c,t} \sim iddN(0,\sigma_{\tau^c}^2) \tag{43}$$

- Evolution of capital income taxes:

$$log((1+\tau_t^k)/(1+\bar{\tau}^k)) = \rho_{\tau^k} log((1+\tau_{t-1}^k)/(1+\bar{\tau}^k)) + \varepsilon_{\tau^k,t}, \varepsilon_{\tau^k,t} \sim iddN(0,\sigma_{\tau^k}^2) \tag{44}$$

- Evolution of labor income taxes:

$$log((1+\tau_t^n)/(1+\bar{\tau}^n)) = \rho_{\tau^n} log((1+\tau_{t-1}^n)/(1+\bar{\tau}^n)) + \varepsilon_{\tau^n,t}, \varepsilon_{\tau^n,t} \sim iddN(0,\sigma_{\tau^n}^2) \tag{45}$$

- Evolution of lump-sum transfers:

$$log(tr_t/(\Gamma_t\bar{tr})) = \rho_{tr} log(tr_{t-1}/(\Gamma_{t-1}\bar{tr})) - \varrho_G log\left(\frac{b_{t+1}}{\Gamma_t\bar{b}}\right) + \varepsilon_{tr,t}, \varepsilon_{tr,t} \sim iddN(0,\sigma_{tr}^2) \tag{46}$$

- Government budget constraint:

$$ps_t + b_{t+1} = R_{t-1}b_t \tag{47}$$

- The target wage rate, w_t^*, is determined by:

$$\begin{aligned} w_t^* &= \eta\Gamma_t a_t(1-\alpha_p)\left(\frac{k_t}{\Gamma_t(1-v_t)n_t}\right)^{\alpha_p}(1+\theta_t) - (1-\eta)\frac{uf_{n,t}}{uf_{c,t}}\frac{1+\tau_t^c}{1-\tau_t^n} \\ &\quad +\eta\left(\rho_t - \pi(\theta_t)\right)E_t\left[\beta_{t+1}\frac{uf_{c,t+1}}{uf_{c,t}}\frac{1+\tau_t^c}{1+\tau_{t+1}^c}F_{n,t+1}\frac{\tau_{t+1}^n - \tau_t^n}{1-\tau_t^n}\right] \end{aligned} \tag{48}$$

- Effective wage rate:

$$w_t = (w_{t-1})^{\chi_w} (w_t^*)^{1-\chi_w} \tag{49}$$

- Balance of payments condition for the economy as a whole:

$$nx_t - \left[R_t^* \left(\frac{b_t^*}{\bar{b}^*} \right)^{\varrho} - 1 \right] b_t^* = - \left(b_{t+1}^* - b_t^* \right) \tag{50}$$

- Definition of net exports:

$$nx_t = y_t - (c_t + g_t + inv_t) \tag{51}$$

The balance growth path is characterized by a annual growth rate equal to γ_g, so $\Gamma_t = (1+\gamma_g)^t$.

An equilibrium for the detrended variables is defined as follows. Define $\mathbf{X}_t = \{\theta_t\ ,\ c_t,\ n_{t+1},\ u_t,\ k_{t+1}/\Gamma_t,\ b_{t+1}/\Gamma_t,\ b_{t+1}^*/\Gamma_t,\ H_{n,t}/\Gamma_t,\ inv_t/\Gamma_t,\ p_{k,t},\ y_t/\Gamma_t,\ r_t^k,\ v_t,\ F_{n,t}/\Gamma_t,\ ps_t/\Gamma_t,\ w_{flex,t}/\Gamma_t,\ w_t/\Gamma_t,\ nx_t/\Gamma_t,\ R_t,\ \rho_t,\ R_t^*,\ tra_{2,t}/\Gamma_t,\ g_t/\Gamma_t,\ 1+\tau_t^c,\ 1+\tau_t^k,\ 1+\tau_t^n,\ tr_t/\Gamma_t,\ a_t\}$ as the detrended variables. An equilibrium for the detrended variables given initial values for $n_1,\ k_1,\ b_1, b_1^*$, is a sequence $\mathbf{X}_t$ such as equations (23) to (51) are satisfied. A first-order log-linear solution for the detrended variables can be written as:

$$\log(\mathbf{X}_t) = \log(\mathbf{X}) + \mathbf{P}(\log(\mathbf{X}_{t-1}) - \log(\mathbf{X})) + \mathbf{Q}\boldsymbol{\varepsilon}_t \tag{52}$$

where $\boldsymbol{\varepsilon}_t = (\varepsilon_{a,t}, \varepsilon_{\tau^c,t}, \varepsilon_{\tau^k,t}, \varepsilon_{\tau^n,t}, \varepsilon_{g,t}, \varepsilon_{DES,t}, \varepsilon_{k,t}, \varepsilon_{R^*,t}, \varepsilon_{w,t}, , \varepsilon_{tra_2,t})'$. Here $\mathbf{X}$ denotes the detrended deterministic steady state value of each variable in $\mathbf{X}_t$.

Defining a vector of observable variables as $\mathbf{OBS}_t = \{u_t,\ y_t/\Gamma_t,\ g_t/y_t,\ c_t/y_t,\ inv_t/y_t,\ ps_t/y_t,\ 1+\tau_t^c,\ 1+\tau_t^k,\ 1+\tau_t^n,\ a_t\}$ we define the observational equation:

$$\log(\mathbf{OBS}_t) = \log(\mathbf{OBS}) + \mathbf{H}'(\log(\mathbf{X}_t) - \log(\mathbf{X})) \tag{53}$$

where $\mathbf{OBS}$ are the corresponding steady state values of the observable variables. $\mathbf{H}'$ is matrix of zeros and ones to make the mapping between observable variables and their respective variable in $\mathbf{X}$.

Using annual data from 1992 to 2000 we apply the methodology of business cycle accounting developed by Chari et al. (2007). This implies that for the observable variables we use the Kalman Filter over the state-space system defined by (52) and (53) (see Hamilton, 1994). The Kalman filter provides a smoothed inference of $\boldsymbol{\varepsilon}_t$, which allows us to decompose the sources of business cycle fluctuations during the fiscal consolidation episode. In addition, we set $\rho_{DES} = 0.84$ and $\rho_{R^*} = 0.79$ for the persistence of the job destruction rate and foreign interest rate, which the point estimate of the autoregressive coefficient for these variables in Sweden. We also set $\rho_{tr} = 0.50$ for the exogenous government transfer shock. The standard deviation of shocks are $\sigma_a = 0.016$, $\sigma_g = 0.016$, $\sigma_{DES} = 0.25$, $\sigma_{\tau^c} = 0.01$, $\sigma_{\tau^k} = 0.012$, $\sigma_{\tau^n} = 0.015$, $\sigma_{tr} = 0.015$, $\sigma_{R^*} = 0.014$, which are consistent with the standard error of the residuals of fitting an autoregressive process of order one for each of these variable. We also set $\rho_i = 0.84$, $\rho_d = 0.48$, $\sigma_i = 0.03$, and $\sigma_d = 0.03$ based on the estimates from Adolfson et al. (2007).

Appendix B: Effective Tax Rates

The data used for calculating the tax rates comes from the European Commission macroeconomic database *AMECO* (available at *http://ec.europa.eu/ economy_finance/db_ indicators/ameco/*) and *OECD.Stat Extracts* (available at *http://stats.oecd.org/).* The data from OECD provides the tax revenues, while the data from AMECO determines the tax base. The ratio of both components defines the effective tax rate. Next, we describe the series used from each database and then show the formulas used to calculate the tax rates based on the work of Mendoza et al. (1994).

Data from *AMECO* is the following:

- C: Nominal Private Consumption.
- G: Nominal Government Consumption.
- GW: Compensation of Employees, General Government.
- OSPUE: Gross operating surplus and mixed income, Households and NPISH.
- PEI: Net property income, Households and NPISH.
- W: Gross wages and salaries, Households.
- OS: Net operating surplus: Total Economy.

Data from the OECD database with their respective codes are:

- 5110: General taxes.
- 5121: Excise taxes.
- 1100: Income, profit and capital gains taxes of individuals.
- 2000: Social security contributions.
- 3000: Payroll taxes.
- 2200: Social security contributions of employers.
- 1200: Income, profit, and capital gains taxes of corporations.
- 4100: Recurrent taxes on immovable property.
- 4400: Taxes on financial and capital transactions.

Using these series we follow the methodology of Mendoza et al. (1994) to calculate the effective tax rates. We focus on the tax rates on consumption, labor, and capital. As an auxiliary variable, we calculate the personal income tax. A fraction of the income tax is allocated to the labor tax while the rest is assigned to the capital tax. Based on the data the methodology of Mendoza et al. (1994) we use the following formulas for the effective tax rates:

a. Consumption tax : $\tau^c = \frac{5110+5121}{C+G-GW-5110-5121}$

b. Personal income tax : $\tau^i = \frac{1100}{OSPUE+PEI+W}$

c. Labor income tax : $\tau^l = \frac{\tau^i W+2000+3000}{W+2200}$

d. Capital income tax : $\tau^k = \frac{\tau^i(OSPUE\ +PEI)+1200+4100+4400}{OS}$

References

[1] Adolfson, Malin, Laseen, Stefan, Linde, Jesper, and Villani, Mattias, 2007, "Bayesian Estimation of an Open Economy DSGE Model with Incomplete Pass-through," *Journal of International Economics*, Vol. 72 No. 2, pp. 481–511.

[2] Anderson, Derek, Hunt, Benjamin, and Snudden, Stephen, 2013, "Fiscal Consolidation in the Euro Area: How Much Can Structural Reforms Ease the Pain" *IMF Working Paper*, WP/13/211.

[3] Andolfatto, David, 1996, "Business Cycles and Labor-Market Search," *American Economic Review*, Vol. 86 No. 1, pp. 112–32.

[4] Barkbu, Bergljot, Rahman, Jesmin, and Valdes, Rodrigo, 2012, "Fostering Growth in Europe Now," *IMF Staff Discussion Note*, SDN/12/07.

[5] Blanchard, Olivier, Jaumotte, Florence, and Loungani, Prakash, 2013, "Labor Market Policies and IMF Advice in Advanced Economies During the Great Recession," *IMF Staff Discussion Note*, SDN/13/02.

[6] Berg, Petter, 2012, "Cartel Damages and Cost Assymetries", Ph.D. Dissertation, Copenhagen Business School.

[7] Borg, Andreas, 2009, "Getting Fiscal Consolidation Right: Lessons from Sweden," *Speech at the London School of Economics* (http://www.lse.ac.uk/publicEvents/pdf/20100114_AndersBorg.pdf).

[8] Bouis, Romain, and Duval, Romain, 2011,"Raising Potential Growth After the Crisis: A Quantitative Assessment of the Potential Gains from Various Structural REforms in the OECD Area and Beyond," *OECD Economics Department Working Paper*, No. 835, OECD Publishing.

[9] Calmfors, Lars, 2012a,"What can Europe Learn from Sweden? Four Lessons for Fiscal Discipline," *Vox CEPR Policy Portal*, (http://www.voxeu.org/article/what-can-europe-learn-sweden-four-lessons-fiscal-discipline).

[10] Calmfors, Lars, 2012b,"Sweden – from Macroeconomic Failure to Macroeconomic Success," *CESifo Working Paper* No. 3790.

[11] Cole, Harold, and Ohanian, Lee, 2004,"New Deal Policies and the Persistence of the Great Depression: A General Equilibrium Analysis," *Journal of Political Economy*, Vol. 112, No. 4, pp. 779-816.

[12] Corsetti, Giancarlo, Kuester, Keith, Meier, Andre, and Muller, Gernot, 2013, "Sovereign Risk, Fiscal Policy, and Macroeconomic Stability," *The Economic Journal*, Vol. 123 No. 566, pp. 99–132.

[13] Chari, V.V., Kehoe, Patrick J., and McGrattan, Ellen R., 2007, "Business Cycle Accounting," *Econometrica*, Vol. 75 No. 3, pp.781–836.

[14] Devries, Pete, Guajardo, Jaime, Leigh, Daniel, and Pescatori, Andrea, 2011, "A New Action-based Dataset of Fiscal Consolidation," *IMF Working Paper,* WP/11/128.

[15] Diamond, Peter, 1982, "Wage Determination and Efficiency in Search Equilibrium," *Review of Economic Studies*, Vol. 49, pp. 217–27.

[16] Elvander, Nils, 2003, "Two Labour Market Regimes in Sweden. A Comparison Between the Saltsjöbaden Agreement of 1938 and the Industrial Agreement of 1997," *The German Journal of Industrial Relations* , Vol. 10 No. 1, pp. 146–49.

[17] Floden, Martin, 2013, "A Role Model for the Conduct of Fiscal Policy? Experiences from Sweden," *Journal of International Money and Finance*, Vol. 34, pp. 177–97.

[18] Folster, Stefan and Peltzman, Sam, 1997, "The Social Costs of Regulation and Lack of Competition in Sweden: A summary," In *The Welfare State in Transition: Reforming the Swedish Model* , Ed. Richard B. Freeman, Birgitta Swedenborg, and Robert Topel, pp. 315–352, Chicago: University of Chicago Press.

[19] Fredriksson, Peter and Topel, Robert, 2010, "Wage Determination and Employment in Sweden Since the Early 1990s: Wage Formation in a New Setting," In *Reforming the Welfare State: recovery and Beyond in Sweden* , Ed. Richard B. Freeman, Birgitta Swedenborg, and Robert Topel, pp. 83–126, Chicago: University of Chicago Press.

[20] Giavazzi, Francesco, and Pagano, Marco, 1990,"Can Severe Fiscal Contractions be Expansionary? Tales of Two Small European Countries," in *NBER Macroeconomics Annual 1990*, Vol. 5. MIT Press..

[21] Gorodnichenko, Yuriy, Mendoza, Enrique G., and Tesar, Linda L., 2012,"The Finnish Great Depression: From Russia with Love," *American Economic Review*, Vol. 102, No. 4, pp. 1619-44.

[22] Guajardo, Jaime, Leigh, Daniel, and Pescatori, Andrea, 2011, "Expansionary Austerity: New International Evidence," *IMF Working Paper,* WP/11/158.

[23] Hagedorn, Marcus, and Manovskii, Iourii, 2008, "The Cyclical Behavior of Equilibrium Unemployment and Vacancies Revisited," *American Economic Review*, Vol. 98 No. 4, pp. 1692–1706.

[24] Hall, Robert, 2005, "Employment Fluctuations with Equilibrium Wage Stickiness," *American Economic Review*, Vol. 95 No. 1, pp. 50–65.

[25] Hamilton, James, 1994, *Time Series Analysis*, *Princeton University Press.*

[26] Henriksson, Jens, 2012, "Using Frontloading as a Signal in Budget Consolidation", manuscript, Stockholm University.

[27] Holmlund, Bertil, 2003, "The Rise and Fall of Swedish Unemployment," *CESifo Working Paper* No. 918.

[28] Hornstein, Andreas, Krusell, Per and Violante, Giovanni, 2005, "Unemployment and Vacancy Fluctuations in the Matching Model: Inspecting the Mechanism," *Federal Reserve Bank of Richmond Economic Quarterly*, 91 No. 3(Sum), pp. 19–50.

[29] IMF Fiscal Monitor, 2012, "Balancing Fiscal Policy Risks," International Monetary Fund.

[30] McKinsey Global Institute, 2006, "Sweden's Economic Performance: Recent Developments, Current Priorities." McKinsey & Company.(http://www.mckinsey.com/insights/europe/economic_performance_of_sweden)

[31] Mendoza, Enrique G., 1991,"Real Business Cycles in a Small Open Economy," *American Economic Review*, Vol. 81, No. 4, pp. 797-818.

[32] Mendoza, Enrique G., Razin, Assaf, Tesar, Linda L., 1994, "Effective Tax Rates in Macroeconomics: Cross-Country Estimates of Tax Rates on Factor Incomes and Consumption," *Journal of Monetary Economics*, Vol. 34 No. 3, pp. 297–323.

[33] Merz, Monika, 1995, "Search in the Labor Market and the Real Business Cycle," *Journal of Monetary Economics*, Vol. 36 No. 2, pp. 269–300.

[34] Mortensen, Dale T., 1982, "Property Rights and Efficiency in Mating, Racing, and Related Games," *American Economic Review*, Vol. 72, No. 5, pp. 968-979.

[35] Mortensen, Dale T. and Pissarides, Cristopher A., 1994, "Job Creation and Job Destruction in the Theory of Unemployment," *Review of Economic Studies*, Vol. 61, pp. 397-415.

[36] OECD, 1992, "OECD Economic Surveys: Sweden 1992." OECD Publications.

[37] Ohanian, Lee, 1997,"The Macroeconomic Effects of War Finance in the United States: World War II and the Korean War," *American Economic Review*, Vol. 87, No. 1, pp. 23-40.

[38] Perez, Esther, and Yao, Yao, 2012, "Can Institutional Reform Reduce Job Destruction and Unemployment Duration? Yes It Can," *IMF Working Paper,* WP/12/54.

[39] Pilat, Dirk, Lee, Frank, and Van Ark, Bart, 2002, "Production and Use of ICT: A Sectoral Perspective on Productivity Growth in the OECD Area," *OECD Economic Studies,* No. 35.

[40] Pissarides, Christopher, 1985, "Short-Run Equilibrium Dynamics of Unemployment, Vacancies, and Real Wages," *American Economic Review*, Vol. 75 No. 4, pp. 676–90.

[41] Shimer, Robert, 2005, "The Cyclical Behavior of Equilibrium Unemployment and Vacancies," *American Economic Review*, Vol. 95 No. 1, pp. 25–49.

[42] Shimer, Robert, 2010, *Labor Markets and Business Cycles. Princeton University Press.*

[43] Shimer, Robert, 2012, "Wage Rigidities and Jobless Recoveries," *Journal of Monetary Economics*, Vol. 59, pp. S55–S67.

[44] Uhlig, Harald, 2010,"Some Fiscal Calculus," *American Economic Review*, Vol. 100, No. 2, pp. 30-34.