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Switzerland: Selected Issues and Statistical Appendix

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SWITZERLAND

Selected Issues and Statistical Appendix

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Approved by the European I Department

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Contents Page

Tables

Figures

Statistical Appendix

Switzerland: Basic Data

Area and population

Total area	41,293 square kilometers
Total population (end-1997)	7.2 million
GNP per capita (1997)	$37,136

	1993	1994	1995	1996	1997 1/
	(Percentage changes at 1990 prices)				
Demand and supply					
Private consumption	-0.9	0.9	0.9	0.7	0.9
Public consumption	-0.1	2.0	-0.8	0.7	-0.4
Gross fixed investment	-2.7	6.5	1.9	-2.7	-1.9
Construction	-1.0	7.0	-3.8	-6.2	-5.5
Machinery and equipment	-5.0	5.8	10.1	1.7	2.2
Final domestic demand	-1.2	2.5	0.9	-0.2	0.0
Inventory accumulation 2/	0.2	-0.0	1.3	-0.1	0.3
Total domestic demand	-1.0	2.5	2.3	-0.2	0.3
Exports of goods and nonfactor services	1.5	2.1	1.3	2.5	7.7
Imports of goods and nonfactor services	0.1	7.9	5.4	2.4	7.3
Foreign balance 2/	0.5	-1.9	-1.5	0.0	0.2
GDP	-0.5	0.5	0.8	-0.2	0.5
GNP	-0.2	-0.2	2.2	-0.2	0.5
	(In millions, unless otherwise indicated)				
Employment and unemployment					
Employment	3.78	3.79	3.80	3.80	3.77
(Percent change)	-0.5	0.0	0.4	0.0	-0.8
Unemployed (Registered)	0.16	0.17	0.15	0.17	0.19
Unemployment rate (In percent)	4.5	4.7	4.2	4.7	5.2
	(Percentage changes, unless otherwise indicated)				
Prices and incomes					
GDP deflator	2.7	1.6	1.3	-0.0	0.3
Consumer price index	3.3	0.9	1.8	0.8	0.5
Nominal wage growth 3/	1.5	1.0	1.9	1.5	0.8
Unit labor costs (Total economy)	1.4	0.6	1.6	1.7	-0.5
Real disposable income	-0.0	-1.1	0.6	-1.0	-0.2
Personal saving ratio (In percent)	10.8	9.1	8.8	7.2	6.1
	(In percent of GDP)				
Public finances					
Central Government					
Financial balance 4/	-2.6	-1.9	-1.2	-1.5	-1.6
Gross debt	18.9	20.5	21.9	23.7	24.6
General Government					
Financial balance 4/	-3.6	-2.8	-1.8	-1.7	-2.7
Structural balance	-2.9	-2.3	-1.5	-0.8	-1.1
Gross debt	42.3	45.0	46.7	49.2	50.9

1/ Staff projections.
2/ Change as percent of previous year's GDP.
3/ Nominal wage growth per employee.
4/ Excluding cash surplus of civil service pension fund as revenue; from 1997 onward, including railway loans as expenditure.

Switzerland: Basic Data (continued)

	1993	1994	1995	1996	1997 1/
		(In billions of Sw F, unless otherwise indicated)			
Balance of payments					
Trade balance	2.4	2.2	1.0	1.1	0.3
Service balance	16.8	15.6	15.2	15.6	18.0
Factor income balance	13.5	10.7	13.9	14.3	14.8
Net private transfers	-3.3	-3.2	-3.3	-3.2	-3.2
Net official transfers	-0.8	-1.5	-1.5	-1.5	-1.5
Current account	28.8	23.9	25.3	26.4	28.3
(In percent of GDP)	8.2	6.7	6.9	7.3	7.7
Foreign direct investment	-13.1	-10.2	-11.8	-11.6	-11.5
Outward	-13.0	-14.8	-14.4	-14.3	-14.5
Inward	-0.1	4.6	2.6	2.7	3.0
Portfolio investment	-26.3	-24.9	-4.6	-8.6	-11.6
Outward	-44.8	-26.1	-10.5	-24.5	-20.0
Inward	18.5	1.2	5.9	15.9	8.4
Banking sector, net	2.4	15.1	-9.3	-13.8	-10.0
Memorandum items:					
Net investment income	20.7	17.6	20.8	21.3	21.8
(In percent of GDP)	5.9	4.9	5.7	5.8	5.9
Net external assets	359.6	357.8	350.3	412.1	440.2
(In percent of GDP)	102.8	100.2	96.1	113.3	120.1
		(Percentage changes in annual averages)			
Monetary and credit data					
Monetary base	1.7	1.8	0.3	3.4	5.1 2/
Money (M1)	10.5	5.6	6.8	11.8	10.6 3/
Broad money (M3)	3.9	5.1	2.2	7.1	5.5 3/
Domestic credit	1.3	1.7	2.3	3.1	1.7 3/
		(Period averages in percent)			
Interest rates					
Three-month euro rate	4.8	4.0	3.0	1.9	1.6
Yield on government bonds	4.6	5.0	4.8	4.2	3.5
		(Levels)			
Exchange rates					
Sw F per US$ (end of period)	1.48	1.31	1.15	1.35	1.44
Sw F per US$ (annual average)	1.48	1.37	1.18	1.24	1.45
SW F per DM (annual average)	0.89	0.84	0.82	0.82	0.84
Nominal effective rate (1990=100)	98.7	105.2	112.8	111.1	104.2
Real effective rate (1990=100) 4/	100.1	104.7	111.5	108.4	100.2

Source: International Monetary Fund, World Economic Outlook database; Swiss National Bank; Swiss Institute for Business Cycle Research.

1/ Staff projections unless otherwise noted.
2/ First eleven months compared with same period a year ago.
3/ First ten months compared with same period a year ago.
4/ Based on consumer prices.

INTRODUCTION

1. This *Selected Issues* paper contains three chapters. The first chapter evaluates Switzerland's long-run growth and productivity performance. The second chapter analyzes the behavior of Swiss fiscal policy over the business cycle. And the third chapter takes a fresh look at the nature of the tradeoff between inflation and economic activity in Switzerland. A statistical data appendix is also included.

2. Since the mid-1970s, there has been a significant reduction in the rate of economic growth in most industrial countries. This growth slowdown has been particularly marked in Switzerland. During 1960–74, real value added in the business sector grew by about 3½ percent, or close to the growth rate in major European industrial countries. During 1976–96, however, real growth in Switzerland fell to about 1¼ percent compared with averaged real growth of about 2½ percent for other major European industrial countries. Chapter I seeks to shed light on the sources of Switzerland's disappointing growth performance during the last two decades.

3. Using a standard growth accounting framework, the chapter finds that the growth slowdown in Switzerland since the mid-1970s is largely accounted for by a drastic decline in total factor productivity gains. At the same time, the average rate of return on capital also declined since the mid-1970s. Reflecting a high and relatively stable national savings rate, the economy adjusted by increasing its foreign investment and decreasing its domestic investment. Consequently, the current account moved into a surplus that averaged close to 5 percent of GDP during 1975–95 compared with near balance during 1962–74. At the sectoral level, it is found that the growth slowdown since the mid-1970s was most pronounced in the "sheltered sectors," i.e. services, construction, and agriculture. The chapter concludes that Switzerland's marked relative long-run growth slowdown largely reflects long-standing structural rigidities, which have stifled competition and adjustment in the "sheltered sectors" and have increasingly become a brake on growth in a global environment of rapid economic and technological changes. Although Switzerland achieved considerable progress in confronting structural rigidities in recent years, a more comprehensive and accelerated approach to structural reforms could pay substantial dividends over time.

4. Switzerland's long tradition of sound public finances has been reflected in relatively low fiscal deficits and public debt, notwithstanding the recent marked deterioration of fiscal positions as a consequence of a seven-year stagnation during the 1990s. At the same time, it has often been argued that fiscal policies have contributed little to macroeconomic stability over the business cycle, due to the weakness of automatic fiscal stabilizers and the, at times, procyclical stance of discretionary fiscal policy. Chapter II reports estimates of the automatic and discretionary responses of general government finances to cyclical output movements during 1970–96 and examines the main options for improving the stabilization role of Switzerland's fiscal policy over the business cycle.

5. The analysis of the cyclical behavior of fiscal balances during 1970–96 suggests that the long lags between income accrual and income tax collections (2–4 years) considerably

weakened automatic fiscal stabilizers. Moreover, notwithstanding Switzerland's moderate inflation rates, the extraordinary length of the income tax collection lags also reduced the real value of tax collections. Discretionary fiscal policy is found to have often operated in a procyclical manner, undermining the operation of the already weak automatic fiscal stabilizers, in particular in years of large excesses or shortfalls of aggregate demand. The chapter argues that three adaptations of present fiscal policy rules would prove beneficial to enhancing macroeconomic stability: one, a significant shortening of the long lags in the collection of income taxes; two, the adoption of fiscal rules that avoid pronounced procyclical discretionary fiscal policies, in particular during periods of significant excesses or shortfalls of aggregate demand; and three, an enhanced coordination of fiscal policy stances among the different levels of governments. Several cantons including the large canton of Zürich are considering shortening the long collection lags for income taxes. At the Confederation level, a constitutional amendment has been proposed that would aim, after the year 2001, at a balanced budget over the business cycle at the Confederation level. At the same time, the new policy rule would provide room for countercyclical discretionary fiscal policy in the face of large aggregate demand disturbances. The chapter concludes that the proposed new fiscal policy rule would likely improve on the present fiscal policy behavior at the Confederation level. At the same time, prospects remain uncertain for enhancing fiscal policy coordination among the different tiers of government, reflecting in part voters' preferences for a highly decentralized fiscal decision making process.

6. The nature of the tradeoff between inflation and cyclical measures of real activity has important implications for the conduct of macroeconomic stabilization policies. Recent research has argued that a non-linear relationship ("Phillips curve") between inflation and cyclical measures of real activity places a high premium on successful stabilization policies, in particular if the economy is subject to significant aggregate demand shocks. More specifically, given a non-linear Phillips curve, large swings in cyclical activity are costly because they reduce the economy's average level of activity. Chapter III reports the results of an empirical investigation of the tradeoff between inflation and economic activity in Switzerland.

7. The empirical analysis in chapter III mainly focuses on the short-run tradeoff between inflation and real activity, although the possibility of a long-run tradeoff is also considered in view of recent research stressing the long-run welfare cost of even moderate inflation rates. The chapter's analysis supports the hypothesis that a non-linear Phillips curve provides a marginally better fit compared with the common linear specification. Statistical inference is, however, hampered by significant structural breaks in the data series in the mid-1970s and the early 1990s. In view of the comparatively high cyclical variability of economic activity in Switzerland, the chapter concludes that the benefits of effective stabilization policies could nevertheless be substantial. At the same time, the chapter's results do not support the hypothesis of a long-run tradeoff between inflation and economic activity in Switzerland.

I. Switzerland's Long-Run Growth Slowdown [1]

8. Since 1976, the average annual rate of growth in real GDP for Switzerland has been substantially less than that recorded during the period 1960–75. Moreover, the real growth rate for Switzerland has been only roughly half the growth rate experienced by other major industrial countries during the past two decades (Figure I-1). How can Switzerland's disappointing growth performance be explained? Is it due to less rapid expansion in factor inputs or slower productivity growth? Does it reflect other countries "catching up" with Switzerland's high income level as Switzerland's technological advantage is reduced? Or has the Swiss economy "run out of steam," suffering increasingly from structural rigidities and lack of entrepreneurial innovation?

9. This chapter attempts to shed some light on these questions. Initially, the standard neo-classical growth accounting framework is used to decompose real GDP growth into the contributions from inputs of productive factors—capital and labor—and from total factor productivity (TFP), the "unexplained" residual. This decomposition shows that more than two thirds of the growth slowdown in Switzerland between 1960–75 and 1976–96 reflects less rapid TFP growth, with most of the remaining slowdown stemming from less rapid capital accumulation. In section B, possible reasons for the slower TFP growth are examined. In the final section, possible routes the economy could take in adapting to lower TFP growth are explored. In this connection, lessons are drawn concerning the beneficial effects on real growth obtained from structural reforms in New Zealand.

A. Accounting for the Long-Run Growth Slowdown

10. During the period 1960–75, average annual real GDP growth in Switzerland (at about 3½ percent) was not out of line with average annual real growth rates of major European industrialized countries, and the United States (Table I-1). From 1976 to 1996 however, Switzerland's average annual real growth rate dropped by more than 60 percent to just below 1½ percent. Average annual growth rates also fell in other major industrial countries in this period compared with 1960–75, but the growth slowdown in these countries was less pronounced than that experienced by Switzerland. Average annual real growth for the G-7 countries during 1976–96 was nearly 3 percent or roughly twice the average annual real growth rate for Switzerland during this period.

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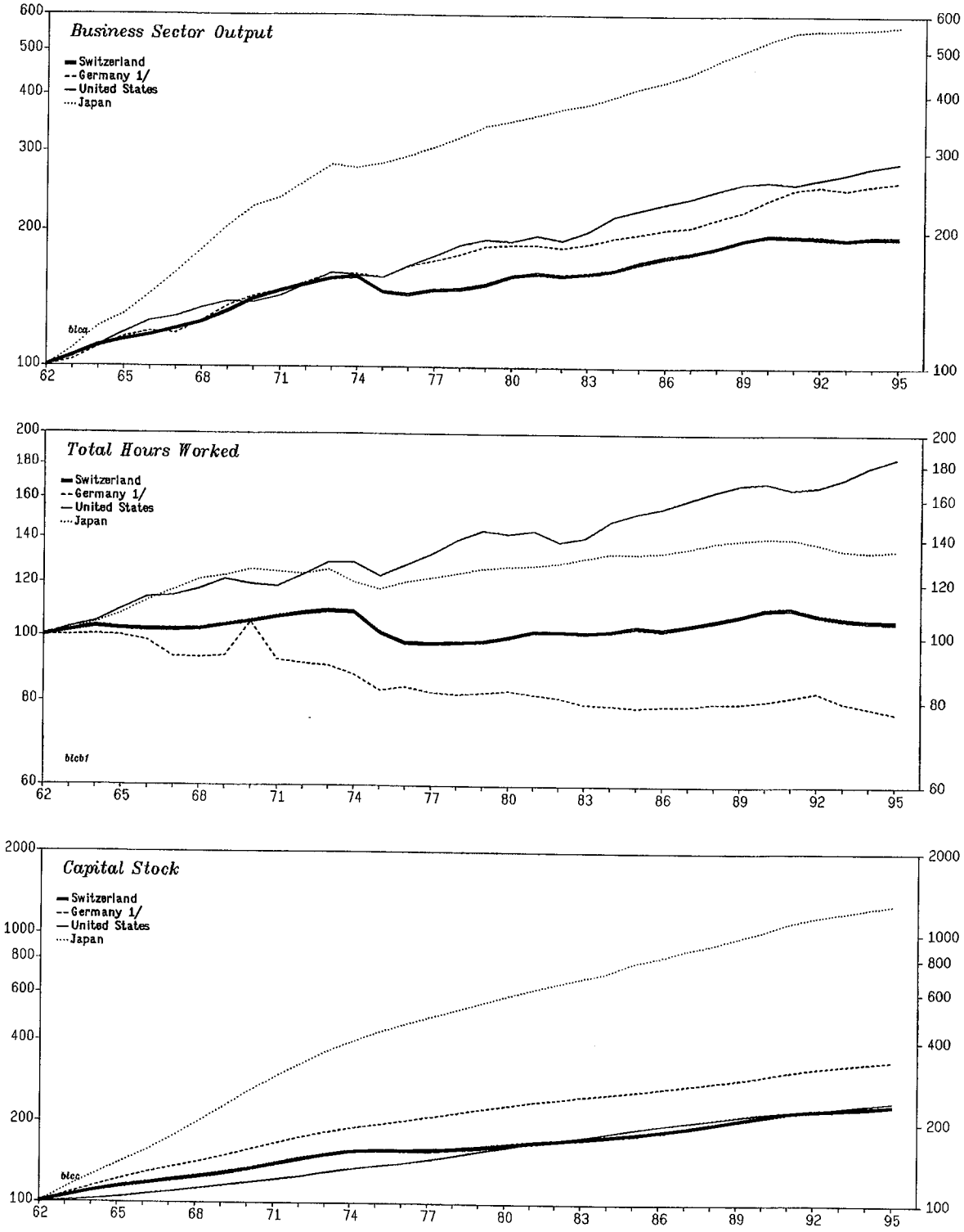
[1]Prepared by Ketil Hviding

Figure I-1. Switzerland: Business Output, Employment and Capital Stock, 1962-95 (1962=100)



Sources: Analytical Database and National Accounts, OECD.
1/ Figures refer to Western Germany.

Table I-1. Real GDP Growth, 1961–96

	1960–75	1976–96
Switzerland	**3.5**	**1.4**
United States	3.6	2.8
Japan	8.2	3.4
Germany	3.7	2.8
France	4.9	2.2
Italy	4.7	2.4
United Kingdom	2.6	2.1
Canada	5.2	2.7
New Zealand	3.5	1.6
G-7	4.7	2.8
EU-4	4.0	2.4

Sources: Analytical Databank, OECD.

11. To understand the factors that have contributed to this growth slowdown, the standard neoclassical growth accounting framework was utilized. Output growth was decomposed into the contributions from: (i) labor (L) —employed workers or hours worked; (ii) capital stock (K) —the value of buildings, machinery and utility vehicles; and (iii) an "unexplained" residual (ε), called TFP growth. The contributions of other inputs to the production process that are not explicitly included—for example, human capital, land or natural resources—would be captured in the residual along with technological progress. Using a Cobb-Douglas function with constant returns to scale, the growth accounting framework weights the production inputs according to their respective income shares:

$$(1) \qquad \Delta GDP/GDP = (1-\alpha)\Delta L/L + (\alpha)\Delta K/K + \varepsilon$$

where α is the capital income share and the notation $\Delta X/X$ denotes percentage change. Total factor productivity growth is equal to the weighted (by income shares) sum of capital productivity growth (output growth minus percentage change in the capital stock) and labor productivity growth (output growth minus percentage change in employment or hours worked).

12. The results from the growth accounting exercise for Switzerland and selected other advanced economies are summarized in Table I-2. The sample period—1961–1996—was split

Table I-2. Contributions to Real Value Added Growth in the Business Sector for Selected Countries, 1961–96

(Annual percent changes)

1961–1975	Real value added Business Sector 1/	(A) Capital	(B) Employment	(C) TFP Unadj.	(D) Avg. Hours Worked	(E) TFP
Switzerland	**3.5**	**1.3**	**0.4**	**1.8**	**-0.2**	**2.0**
United States	3.6	0.7	1.0	2.0	0.0	2.0
Japan	8.3	4.1	0.6	3.5	-1.1	4.6
Germany 2/	3.7	1.7	-0.4	2.4	-0.7	3.1
France	3.6	1.6	0.2	1.8	-0.6	2.3
Italy	5.1	1.7	-0.3	3.7	..	..
United Kingdom	2.6	1.0	-0.3	1.9	..	..
Canada	4.7	1.9	1.4	1.4	..	..
New Zealand	3.5	1.1	1.0	1.3	..	..
EU-4	3.7	1.5	-0.2	2.4	...	...
G-7	4.7	1.8	0.5	2.4	...	...

1976-1996	Real value added Business Sector	(A) Capital	(B) Employment	(C) TFP Unadj.	(D) Avg. Hours Worked	(E) TFP
Switzerland	**1.3**	**0.9**	**0.5**	**-0.1**	**-0.5**	**0.4**
United States	3.0	0.9	1.5	0.6	-0.1	0.7
Japan	3.5	2.0	0.7	0.9	-0.6	1.5
Germany 2/	2.7	0.9	0.3	1.6	-0.6	2.1
France	2.4	0.9	-0.1	1.5	-0.6	2.2
Italy	2.7	0.9	0.2	1.6	..	..
United Kingdom	2.6	0.6	0.3	1.6	-0.4	2.0
Canada	2.9	1.9	1.1	-0.1	-0.3	0.2
New Zealand	1.7	0.6	0.6	0.5	-0.6	1.2
EU-4 3/	2.6	0.8	0.2	1.6	-0.5	2.1
G-7 3/	3.0	1.2	0.8	1.0	-0.3	1.1

Sources: Analytical Databank, OECD Economic Outlook, and Employment Outlook 1997 and 1998, OECD.

1/ In the cases where hours worked data are available, the annual growth rate of real value added in the business sector is composed of the contribution from capital (A) plus the contribution from employment (B) plus an adjustment from average hours worked (D) (average hours worked times the labor income share) and growth in TFP (E).

2/ Includes only western Germany.

3/ In the case of average hours worked, Italy is excluded.

in 1975 because that year has been identified as a structural break point for Switzerland.[2] The two sub-periods—1961–75 and 1975–1996—contain 15 and 20 annual observations, respectively. In the case of Switzerland, output growth for the business sector (real GDP less the government sector) fell from 3½ percent per annum (pre-1975 period) to 1¼ percent per annum (post-1975 period). This slowdown in average annual output growth was almost 2¼ percentage points or a decline of 60 percent.[3] The major industrial countries also experienced slower growth of private sector output but their slowdowns were less sharp than the one exhibited by Switzerland; for the 4 largest European economies, the growth slowdown averaged about 1 percentage point and the slowdown in the United States was around ½ percentage point. By contrast, the Japanese economy experienced a growth slowdown more in line with Switzerland. In Japan, annual average output growth dropped from more than 8¼ percent during 1960–75 to 3½ per cent during 1975–96—a growth slowdown of almost 5 percentage points, or a decline of around 60 percent.

13. Estimates of the contributions to output growth from the capital stock and employment are provided in Table I-2. The same capital income share—the average for 1960–96—was used for both periods to avoid biasing the calculations; this also accords reasonably well with actual developments in income shares. Data on capital stock data was calculated by the OECD[4], except for the case of Switzerland. The Swiss capital stock was constructed from national sources and includes the large revision to the investment series released in 1997 (see Annex I for details). Employment data for the total number of

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[2]For details on the statistical analysis related to identifying 1975 as a series break for Switzerland, see the chapter "Estimates of Potential Growth and Cyclical Output Gap" in the IMF Staff Country Report No. 97/18 for Switzerland. This series break coincides with the negative supply shock generated by the first oil price shock and the introduction of floating exchange rates.

[3]This slowdown is even more striking if 1975 is excluded from the sample period (between 1974 and 1976, nongovernment output fell by more than 9 percent). From 1960 to 1974, nongovernment output increased by close to 4 per cent per annum compared with 1½ percent per year during 1976–96, or an annual growth slowdown of 2½ percentage points.

[4]In the OECD estimates, depreciation rates follow the so-called "sudden death" assumption—the value of capital equipment drops to zero after a specified number of years which differ by type of capital. "Scrapping rates" were set equal for all countries and only productive capital of the business sector was included.

employees in the nongovernment sectors were taken from the OECD[5], while most of the data on hours worked were obtained from national sources.[6]

14. As shown in Table I-2, more than two thirds of the Swiss growth slowdown can be attributed to slower TFP growth (columns C and E). At the same time, the contribution to output growth from capital accumulation fell by nearly ½ percentage point between the pre-1975 period and the post-1975 period. This lower contribution reflected lower average capital productivity across the two periods as the capital-output ratio continued to rise rapidly (Figure I-2). Indeed, capital productivity growth fell throughout the period 1962–95, and in 1995 capital productivity growth was roughly half its 1962 level. Total factor input contributions were also affected by lower average hours worked (column C), which dropped the labor contribution by about ¼ percentage point. However, Switzerland's relatively slow output growth in the post-1976 period is only partly explained by slower growth in capital and labor. Switzerland's annual growth rate for TFP (column E) during 1976–1996 was less half that for G-7 countries and only about one fifth of the TFP growth rate for the largest four European economies (EU-4).

15. No consistent picture emerges from a comparison with selected industrial countries, although it does appear that TFP growth declined in most industrial countries. The growth contribution from capital formation declined generally among the selected industrial countries with the notable exceptions of the United States and Canada. Among the major industrial countries, the contribution from capital increases fell by around ½ percentage point, while the contribution of capital formation in the four largest EU economies slipped on average by close to ¾ percentage point.[7] With the exception of France and Canada, the contribution to growth from employment in the G-7 countries was the same, or larger, during the second sub-period compared with the first sub-period. Average hours worked fell by around ½ percentage point in most countries, with the notable exception of the United States.

16. Hours worked data—which adjusts for changes in statutory work week, overtime, vacation periods, and the share of part-time work—were not readily available for all countries. In the absence of hours worked data, TFP growth was calculated as a residual after

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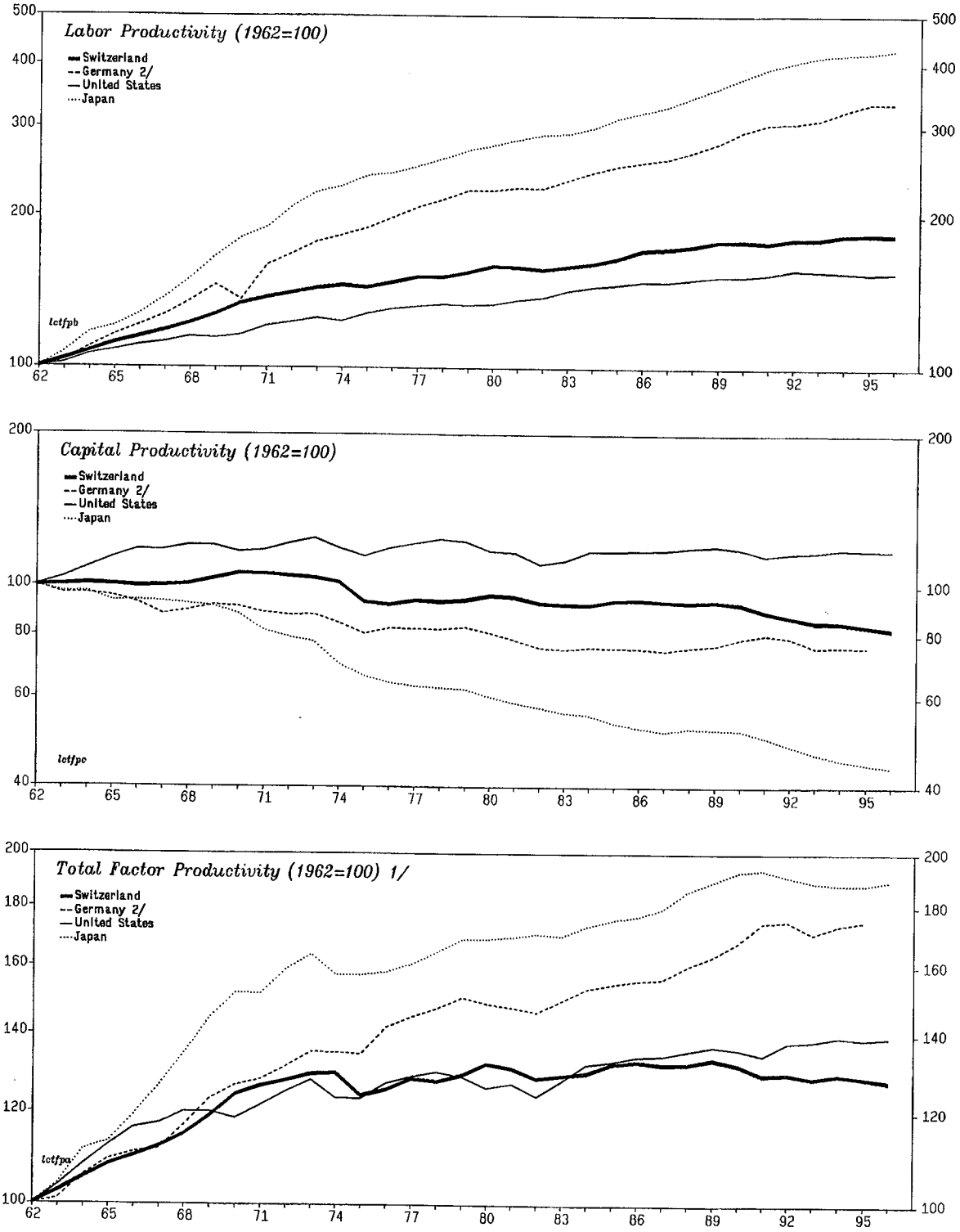
[5]Data on capital stock, employment and output for western Germany after 1991 where taken from national sources.

[6]In the case of the United Kingdom, Canada, and New Zealand, the hours worked data were taken from OECD Employment Outlook, 1997.

[7]For Germany, the data excluded eastern Germany in order to reduce the bias from the reunification, particularly the introduction of a large number of relatively unskilled (or "inappropriately" skilled) labor from the eastern Länder. Using unified Germany for the period after 1990, does not change the results significantly, except for the contribution from reduced working hours in 1976–1996. Using unified Germany data, the contribution from working hours was -0.4 percent compared with -1.1 percent for western Germany.

Figure I-2. Switzerland: Labor, Capital and Total Factor Productivity, 1962-96 (1962=100)



Sources: Analytical Database and National Accounts, OECD.

1/ Total Factor Productivity (TFP) growth is equal to a weighted average of the growth in labor and capital productivity. The sample period averages for capital and labor shares are used as weights.

2/ Figures refer to Western Germany.

substituting the contributions from capital and employment. The results are very similar to those obtained using hours worked data: unadjusted Swiss TFP growth (column C) is estimated to have averaged approximately zero in the post-1976 period, dropping from 1¾ percent per annum during 1960–75. The average decline in unadjusted TFP growth for the EU-4 countries from the pre-1975 to the post-1976 period was around ¾ percentage points. Thus, the Swiss slowdown in TFP growth was more than twice that experienced by the EU-4 economies. By either measure, Switzerland recorded a pronounced decline in TFP growth.

B. Explaining Slower Productivity Growth

17. The quest for explanations for Switzerland's slower growth during 1975–96 requires an understanding of the growth process. In traditional neoclassical growth models, the steady state rate of growth is determined by exogenous factors, such as growth in the labor force and technological change. In these "older" models, economic policies affect the level of output by removing economic distortions or by changing the capital/labor ratio, but economic policies would not affect long-term growth rates. A broader set of theories, such as endogenous growth models and institutionally based theories, have introduced channels (e.g. via human capital formation, technological change, infrastructure externalities) by which economic policies can change long-term growth rates. In particular, such growth rates could be raised by: (i) a stable macroeconomic environment; (ii) high investment rates in physical capital, including infrastructure, and in human capital; (iii) reduced distortions in both international and domestic trade; and (iv) quick adaptations to a rapidly changing economic environment.

18. Against this background, Switzerland's relative poor growth performance is all the more puzzling since Switzerland would not seem to lack the preconditions to grow as fast as other industrial countries. Clearly, macroeconomic policies have been "stability oriented" and should be conducive to long-term economic growth. Average annual inflation in Switzerland has been one of the lowest among industrial countries during the postwar period. Public finances have been sound: general government deficits in Switzerland have been smaller on average than those in other industrial countries and the gross public debt/GDP ratio in Switzerland has changed little from 1975 to 1996 (in spite of a rise during the 1990s). Recent evidence points to a negative impact on real growth rates from high marginal tax rates on both human and physical capital.[8] However, this consideration does not explain the relative greater growth slowdown in Switzerland: Swiss tax rates have generally been lower than in the most EU countries and the relative positions have not changed significantly. Public spending on education and health care has been found to have a statistically significant long-run effect on real GDP growth [9] in Switzerland. However, public spending on these expenditures categories has increased relative to GDP and therefore can not explain the growth slowdown.

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[8]See W. Leibfritz, J. Thornton, and A. Bibbee,"Taxation and Economic Performance", OECD Economics Department Working Paper, (Paris: OECD), 1997).

[9]For an empirical study of endogenous growth and public spending in Switzerland, see R. Jan Singh and R. Weber, "The Composition of Public Expenditure and Economic Growth: Can Anything be Learned from Swiss Data?", *Swiss Journal of Economic and Statistics*, Vol.133, 1997, pp. 617–634.

19. Insufficient fixed investment has also not been a problem in Switzerland. The gross investment-GDP ratio for Switzerland averaged around 25 percent of GDP during 1976–96—one of the highest ratios in the world. Owing to high domestic investment, the capital-output ratio in Switzerland has trended upwards over the period 1962–96 (Figure I-3). Consistent with a rising capital-output ratio, capital productivity in Switzerland declined. The average rate of return on capital in Switzerland has drifted steadily downwards since the mid-1960s.[10] The decline in the rate of return on investment in Switzerland is also reflected in a swelling current account surplus as investors sought the higher rates of return available abroad. While the national saving-GDP ratio remained fairly constant during the 1960–1996 period, the domestic investment-GDP ratio dropped by about 5 percentage points in the mid-1970s. Consequently, the current account position increased from an average of near balance during 1962–74 to an average surplus of about 5 percent of GDP during 1975–95 (Figure I-4).

20. Investment in research and development (R&D) has also been high in Switzerland and has been on an upward trend since the 1970s. Spending on R&D averaged around 2¼ percent of GDP per annum during the 1970s and rose to an annual average of 2¾ percent during the 1990s—which placed Switzerland among the leading R&D spenders in the OECD. According to the number of patents awarded, technical innovation is high. However, the technological content of exports and patent data seems to indicate that Switzerland may have slipped in the knowledge-intensive and high technology areas (see OECD Economic Survey of Switzerland 1996).[11] The Swiss workforce is also highly educated with human capital underpinning the country's high labor productivity (see OECD Economic Survey of Switzerland 1997). The proportion of the adult working-age population that has completed at least upper secondary education is the third highest in the OECD. The apprenticeship system also enhances the quality and effectiveness of the human capital formation and facilitates the transition from education to work. Except for international protection of agriculture and food products,

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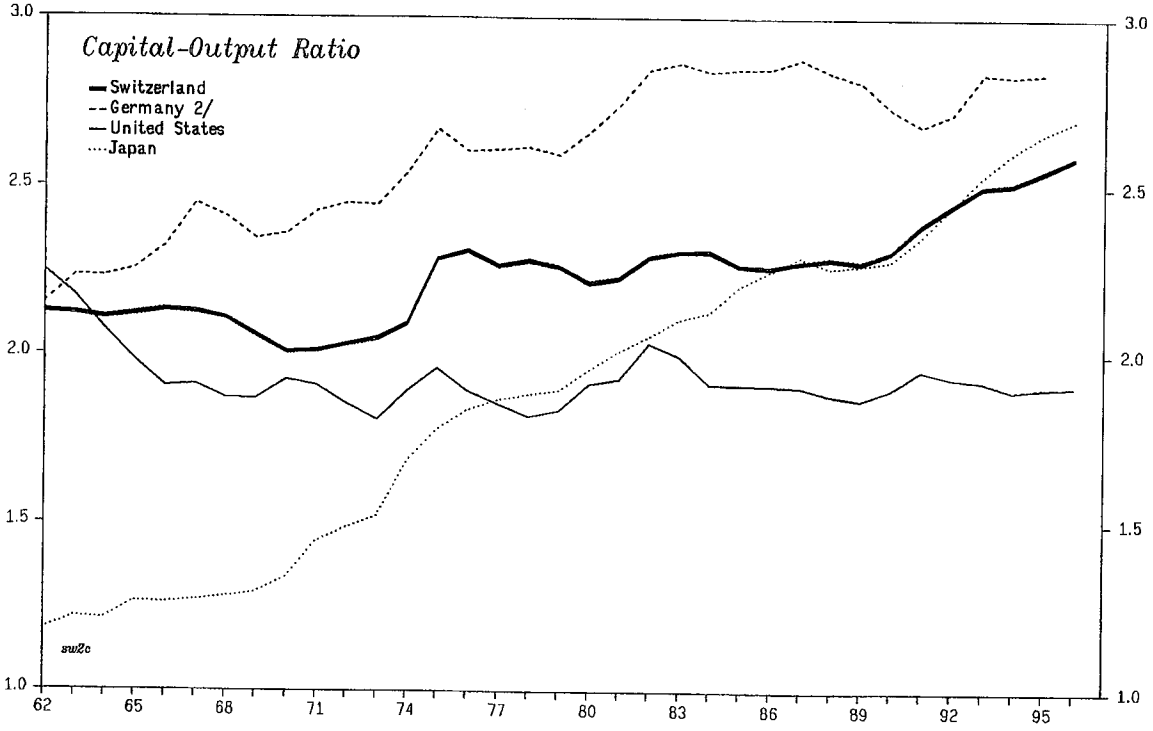
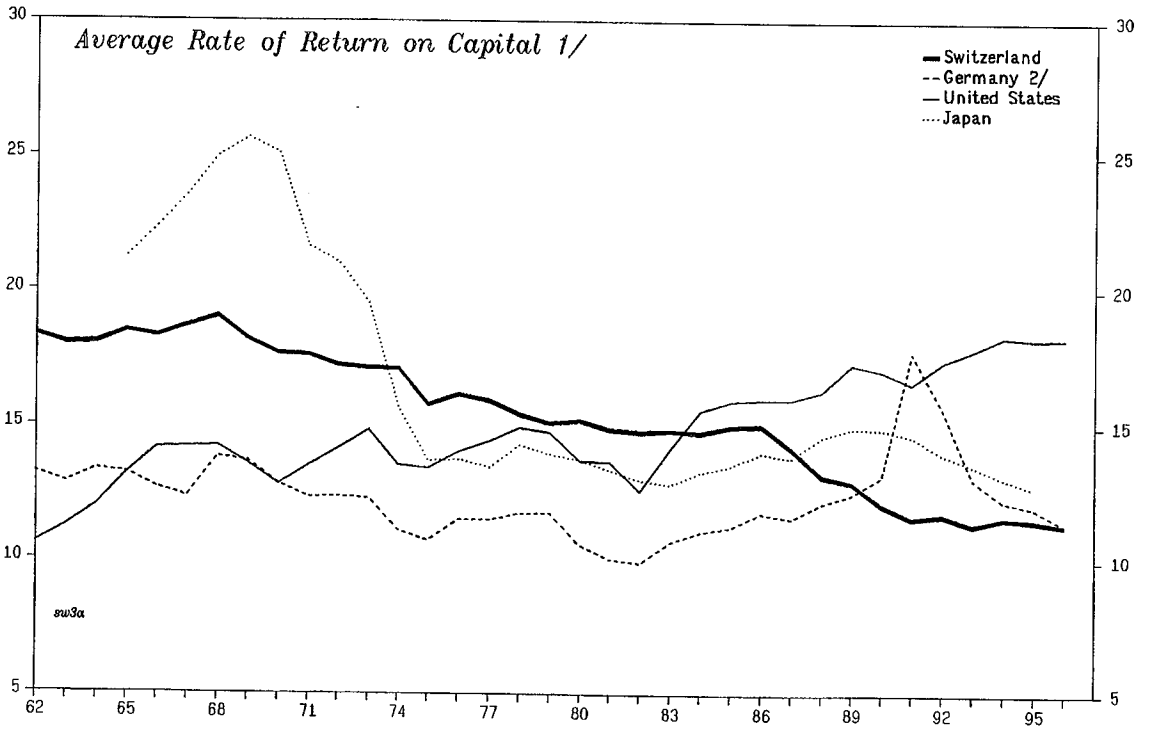
[10]A large degree of uncertainty is associated with these data. The rate of return on capital is not only dependent on the level of the real capital stock, but also its income share and the unit price of capital used to calculate the nominal value of capital. Observations based on the rate of return on comparable financial assets in Switzerland from 1979 to 1994 suggest that the rate of return on Swiss financial assets is 2–4 percent lower than the rate of return on similar assets denominated in deutsche mark, French francs, lira, yen, or US dollars (see "Switzerland —Selected Background Issues", SM/95/2).

[11]These activities tend to be centered in the sheltered sectors which face less competitive pressures.

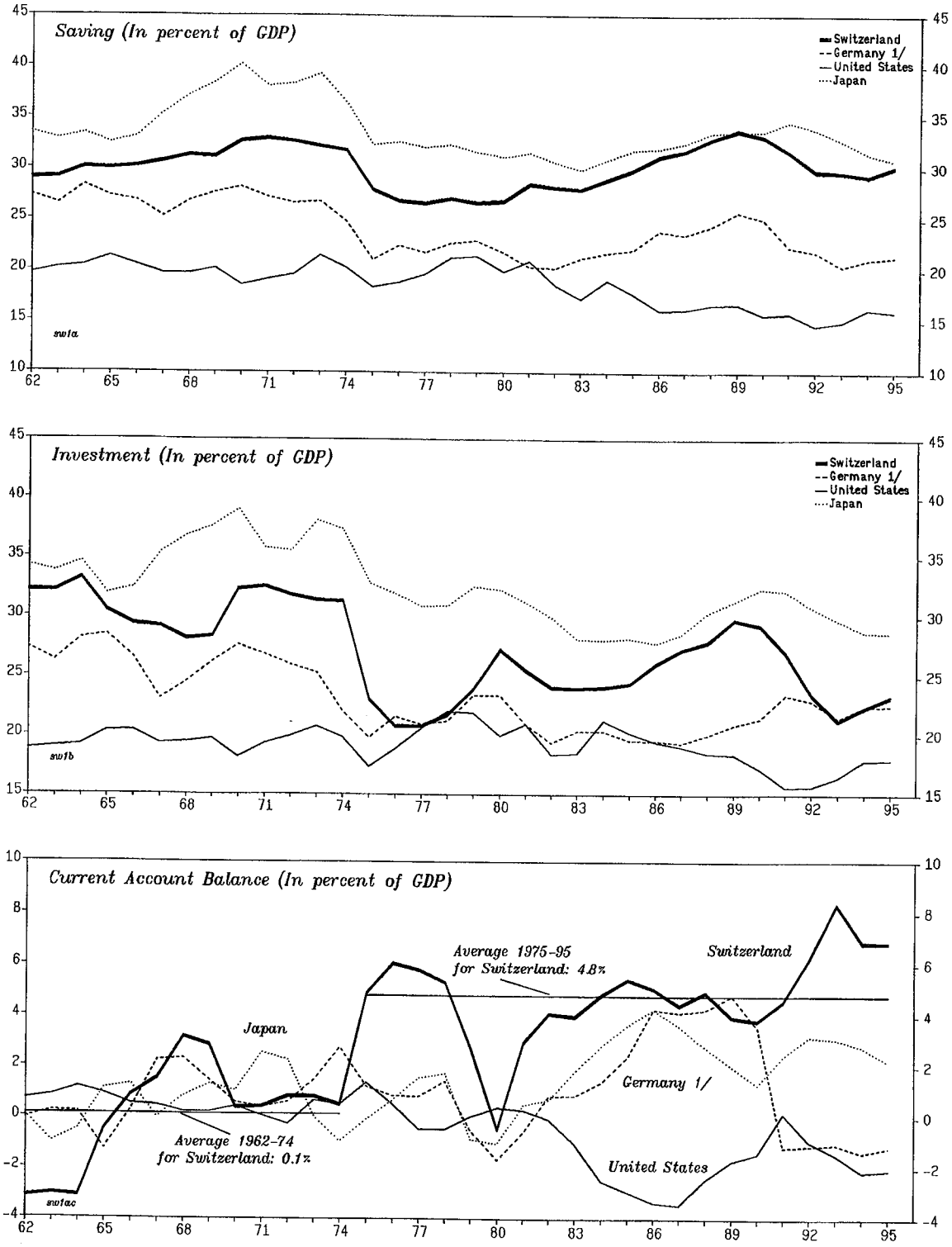
Figure I-3. Switzerland: Capital-Output Ratio and Average Rate of Return, 1962-96





Sources: Analytical Database and National Accounts, OECD.
1/ Business sector capital (Total economy less government sector).
2/ Figures refer to Western Germany.

Figure I-4. Switzerland: Saving, Investment and the Current Account, 1962-95



Sources: Analytical Database and National Accounts, OECD.
1/ Figures refer to Western Germany.

Switzerland scores highly on openness to international trade. Yet, in spite of all these favorable elements, Swiss economic growth seems to have "run out of steam."

21. In standard neoclassical growth theories, real GDP per worker levels in different economies tend to converge over time in the absence of major impediments. This convergence or "catch up" hypothesis has also found empirical support. Thus, a high-income country like Switzerland would naturally grow less rapidly than lower-income countries. Looking at per capita real GDP (at purchasing-power-parity exchange rates), Switzerland has a higher income level than nearly all industrial countries, which is consistent with the hypothesis of catch up growth. However, the relatively faster growth rate of the United States and its higher relative per capita real GDP level are inconsistent with this theory. In addition, based on real GDP per hour worked (again at PPP exchange rates), Switzerland is not a labor productivity "leader" (Table I-3). The average labor productivity level of the four largest EU countries in 1992 was about 5 percent higher than Switzerland's labor productivity, while productivity in the United States was around 13 percent higher than Swiss productivity. The largest EU countries and the United States grew faster than Switzerland since 1975 by about 1 percentage point and 1½ percentage point (per annum), respectively. In sum, economic developments in Switzerland compared with those in other economies suggest that income divergence, rather than, income convergence has been taking place.[12]

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[12]Improved environmental standards may explain some of the slowdown in growth. Conventional national accounts do not measure environmental quality. Thus, international growth comparisons based on national accounts could bias the outcome against countries like Switzerland with relatively tough environmental standards (for an extensive discussion of Swiss environmental policies, see OECD Economic Survey of Switzerland, 1996).

Table I-3. Real GDP per Capita and Labor Productivity Levels

	GDP per Capita 1/	GDP per hour worked 1/
	1994	1992
Switzerland	**92.3**	**87.2**
United States	100.0	100.0
Japan	86.4	68.8
Germany	84.6	94.7
France	79.6	101.8
Italy	72.7	84.5
United Kingdom	72.5	82.4
Canada	81.3	87.0
Australia	75.8	77.5
New Zealand	66.8	...
G-7	88.7	89.8
EU-4	78.6	92.1

Source: A. Maddison, "Monitoring the World Economy: 1820–1992," (Paris: Development Centre of the OECD), 1994.

1/ Adjusted by relative PPPs.

22. A clue to Switzerland's relatively poorer growth performance may be found in structural rigidities. Switzerland has been frequently characterized as a dual economy with a highly competitive open sector engaged in external trade and a sheltered sector oriented toward the domestic market. With the exception of agriculture, which accounted for less than 3½ percent of domestic value added in 1996, the open sector in Switzerland has relative low tariff protection. On the other hand, the sheltered sector has been extensively protected.[13] The distribution sector is highly concentrated and, at least until recently, anti-competitive practices, such as price-fixing, market-sharing arrangements, pooling of sales or outright cartel arrangements, have been common.[14] In addition, the domestic market was segmented until recently by canton, owing to differences in technical standards, licencing and public procurement practices. Public monopolies in transport, postal services, telecommunications, and electricity resulted in relatively high prices, inefficient operations, and less innovation. In addition, the domestic market led to higher input costs for other sectors and may have hampered the diffusion of the benefits from new technologies.

23. The opportunity costs of the reported rigidities in sheltered product and service sectors have probably been large. While during the 1950s and 1960s, innovations occurred largely in manufacturing industries, in the 1980s and 1990s, rapid technical change has

[13]OECD Economic Surveys of Switzerland of 1993, 1996 and 1997.

[14]OECD Economic Survey of Switzerland, 1993.

centered in telecommunications, information technologies, and biotechnology, which are part of the sheltered sector in Switzerland. Deregulation can open up new possibilities for productivity gains and growth. In the United States, for example, deregulation of telecommunications, airlines, and trucking reduced unit costs by 25 to 50 percent (Council of Economic Advisors, February 1997). In addition, deregulation helped fuel an impressive process of product innovation. The economic benefits were widespread: input costs to manufacturing industries fell, the distribution system was improved and new marketing techniques were introduced; enhanced telecommunication and information technology have facilitated globalization of production and finance. Some econometric evidence also suggests that product market rigidities have lowered long-run growth in some EU countries.[15] A statistically significant negative correlation was found between real growth rates and indices of product and labor market rigidities across different EU countries.[16] The regression showed that product market rigidities were about twice as damaging to real growth as labor market rigidities—slower TFP growth was the major transmission mechanism.

24. The level of Swiss consumer prices relative to other European industrial countries can serve as an indicator of the relative degree of domestic competition. An international price comparison based on a standard basket of consumer goods and services was conducted by the OECD. It found that consumer prices in Switzerland in 1990 were about 37 percent higher than prices in EU countries (EU-12). In 1993, Swiss consumer prices were still 35 percent higher than in the same EU countries (Table I-4). Although changes in definitions, productivity effects or VAT differences make relative price comparisons suspect, these factors cannot fully explain the large observed differences.[17] It seems reasonable, therefore, to conclude that persistent price premiums in Switzerland reflect in that market.

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[15]K. Kremers and J. Koedijk, *Economic Policy*, October 1996, pp. 445–467.

[16]An index of product market regulation was created as an unweighted average of regulations on business establishment; competition policy; extent of public ownership; restrictions on shop hours; and extent of implementation of the single market.

[17]Indeed, correcting for VAT differences is likely to reinforce the basic message because indirect taxes are lower in Switzerland than in most EU countries.

Table I-4. Switzerland: Price Level Comparison between Switzerland and the EU (12)

(Percent difference between Swiss prices and EU prices)

	1990	1993
Food	52.0	51.1
Clothing and footwear	12.4	20.4
Car fuel (rent and power)	48.9	60.2
Household equipment	17.0	24.3
Health care	60.4	43.0
Transportation	13.0	18.3
Education, recreation	21.1	29.8
Other	44.6	21.2
Total private consumption	**36.6**	**34.7**

Source: Purchasing Power Parities and Real Expenditure, OECD, 1992 and 1995.

25. The dual character of the Swiss economy would suggest that the sheltered sectors are the principal factor explaining the growth slowdown. However, as sectoral data on the capital stock are not available, the growth accounting framework cannot be utilized. Instead, the annual average growth rates for labor productivity in the manufacturing (a proxy for the "open" sector) sector manufacturing private (or "sheltered") sector.[18] The average annual growth rate for labor productivity in the Swiss manufacturing sector (which accounted for about 30 percent of value added), was 2¾ percent during 1965–75 or substantially below the average annual growth rates in labor productivity in other industrial countries (Table I-5). However, the average annual growth rate for Swiss labor productivity in the manufacturing sector slowed by only ¼ percentage point from 1965–75 to 1976–96. This slowdown in labor productivity growth in manufacturing in Switzerland was much less than the average growth slowdown experienced in the other industrial countries. Thus, Swiss labor productivity growth in manufacturing during 1976–96 was roughly comparable to its growth rate in the pre-1975 period and Switzerland improved its relative position with the average for selected industrial countries. Clearly then, the manufacturing sector has not been the major source of the marked slowdown in Switzerland's real GDP growth performance. On the other hand, the implied growth slowdown for the sheltered sectors—the non-manufacturing private sector—has been considerable. The average annual growth rate of labor productivity in the sheltered sector fell by 2 percentage points from about 2½ percent during 1965–75 to ½ percent during 1976–96. This contrasts with an implied productivity growth of nearly 2 percent per annum (1976–1996) in the sheltered sector of the EU-4 countries.

[18]This categorization does not correspond perfectly to the distinction between the open and sheltered sectors, but it is the best that can be done given the data limitations.

Table I-5. Labor Productivity in Manufacturing
(Percent annual changes)

	1965–75	1976–96
Switzerland	**2.7**	**2.4**
United States	3.3	3.0
Japan	8.2	2.9
Germany 1/	4.8	3.5
France	4.1	3.4
Italy	4.1	1.7
United Kingdom	5.5	3.7
Canada	3.4	1.8
New Zealand	6.4	12.7
G-7	4.8	3.0
EU-4	4.6	3.2

Source: WEO database.

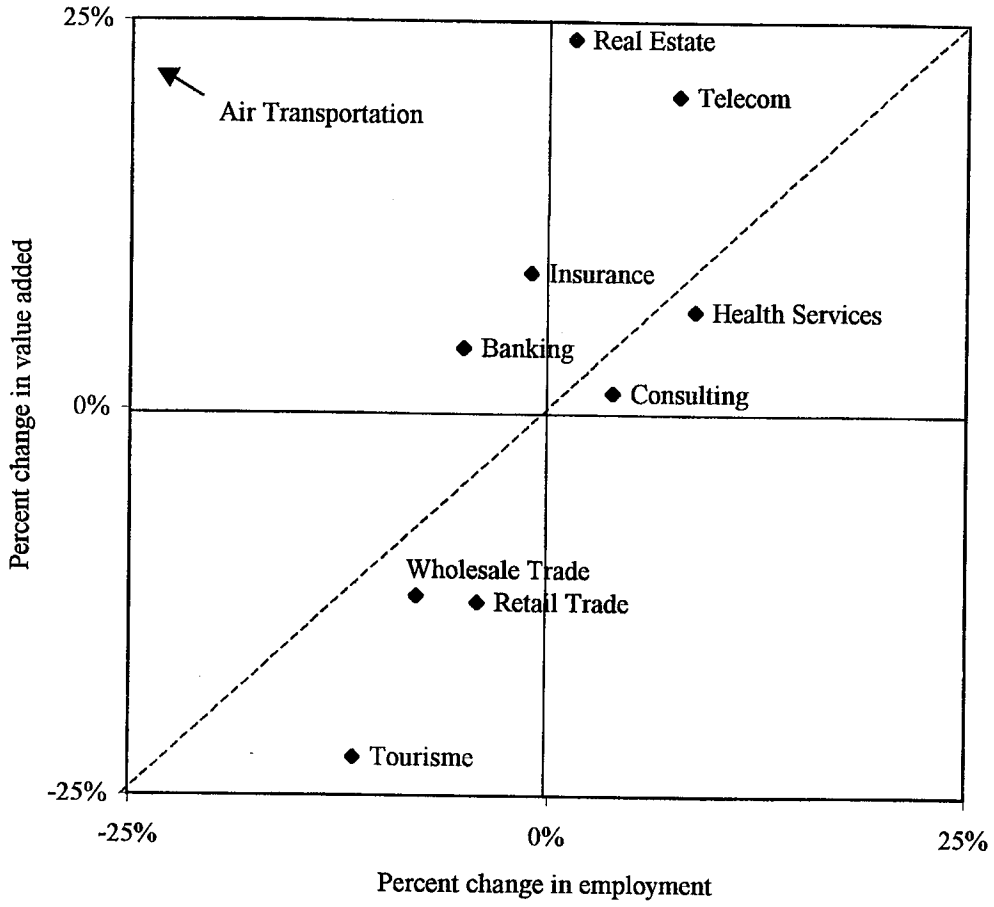
1/ From 1968–75.

26. Preliminary sectoral data from the service sector for the period 1990–1995 provides some more recent evidence on the restructuring process. These data indicate that large shifts—both of production and employment—have taken place among various sub-sectors within the service sector (Figure I-5). While overall real output of the service sector contracted by close to 5 percent, some sub-sectors—such as telecommunications, air transport, insurance and, to a lesser extent, health services—expanded (and in some cases, significantly) in the same period. Wholesale and retail trade, and tourism, on the other hand, experienced a sharp contraction. On average, employment fell in the service sector by close to 4 percent, but some sectors—such as telecommunications, and health services—were net "creators" of jobs. Only two sub-sectors—telecommunications and real estate—posted productivity gains together with employment expansion, while financial services and air transport achieved improved labor productivity through labor shedding.

27. The sectoral patterns in the service sector contrast sharply with the sectoral data on manufacturing industries (Figure I-6). While the total manufacturing sector expanded by some 5 percent, some sub-sectors—e.g., machines and vehicles, electronics, and textiles and clothing—contracted. In all sub-sectors of manufacturing, employment fell, contracting, on average, by as much as 16½ percent. Thus, the increased labor productivity in manufacturing is explained by massive labor shedding.

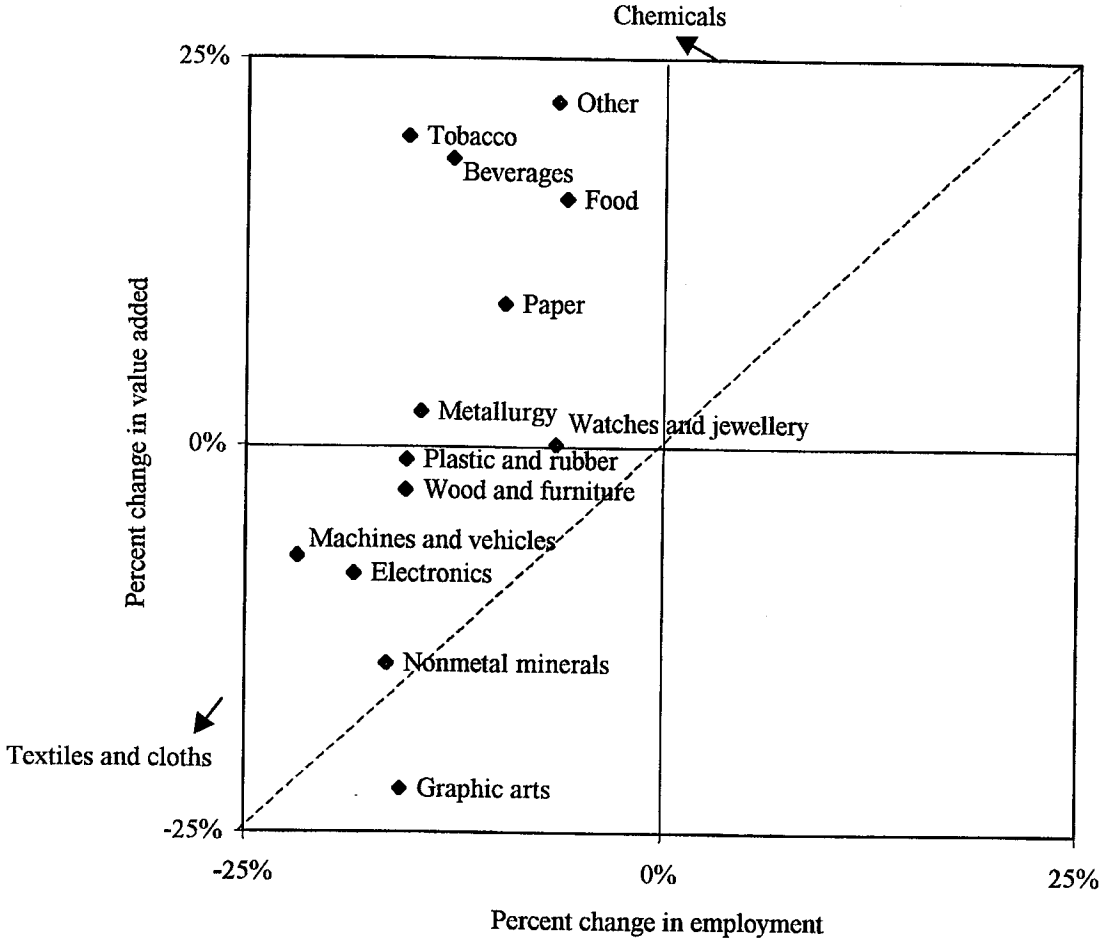
28. In spite of the preliminary nature of the sectoral data and measurement problems (in particular the split between real output and price mark-ups in the service sector) the sectoral data does suggest that, under the surface of lackluster productivity growth, a process of structural change is taking place in the whole economy. Reflecting its exposure to foreign competition, it is not surprising that the process is much faster, and the productivity gains

Figure I-5. Switzerland: Sectoral Change in Real Value Added and Employment, 1990-95
Main Service Sectors



Source: Staff estimates based on country submission.
1/ Sectors to the left (right) of the dotted line experienced an increase (decline) in productivity.

Figure I-6. Switzerland: Sectoral Changes in Real Value Added and Employment, 1990-95
Manufacturing Industries



Source: Staff estimates based on country submission.
1/ Sectors to the left (right) of the dotted line experienced an increase (decline) in productivity.

larger, in the manufacturing sector. But the process of structural change is also taking place in the service sector, partly reflecting the anticipation of increased competition (air transport, financial services, and telecommunications) or structural shifts in foreign demand (tourism).

C. Redressing the Structural Growth Problem

29. Is relatively slow real GDP growth in Switzerland a problem? The answer is not straightforward because real GDP may not be the appropriate measure of social welfare. The quality of life is also influenced by environmental issues and pursuit of leisure—neither are captured in standard national income accounts. Even presuming that per capita real consumption is the appropriate measure, then national income, and not real domestic production is the appropriate income variable to maximize.

30. With these caveats in mind, it is nevertheless useful to ask how the economy might adapt to slower productivity growth and a lower total rate of return on investment. Possibilities include (i) shifting more savings abroad and expanding further the current account surplus, (ii) reducing savings, and (iii) raising productivity growth. To the extent that rates of return remain lower in Switzerland than abroad, holding a greater share of real capital abroad would increase national income.[19] A higher steady state ratio of net foreign assets to GDP could be achieved by running a larger current account surplus. While the increase in the current account surplus relative to GDP during the 1990s has undoubtedly an important cyclical component, it may also reflect efforts by the private sector to invest more wealth abroad to take advantage of the higher rates of return. Alternatively, domestic savings could decline in the long run as private households face a lower opportunity cost for current consumption, that is a lower rate of return on domestic investment.[20]

31. The best solution would be to increase the growth rate of TFP and the rate of return on investment to international levels. Structural reforms aimed mainly at the product market could contribute to faster TFP growth and higher rates of return on investment. With this in mind, the Government's "revitalization" program has made important progress towards redressing structural rigidities in the sheltered sector. This revitalization program was the Government's response to the rejection of Switzerland's participation in the European Economic Area in a referendum in December 1992.

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[19]Portfolio theory also requires an analysis of the risks—the variance and covariance matrix of returns. Data on the variability of rates of return on capital are not readily available; however, calculations on the variability of real GDP in Switzerland, western Germany and the United States—a proxy for variance—indicate that real GDP variability in Switzerland is greater than in Germany and the United States. Also, foreign business cycles are likely not to be perfectly correlated with the Swiss business cycle.

[20]Such action would only be welfare enhancing in the presence of capital account restrictions that effectively foreclosed the option of investing abroad to obtain the higher rates of return available there.

32. One major element of this program is the new Cartel Law. This law was approved by Parliament in October 1995 and came into force on July 1, 1996, although a phase in period continued until January 1, 1997. Under this law, the Competition Commission is given clearer guidelines and an improved instrument to combat anti-competitive commercial practices. The law does not prohibit cartels outright as that would have required a time consuming amendment to the constitution and possibly a referendum. Rather, the new law prohibits the "abuse of dominant" market position and is, in effect, considered to be close to the EU law.[21] The law contains a presumption that horizontal agreements that set prices, production volumes or territorial distribution, act to eliminate effective competition and hence are illegal. Limitations of competition—e.g., vertical integration—are not prohibited, if they can be shown to increase economic efficiency, in some way advance a positive economic goal (e.g., consumer welfare), or meet political/social needs. Mergers are to be reported where they exceed certain thresholds—annual turnover of Sw F 2 billion worldwide or Sw F 500 million in Switzerland. These notification thresholds have been criticized for being too high.[22] It is, however, too early to assess the economic impact of the law since much depends on how strictly the law is implemented.

33. Another important plank in the revitalization program was the "domestic market law", which was also approved by Parliament in October 1995. This law came into effect in early 1996. It establishes the fundamental principles for market access throughout the Confederation. Under the new law, all persons established or headquartered in Switzerland have the right to offer goods and services, including personal services, throughout Switzerland. In doing so, it should reduce the market segmentation across cantons. This law is based on the principle of "mutual recognition" of qualifications and technical standards. (This is the same principle adopted in the EU rules on the internal market.) Thus, access to cantonal markets will no longer be regulated by the canton and will no longer be restricted through specific cantonal qualifications. The law on the internal market also opens up public procurement at the federal, cantonal and communal levels, providing for non-discriminatory access for all suppliers and public offers to enhance transparency. Non-discriminatory access to public procurement is however subject to the threshold levels agreed in the Uruguay Round. These relatively high thresholds—given the small scale of some cantons—may effectively leave incumbent producers shielded from competition.

34. The third leg of the revitalization program was the removal of the legal basis for technical barriers to trade in order to open Swiss markets to greater foreign competition. This provision was approved in October 1995 and came into effect in July 1996. It established the guiding principles for the preparation, adoption, and periodic examination of regulations on technical standards. The new technical regulations must be compatible with those in

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[21]See D. Neven and T. von Ungern-Sternberg, "Competition Policy in Switzerland", Center for Economic Policy Research Discussion Paper, No. 1416, June 1996.

[22]See OECD Economic Survey of Switzerland 1996–1997.

Switzerland's main trading partners and should effectively reduce the protection stemming from specific Swiss technical standards.

35. Deregulation of key network services is also scheduled, following closely developments in the EU. In line with the opening of competition in the EU, free entry (subject to an assessment of the technical capabilities of the applicant) into the telecommunication market was established from January 1998, and Swiss Telecom, the previous monopoly, is scheduled to be partly privatized (49 percent) in the second half of 1998. The key issue—the level of interconnection prices—is still to be decided, however. Too high a level could limit the degree of effective competition in the industry, while too low a level would put Swiss Telecom at a cost disadvantage. Electricity production and distribution are subject to a regime of concessions, with utilities having a geographical monopoly. Moreover, three-quarters of the electricity sector is owned by local governments. This situation has contributed to Swiss electricity prices being among the highest in Europe and to large price differences within Switzerland. To open up the electricity market, a reform based on the principle of "third party access" has been proposed. This reform would align Switzerland with reforms introduced in the United Kingdom, Sweden, Norway, and New Zealand, and make it compatible with the EU's internal electricity market. It is intended that the Swiss reform be in place by 1999, the date envisaged for the opening of the EU electricity market.[23]

36. These comprehensive structural reforms will create more competition in the sheltered sectors, lowering prices to consumers and producers in the traded goods sector. Since the various laws have been in force for a year or less, it is too early to assess their impact on the Swiss economy. In particular, will these reforms pay off in terms of faster TFP growth? In order to answer this question, it might be instructive to review the main lessons from New Zealand's experience. As in the case of Switzerland, structural reforms in New Zealand came after a long period of slow growth: per capita real GNP in New Zealand dropped from nearly equal that of the United States prior to World War II to half that of the United States in the early 1980s. Prompted by crisis in 1984, a new Government embarked on an impressive agenda of economic reforms, including privatization and deregulation of industry and reduced agricultural protection.[24] The bulk of the reforms were implemented between 1984 and 1987, although labor market liberalization was delayed until the early 1990s.

37. New Zealand's structural reform program consisted *inter alia* of: (i) an industrial and competition policy focused on the development of a competitive environment in which no sector was singled out by policy interventions; (ii) privatization and commercialization of network services such as telecommunications and electricity; (iii) a comprehensive tax reform;

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[23]"Third party access" is the general model for the planned EU electricity market, although France and Austria opted for the "single buyer" model.

[24]For an accessible account of New Zealand's reforms see L. Evans, A. Grimes, B.Wilkinson, and D. Teece, "Economic Reform in New Zealand 1984–95: The Pursuit of Efficiency," *Journal of Economic Literature*, December 1996.

(iv) a sharp reduction in the support and regulation of agrculture; and, finally, (v) comprehensive labor market reforms, including a replacement of centralized wage bargaining structures by decentralized enterprise (or individual) bargaining. In particular, the deregulation of telecommunications led to a rapid fall in prices and improved services. The implementation of the reforms were greatly helped by reforming several sectors at once; in this way, the cost to one sector were compensated by gains to other sectors. The delayed introduction of labor market reforms did probably, however, increase the transition costs by slowing the needed shift of labor from contracting to expanding sectors. Switzerland, however, with its relatively flexible labor market is less likely to encounter such sequencing problems.

38. There is now some evidence that the reforms have redressed the pace of productivity growth in New Zealand. The average rate of return on capital in the business sector increased from about 12 percent in the late 1980s to around 16½ percent during 1991–1996. The annual rate of per capita real growth rose to over 2½ percent during 1991–96or nearly almost triple its per capita growth rate during 1974–91. While average annual growth rates for New Zealand and Switzerland were similar during 1960–75 and 1976–96, current estimates of the growth rate for potential output in New Zealand are close to 3 percent per annum or at least twice the growth rate for potential output in Switzerland.

39. In short, the main lessons from the New Zealand experience may be summarized as follows. First, comprehensive structural reform can yield more rapid growth. Second, the reform process cannot be expected to be painless; structural reform may result in a period of lower growth, in particular if the reform is incomplete or if there are problems with the sequencing of reforms. Restructuring means moving "resources" to more efficient uses, often by closing businesses and laying off workers. Retraining is therefore important to facilitate the transition of labor from declining to expanding sectors. As evidenced by the sectoral data presented in the previous section of this paper, significant economic restructuring has already been taking place in Switzerland in the early 1990s. Given the relatively flexible labor market in Switzerland and high level of education, the conditions should therefore be congenial for more rapid growth in the future.

SWISS CAPITAL STOCK DATA

40. The Swiss data were constructed directly from published national investment series, using the same methodology as B. Lüscher, and E. Ross (1996). The resulting capital stock series produce a significantly higher capital-output ratio than the OECD data for Switzerland; for 1960, the capital-output ratio of the capital stock—based on national data—was around 2¼ compared to 1½ using the OECD capital stock data. The capital-output ratio capital stock based on the national data is more in line with the level observed in other countries: in the same year, German and the United States capital-output ratios were 2 and 2½, respectively. Abstracting for the level differences, the two series are, however, very similar.

41. The capital stock data were constructed on the basis of three sources:

i. "Séries longues des comptes nationaux de la Suisse", (Bern: Federal Statistical Office), 1992;

ii. "Le système de comptabilité nationale", Séries longues de 1980 a 1995, Méthodes et résultats (Bern: Federal Statistical Office), 1997; and

iii. Lüscher, and E. Ross, "Entwicklung der potentiellen Production in der Schweiz," Geld, *Wahrung und Konjuktur*, Quarterly Bulletin No.14 (1), (Zurich: Swiss National Bank), 1996.

42. The capital stock series was constructed in two steps. First, the new investment series from (ii)—covering only 1980–1996—was converted into 1980 prices—the price-base used in the old investment series in—and extended back to 1960 by linking it with the old series from (i). This calculation was undertaken separately for investment in machinery and equipment and commercial construction (total construction minus residential construction)[25]. A level adjustment was applied to the old series based on the ratio of the new investment to old investment in 1980 for the two categories of investment (Table I-A1, Column A-C) Second, the real investment series (in 1980-prices) was combined with the observed capital stock in 1966 taken from (iii), to construct a capital stocks series from 1960 to 1996 in 1980 prices (Table A1, Column D). A depreciation rate of 20 percent was assumed for machinery and equipment and 4 percent for commercial buildings. This is the same depreciation rates that were used in B. Lüscher, and E. Ross (1996). The original capital stock data from (iii) was adjusted by the same level adjustment applied to the old investment series.

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[25]Since for the period 1960–1975 no residential construction data were available, commercial construction was assumed to be a constant fraction of total construction. The fraction was set equal to the average of 1980 to 1996.

Table I-A1. Switzerland: Investment and Capital Stock for the Business Sector

(In million Sw F; 1980 prices)

	Investment in Machinery and Equipment	Commercial Construction	Total Business Sector Investment	Capital Stock
1960	10,383	7,528	17,911	177,259
1961	12,289	8,603	20,892	184,169
1962	14,298	9,184	23,482	192,804
1963	15,138	9,932	25,070	201,890
1964	15,457	11,114	26,571	211,346
1965	15,193	10,792	25,985	219,173
1966	15,193	10,660	25,853	226,064
1967	15,395	10,595	25,990	232,425
1968	15,815	10,947	26,762	238,958
1969	16,500	11,695	28,195	246,318
1970	18,765	12,418	31,183	255,988
1971	20,353	13,755	34,108	267,525
1972	20,804	14,662	35,467	279,169
1973	20,719	15,371	36,089	290,265
1974	20,656	14,386	35,042	299,321
1975	16,990	12,780	29,770	302,313
1976	14,624	11,670	26,295	301,952
1977	15,247	11,700	26,947	302,831
1978	17,255	11,979	29,234	306,320
1979	18,173	12,568	30,741	311,143
1980	20,236	13,191	33,427	318,283
1981	20,006	13,942	33,948	325,190
1982	19,041	13,955	32,996	330,529
1983	19,442	14,286	33,728	336,270
1984	20,152	14,621	34,772	342,668
1985	21,223	14,848	36,071	349,869
1986	23,509	15,453	38,962	359,310
1987	24,565	16,117	40,682	369,438
1988	26,762	17,621	44,383	382,167
1989	27,546	19,098	46,644	395,742
1990	29,497	19,997	49,494	410,772
1991	28,830	19,914	48,744	423,459
1992	24,972	19,843	44,815	431,021
1993	23,721	18,817	42,538	436,072
1994	25,104	18,550	43,653	442,290
1995	27,635	17,269	44,904	449,491
1996	28,091	16,202	44,294	455,375

Source: Staff estimates.

II. Fiscal Policy Rules and the Business Cycle [26]

A. Introduction and Summary

43. While Switzerland has a long tradition of sound public finances, the contribution of fiscal policies to macroeconomic stability over the business cycle has often been criticized.[27] In particular, this criticism has emphasized the weakness of automatic fiscal stabilizers and the, at times, procyclical stance of discretionary fiscal policy. This chapter has two aims: One, to gauge quantitatively the automatic and discretionary responses of general government finances to cyclical output movements during 1970–96. And two, to examine the main options for improving the stabilization role of fiscal policy over the business cycle. In the latter context, the chapter describes and assesses a proposed constitutional amendment mandating a balanced Confederation (central government) budget over the business cycle after 2001.

44. The empirical results reported in this chapter suggest that the size of the automatic cyclical responsiveness of general government finances—the change in the general government balance as a percent of GDP in response to a 1 percentage point increase in the output gap—in Switzerland is broadly comparable to those in other industrial economies. However, a considerable lag between income accrual and income tax collections (2–4 years) weakens automatic fiscal stabilizers. Moreover, Switzerland's moderate inflation rates notwithstanding, the extraordinary length of the income tax collection lags also reduces the real value of tax revenue collections. As regards the stance of discretionary fiscal policy, it is found that fiscal policy has often been procyclical during the period 1970–96, undermining the operation of the already weak automatic fiscal stabilizers, in particular in years of large excesses or shortfalls of aggregate demand.

45. The empirical results suggest that three adaptations of present fiscal policy rules would prove beneficial to enhancing macroeconomic stability over the cycle: (i) a significant shortening of the long lags in the collection of income taxes; (ii) the adoption of fiscal rules that avoid pronounced procyclical discretionary fiscal policies, in particular during periods of significant excesses or shortfalls of aggregate demand; and (iii) enhanced coordination of fiscal policy stances among the different level of governments. Indeed, various proposals to reform Switzerland's fiscal institutions in these directions have been put forward during the last 30 years. However, Switzerland's deeply entrenched status-quo bias appears to have lessened in this area. In particular, several cantons including the large canton of Zürich are considering reducing significantly the present long collection lags for income taxes. At the Confederation level, a constitutional amendment has been proposed that would aim after the year 2001 at a

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[26]Prepared by Albert Jaeger.

[27]See, for example, Paul Bernd Spahn, "Switzerland," in: Fiscal Federalism in Theory and Practice, edited by Teresa Ter-Minassian, pp. 324–41, International Monetary Fund (Washington, D.C.: 1997).

balanced budget over the business cycle at the Confederation level, while providing room for countercyclical discretionary fiscal policy in the face of large aggregate demand disturbances. Prospects for enhanced fiscal policy coordination over the cycle among the different tiers of government, however, appear to be dim, despite an already existing constitutional obligation mandating such coordination.

46. The remainder of this chapter is organized as follows. Section B provides some background on fiscal developments and institutions. Section C outlines a framework to gauge the cyclical responsiveness of budget balances. Sections D reports empirical estimates on the size of automatic fiscal stabilizers and the discretionary fiscal response to cyclical output fluctuations, respectively. Finally, section E describes and assesses the proposed fiscal policy rule for balancing the Confederation over the business cycle.

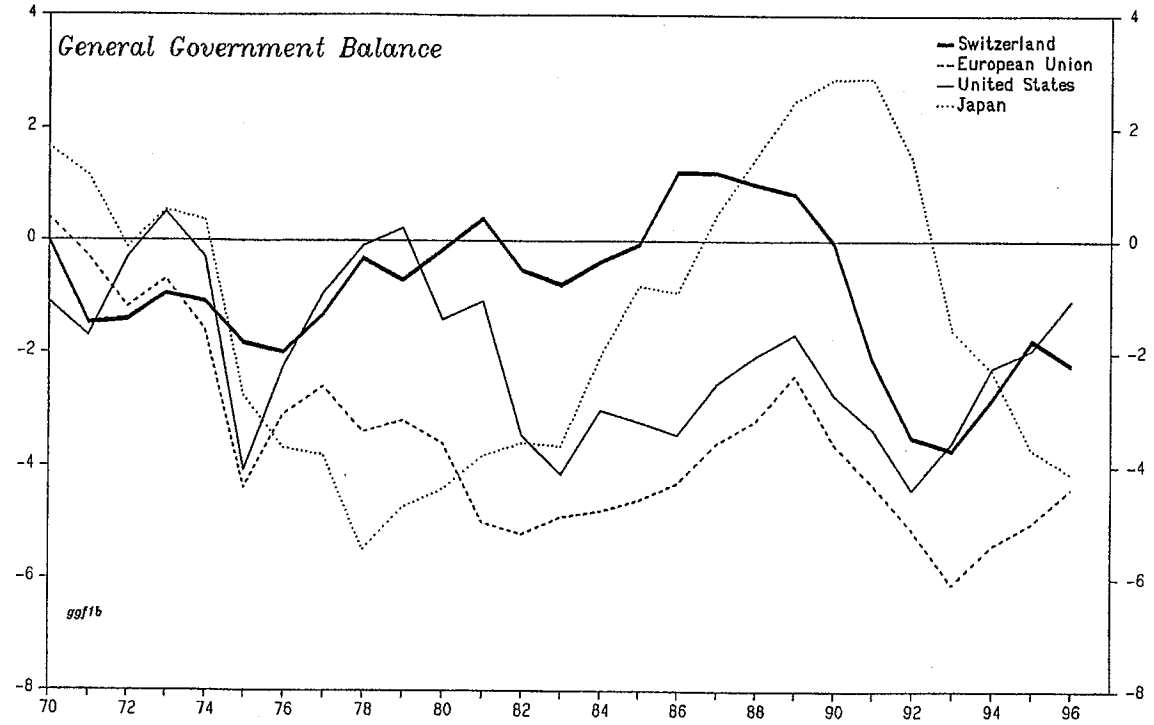
B. Background

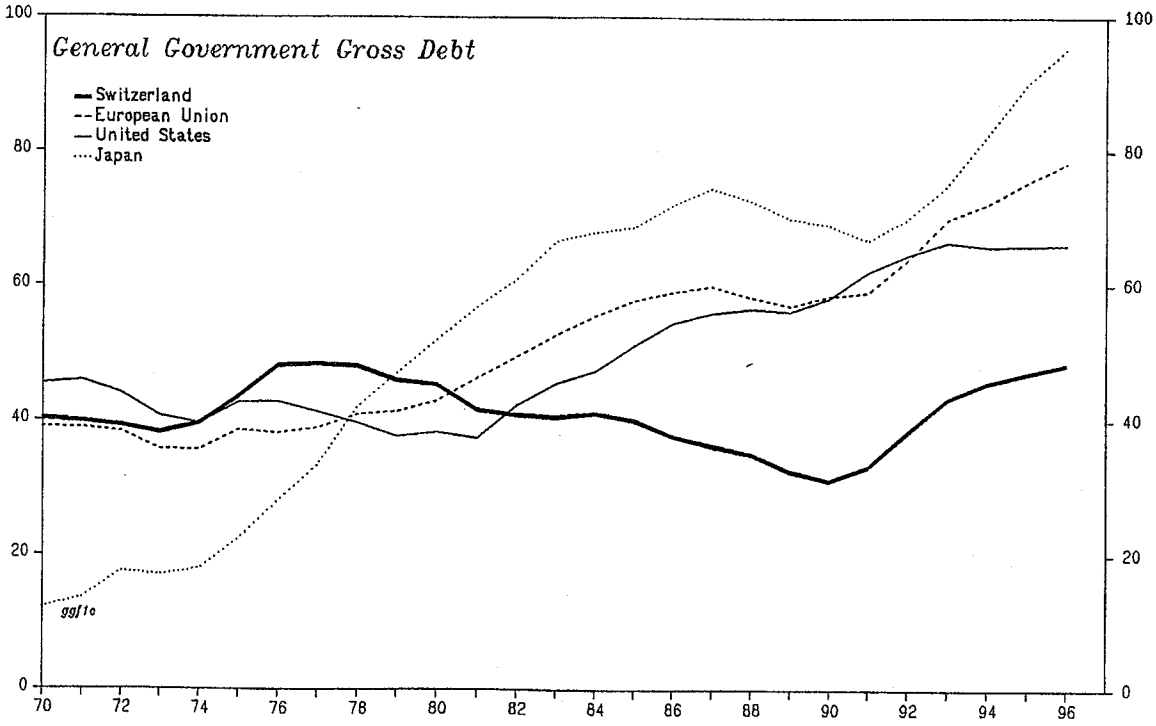
47. Switzerland has a long-standing tradition of sound public finances. This is vividly illustrated by comparisons of developments in fiscal deficits and public debt in Switzerland and in other industrial countries over the last twenty-five years (Figure II-1). While the Swiss general government balance moved into deficit in the 1970s—as in most other industrial countries—a broadly balanced fiscal position was restored by 1980. At the same time, the public debt-GDP ratio declined steadily from the mid-1970s to 1990, contrasting with the sharply rising levels of public debt in many other industrial countries over the same time period. The on-set in 1991 of a prolonged economic slowdown in Switzerland was accompanied by a sharp rise in the general government deficit and a reversal of the trend decline in the public debt-GDP ratio. However, since 1993, the fiscal position has again improved markedly, reflecting strenuous consolidation efforts in the face of a protracted slump in economic activity.

48. In addition to exhibiting generally low average levels of fiscal deficits and debt (as a percent of GDP), the variability of Switzerland's general government balance has also been remarkably low over the last 25 years, notwithstanding a comparatively high variability of real output fluctuations (Figures II-2 and II-3). Indeed, in many other small open industrial economies, the variability of general government balances was a multiple of Switzerland's during the period 1971-96. However, as discussed in more detail in the following sections, the stylized fact of comparatively low variability of Switzerland's fiscal balance is in part a consequence of relatively weak automatic fiscal stabilizers and the procyclical behavior of discretionary fiscal policies.

49. The operation of automatic fiscal stabilizers through changes in general government revenue is impeded by Switzerland's idiosyncratic income tax collection system. At the Confederation level and in most cantons, income tax collection is spread over several years. For example, the income tax due for the years 1997 and 1998 (the tax period) will be based on

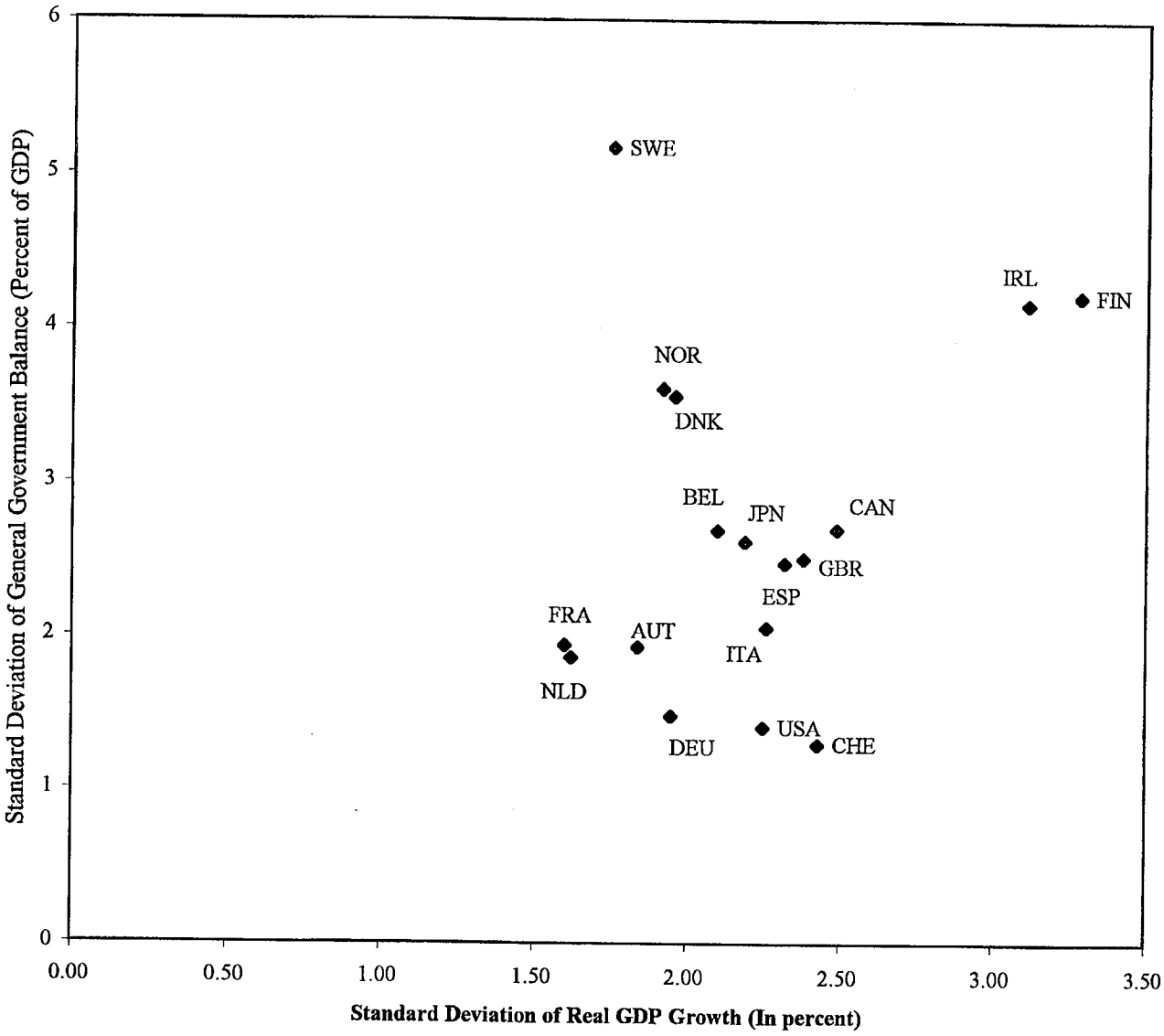
Figure II-1. Switzerland: International Comparison of General Government Finances, 1970-96
(In percent)





Source: WEO database; European Economy N63, 1997.

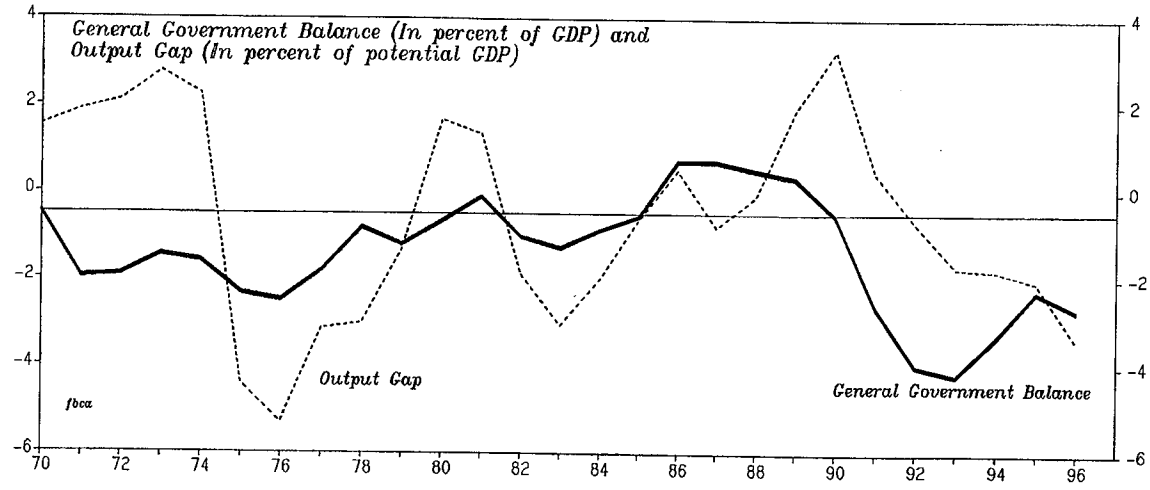
Figure II-2. Switzerland: Variability of General Government Balances in Selected Industrial Countries, 1971-96 1/

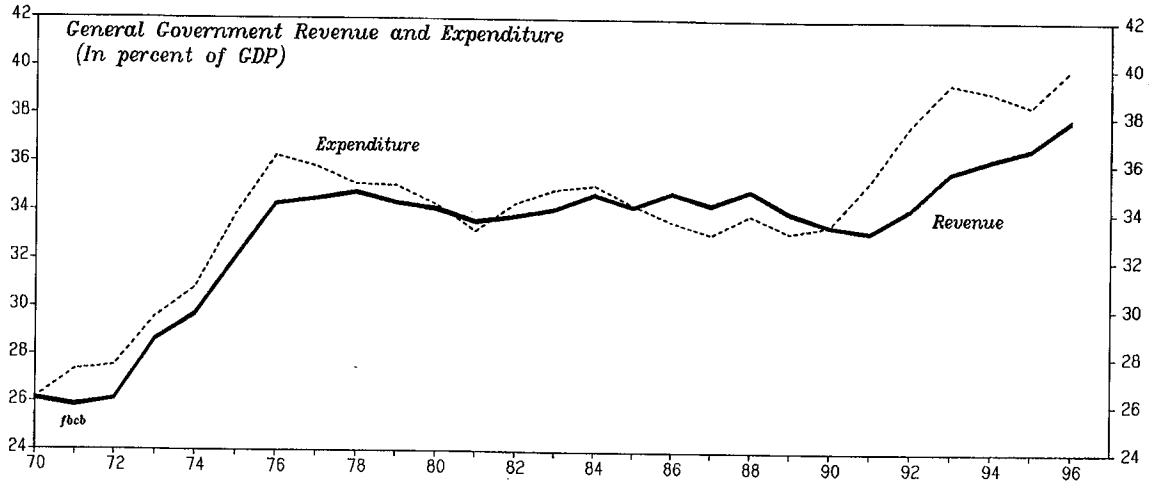


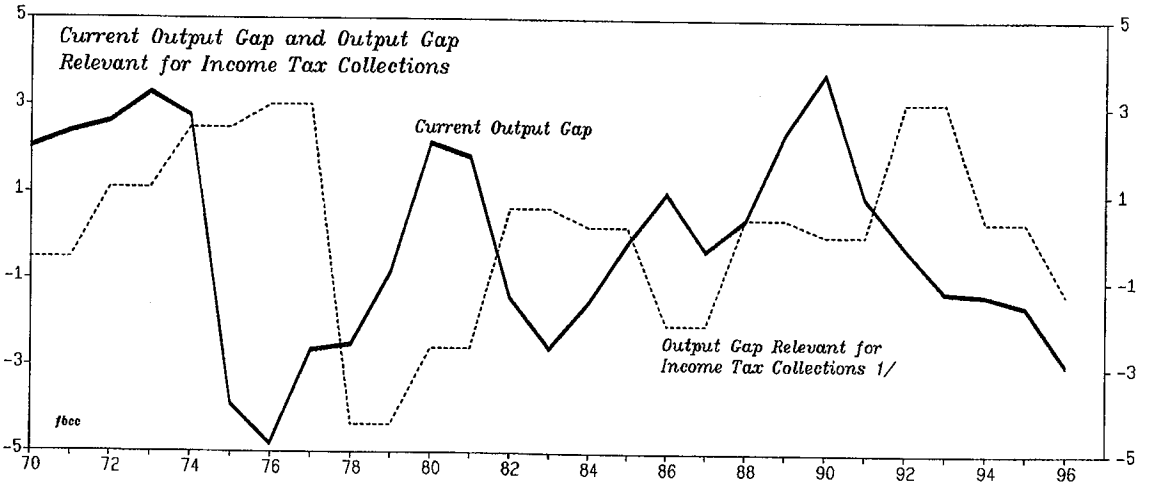
Source: WEO database; and staff estimates .

1/ Time range for all countries is 1971-96 except for Norway, where the time range is restricted to 1976-96.

Figure II-3. Switzerland: General Government Finances and the Business Cycle, 1970-96







Source: WEO database; and staff estimates.

1/ Average of output gaps in years t-2 and t-3 for even years; and average of output gaps in years t-3 and t-4 for odd years.

the average taxable income during the previous two years, i.e. 1995 and 1996.[28] As income tax is payable in the year after it falls due, actual income tax payments in 1998 and 1999 will reflect average incomes accrued during the years 1995–96. Given the average length of typical business cycles in industrial countries during the post-war period, which was estimated by Zarnowitz (1992) at about 4–5 years,[29] this considerable collection lag for income taxes will not only reduce the size of automatic fiscal stabilizers relative to the automatic fiscal response to cyclical output fluctuations but may act as a partial off-set to automatic fiscal stabilizers. For example, when the economy entered a recession at the beginning of the 1990s, income tax collections reflected the high incomes accrued during the boom years of the second half of the 1980s, thus further hemorrhaging private households' real purchasing power when income growth was slowing due to the recession. More generally, plots of the series for the current cyclical output gap and the cyclical output gap relevant for income tax collections indicate a high degree of asynchronism between the series at critical business cycle junctures (Figure II-3).[30]

50. Switzerland's high degree of fiscal federalism has led to a roughly equal division of spending powers and resources among the three levels of territorial governments, i.e. the Confederation, the cantons, and the communes (Figure II-4). In this setting, use of discretionary fiscal policy actions to off-set large macroeconomic disturbances would require a considerable degree of fiscal coordination between the different levels of government. Although the Constitution obliges all tiers of governments to take account of the state of the business cycle when establishing their budgets (Article 31^{quinquies}), the high degree of fiscal decentralization and complex budgeting procedures do not provide an auspicious setting for ensuring fiscal co-ordination. Moreover, the tendency at the cantonal and communal levels to aim for balanced budgets has been reflected in broadly stable but also to some extent procyclical fiscal balance developments at the lower government levels (Figure II-4).

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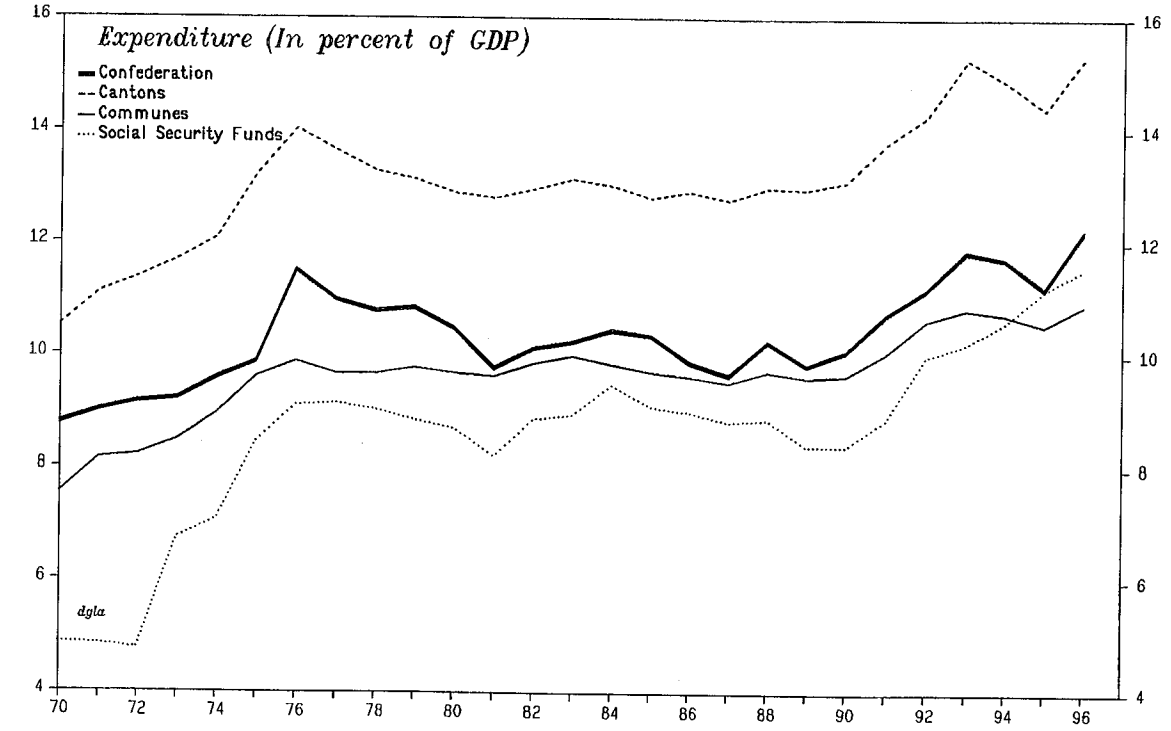
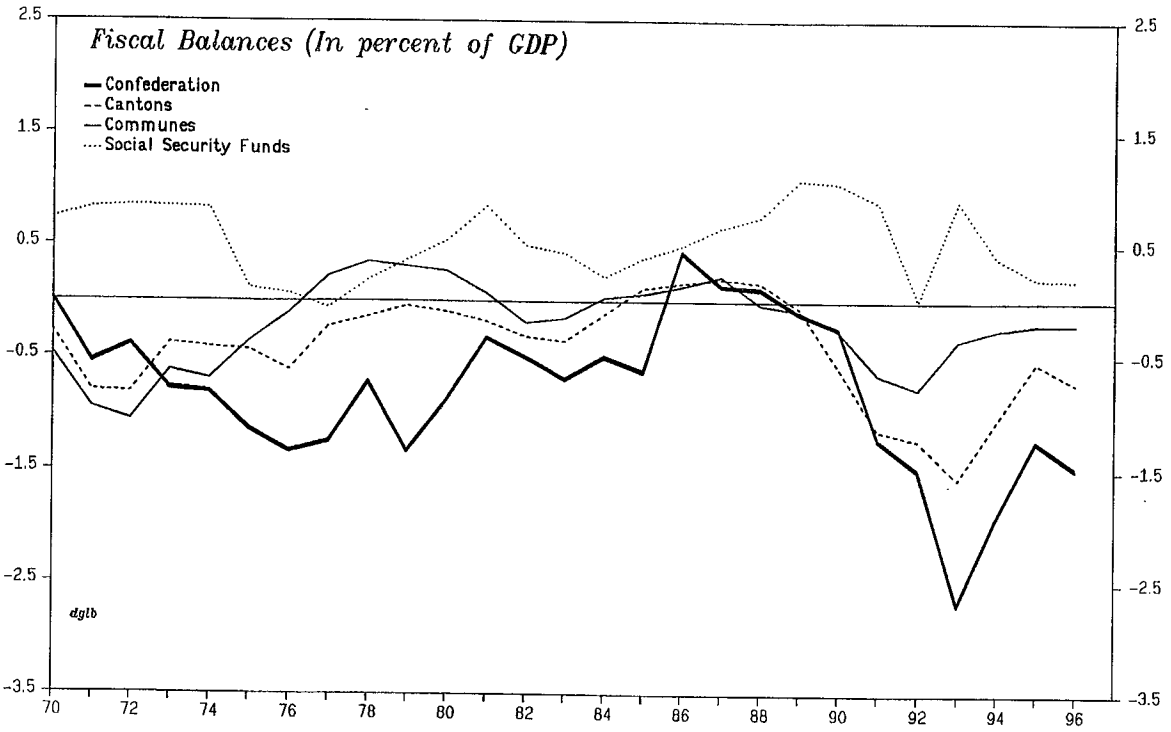
[28]Five cantons (Basel-City, Geneva, Jura, Neuchâtel, and Solothurn) use tax periods of one year.

[29]This is an estimate of the average duration of business cycles in ten industrial countries including Switzerland during the period 1948–83. Duration is measured from cyclical trough to trough. See Victor Zarnowitz, "The Regularity of Business Cycles," in: Business Cycles: Theory, History, Indicators, and Forecasting, by Victor Zarnowitz, pp. 232–64 (Chicago: 1992).

[30]The cyclical output gap estimates are based on the production function methodology outlined in last year's paper on Selected Issues (SM/97/23).

Figure II-4. Switzerland: Government Finances at Different Government Levels, 1970-96





Source: Swiss Federal Finance Administration.

51. A small literature has analyzed the cyclical behavior of fiscal policy in Switzerland. Wagner (1973) examined discretionary fiscal policy actions during the period 1955–70.[31] This study concluded that the Confederation's budget was generally countercyclical during periods of excessive aggregate demand, but also that the Confederation undertook procyclical budget cuts during recession periods. On the other hand, lower government levels behaved procyclically during periods of excessive aggregate demand, but these lower levels pursued expansionary countercyclical policies during recession periods. The net result of this un-coordinated mix of fiscal policies at different government levels was found to be somewhat procyclical. In an OECD study of fiscal policy in small OECD countries during 1970–83, Chouraqui and Montador (1983) found that fiscal policy in Switzerland was procyclical in the first half of the 1970s, but it moved to neutral or countercyclical stances thereafter.[32] A study by the Federal Office for Economic Policy (1986) reached a similar conclusion—fiscal policy during the 1970s shifted from pro- to countercyclical postures.[33] Ammann (1995) provides a comprehensive review of estimates of structural balances at different government level and draws particular attention to the potentially destabilizing role of income tax collection lags.[34]

C. Fiscal Policy Rules

52. The actual or observed budget balance (b_t) can be decomposed into two unobservable components, the structural budget balance (bs_t) and the cyclical budget balance (bc_t):

(1) $b_t = bs_t + bc_t$,

where the actual balance is expressed as a ratio to nominal GDP, while the structural and cyclical balance components are both expressed as ratios to nominal potential GDP.[35] The

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[31]See A. Wagner, " Die Auswirkungen der öffentlichen Haushalte auf den Konjunkturverlauf in der Schweiz,"Schweizerische Zeitschrift für Volkswirtschaft und Statistik, pp. 17–30, 1973.

[32]See Jean-Claude Chouraqui and Bruce Montador, "Fiscal Policy in the Small OECD Countries Since the Early Seventies," Schweizerische Zeitschrift für Volkswirtschaft und Statistik, pp. 259–83, 1985.

[33]See Federal Office for Economic Policy, Zur Messung finanzpolitischer Impulse und struktureller Haushaltsdefizite, Study No. 10 (Bern: 1986).

[34]See Yves Ammann, Le budget de plein emploi--un réexamen, Study No. 20, Federal Office for Economic Policy (Bern: 1995).

[35]For more background on the formal derivations of equations see the annex to this chapter. As shown in the annex, equation (1) represents only an approximation due to the different GDP scaling conventions on the left and right hand side of equation (1).

cyclical budget component captures the automatic or built-in response of the budget to cyclical output fluctuations:

(2) $bc_t = \alpha GAP_t, \quad \alpha > 0.$

The parameter α measures the automatic response of the balance-GDP ratio to a 1 percentage point change in the cyclical output gap (GAP_t), which, for expositional simplicity, is assumed to occur without lagged responses, due, for example, to tax collection lags. While the structural balance component abstracts, by construction, from the built-in budgetary responses to cyclical output fluctuations, discretionary fiscal policy actions could lead to systematic co-movements between the structural balance and the cyclical output gap:

(3) $bs_t = \gamma GAP_t + \Psi_t,$

where the parameter γ measures the discretionary response of the budget to cyclical output movements. For expositional simplicity, the discretionary fiscal policy response is also assumed to take place without lag, and Ψ_t captures the component of the structural balance that is unrelated to cyclical output fluctuations. Inserting equations (2) and (3) in (1) gives a generic fiscal policy rule linking budget balances and the business cycle:

(4) $b_t = (\alpha+\gamma)GAP_t + \Psi_t.$

53. This framework is useful to highlight various parameter restrictions imposed by four specific fiscal policy rules:[36]

Balanced budget rule: $\gamma = -\alpha$ and $\Psi_t = 0.$

Structural balanced budget rule: $\Psi_t = 0$ and $\gamma = 0.$

Countercyclical budget rule: $\gamma > 0.$

Maastricht budget deficit limit rule: $\Psi_t \geq -0.03 - (\alpha+\gamma)GAP_t.$

The balanced budget rule imposes the requirement to fully off-set the operation of automatic fiscal stabilizers by procyclical discretionary fiscal policy actions. By contrast, a structural balanced budget rule allows for the full operation of automatic fiscal stabilizers. The countercyclical budget rule seeks to reinforce the operation of automatic fiscal stabilizers. Finally, the Maastricht budget deficit limit rule imposes a ceiling on the maximum (general government) deficit once adjustments are made for automatic fiscal stabilizers and cyclical discretionary policy actions.

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[36]See the recent Board Paper on "Fiscal Policy Rules" (SM/97/175) for a discussion of different types of fiscal rules.

54. Three additional considerations regarding fiscal policy rules appear to be noteworthy. First, the different levels of government may follow different rules, e.g. lower government levels may follow balanced budget rules, while the central government allows automatic fiscal stabilizers to operate. Thus, the behavior of general government finances will reflect a (weighted) mix of fiscal policy rules, and it can be of interest to examine the contributions of different government levels to the cyclical behavior of the general government balance, a consideration of considerable interest in the case of Switzerland. Second, some of the above fiscal policy rules can be combined to yield a more complex rule, e.g. a combination of the structural balanced budget rule and the countercyclical budget policy rule, as in the case of the constitutional balanced budget amendment presently under discussion in Switzerland (see Section E for details). And third, normative discussions of macroeconomic policies have often emphasized the distinct roles of automatic stabilizers and discretionary policy actions in a well-designed stabilization framework.[37] Automatic stabilizers are considered to be best suited to counteract economic shocks that are small, frequent, and difficult to identify. By contrast, discretionary policy actions are considered most effective in the case of large shocks that are tied to events whose sources can be readily identified.[38] If fiscal policy would be set according to these broad norms, the simple fiscal policy rules set out above could not work well as an empirical description of the behavior of fiscal policy over the business cycle. In particular, the value of the parameter γ would depend on the size of the shocks to the output gap, implying a "switching" fiscal policy rule, where the size of the budget balance responds discontinuously to changes in the state of economic activity.

55. Within the framework of equations (1) to (4), a two-stage approach to gauging the size of automatic and discretionary fiscal responses to cyclical output fluctuations can be developed. In the first stage, the automatic fiscal response parameter (α) can be derived from estimates of cyclical budget elasticities conventionally employed to construct structural budget balances (see Annex for details). In the second stage, the estimates of the automatic response parameters are used to derive estimates of the structural budget balance series, which can then

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[37]See, for example, Olivier J. Blanchard and Mark W. Watson, "Are Business Cycles All Alike?," in: The American Business Cycle: Continuity and Change, edited by Robert J. Gordon, Studies in Business Cycles Volume 25, pp. 123–79 (Chicago: 1986).

[38]Descriptions of Switzerland's monetary policy framework often emphasize that the Swiss National Bank's (SNB) monetary policy rule is consistent with these broad norms. Under "normal circumstances," the SNB aims at meeting a medium-term target for monetary base growth based on an implicit inflation target of about 1 percent, which is held to induce automatic countercyclical movements of interest rates. However, in case of large shocks, in particular of large exchange rate disturbances, monetary policy reserves the option of discretionary deviations from the medium-term money target rule. See, for example, Georg Rich, "Die schweizerische Teuerung: Lehren für die Nationalbank," Quartalsheft No. 1, March 1992, pp. 73–88 (Swiss National Bank: 1992).

be employed to estimate a version of equation (3) using OLS regressions to derive an estimate of the discretionary fiscal response.

56. The results from this two-stage estimation exercise are, however, subject to several caveats. As cyclical output gap and discretionary fiscal actions could occur at the same time, OLS regression could be subject to simultaneous equation bias and the use of an instrumental variable regression technique may be preferable. However, in addition to the use of statistical regression techniques to estimate the discretionary response to the cycle, alternative, less formal methods, can be utilized to gauge the relationship between discretionary fiscal actions and the cycle. Indeed, there are several reasons why a less formal approach to interpreting the data may also be useful in this context: First, measurement errors in the unobserved fiscal balance components, which could be particularly large in the case of Switzerland given the considerable uncertainties regarding estimates of the output gap, could distort the statistical results. Second, fiscal policy could change over time, leading to shifts in the parameter γ. Third, fiscal policy could be more responsive to "large" cyclical output gaps and/or react asymmetrically to positive and negative cyclical output gaps, thus invalidating the assumptions underlying conventional regression approaches.

D. Estimates of the Cyclical Responsiveness of Budget Balances

57. Cyclical budget elasticities capture the automatic response of a nominal revenue (or expenditure) component to a 1 percentage point change in the cyclical output gap.[39] As shown in the annex, cyclical budget elasticities can be used to estimate automatic cyclical response parameters. Estimates of the automatic responses of general government finances to cyclical output fluctuations are summarized in Table II-1. The first part of the table provides parameter estimates for revenue elasticities and response parameters. The revenue elasticity estimates are drawn from work by the Federal Finance Administration (FFA), by Ammann (1995), and staff estimates. The overall elasticity of general government revenue is estimated at 1.1, close to the overall general government revenue elasticity estimates for other industrial countries.[40] Using average revenue-GDP ratio estimates for the period 1975–95 and the conversion formulae in the annex, the overall revenue elasticity yields an estimate of the automatic revenue increase (including lagged effects) of 0.37 in response to a 1 percentage point increase in the cyclical output gap. However, in Switzerland, due to income tax collection lags, roughly one third of revenue collections occurs with a lag of 2–4 years. Thus,

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[39]See Jean-Claude Chouraqui, Robert P. Hagemann, and Nicola Sartor, "Indicators of Fiscal Policy: A Reexamination," OECD Economics and Statistics Department Working Paper No. 78 (Paris, April 1990) for a discussion of estimates of budget elasticities in most industrial countries.

[40]See, for example, the revenue elasticity estimates for the major industrial countries reported in Annex I of the October 1993 World Economic Outlook, Table 23, which average to about 1.0.

Table II-1. Switzerland: Automatic Responses of General Government Finances to Cyclical Output Fluctuations

	Elasticity Parameter Estimates 1/			Response Parameter Estimates 2/		
	Current	Lagged 3/	Total	Current	Lagged 3/	Total
Total revenue	0.95	0.16	1.11	0.25	0.12	0.37
Income tax	0.00	1.20	1.20	0.00	0.12	0.12
Other direct taxes	1.20	0.00	1.20	0.06	0.00	0.06
Social contributions	0.70	0.00	0.70	0.07	0.00	0.07
Turnover tax/VAT	1.30	0.00	1.30	0.04	0.00	0.04
Customs duties	0.80	0.00	0.80	0.04	0.00	0.04
Other taxes	1.00	0.00	1.00	0.01	0.00	0.01
Other revenue	1.00	0.00	1.00	0.03	0.00	0.03
Total expenditure				-0.07	0.00	-0.07
Unemployment benefits 4/				-0.07	0.00	-0.07
Other expenditure				0.00	0.00	0.00
Overall fiscal balance				0.32	0.12	0.44
Confederation				0.16	0.02	0.18
Cantons				0.07	0.05	0.12
Communes				0.02	0.05	0.07
Social Security Funds				0.07	0.00	0.07

Sources: Federal Finance Administration; Ammann (1995); and staff estimates.

1/ Percentage point change in nominal revenue in response to a 1 percentage point change in the cyclical output gap.

2/ Percentage point change in the ratio of fiscal aggregate to GDP in response to a 1 percentage point change in the cyclical output gap. See the chapter's appendix for a description of the calculation of parameter estimates.

3/ Lagged response refers to the average of ouput gaps in t-2 and t-3 for even income tax collection years and to the average of output gaps in t-3 and t-4 for odd income tax collection years.

4/ Response parameter estimates are based on data covering the time period 1992–96.

58. the automatic contemporaneous increase of the general government revenue-GDP ratio to a 1 percentage point is estimated at only 0.25, while the remaining automatic responses occurs with considerable lag.

59. As regards the automatic cyclical responsiveness of spending, only unemployment benefits are assumed to respond to cyclical fluctuations. However, the coverage and generosity of the unemployment benefit insurance system in Switzerland have expanded considerably since the system was inaugurated in 1977, and the observed unemployment rate has undergone a clear structural break at the beginning of the 1990s (see also Chapter III on the Phillips curve). As a consequence, the reported estimate of the automatic responsiveness of unemployment benefits of -0.07 is based only on data covering the period 1992–96.[41]

60. Combining the automatic response estimates for general government revenue and expenditure yields an estimate of 0.44 (including lagged effects). This response parameter estimate is significantly smaller than the estimated total response parameters for most other industrial countries, in particular the member countries of the European Union (Table II-2). The size of automatic fiscal stabilizers in Switzerland appears to be constrained by the comparatively small size of the public sector, as measured by the ratio of general government revenue to GDP (Figure II-3). For example, the average general government revenue to GDP ratio in Switzerland during the period 1990–96 amounted to 35¼ percent of GDP, as compared with an average of 45 percent of GDP for the European Union. However, this apparent "scale disadvantage" of Switzerland largely reflects different institutional characteristics, particularly as regards the social security sector. In Switzerland, the revenues of the funded occupational pension system ("second pillar") and the health care insurance funds are excluded from the data on general government, although these funds are subject to strict government mandates. The reason for the exclusion is that these funds are operated within the private sector. Total revenue of the two funds from employer and employee contributions during 1990–96 amounted to some 10 percent of GDP, thus bridging the gap between observed revenue-GDP ratios in the European Union and Switzerland. Assuming the excluded contributions amount to about 10 percent of GDP and further assuming a cyclical elasticity for contributions of 0.70, including these mandatory contributions would increase the total response parameter by 0.07, bringing the total response parameter (0.51) closer to the average value calculated for the European Union (0.59).

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[41]This estimate is based on the assumptions of an Okun's law coefficient of 3 linking fluctuations of cyclical unemployment and cyclical output—a 3 percentage points increase in the cyclical output gap decreases cyclical unemployment by 1 percentage point; an estimate of the natural rate of unemployment of about 3 percent; and an average unemployment benefits-GDP ratio of about 1 percent during 1992–96. The formulae underlying the calculation of the cyclical response coefficients for unemployment benefits given these data inputs are provided in the Annex.

Table II-2. Switzerland: Automatic Responses of General Government Balances to Cyclical Output Fluctuations in Selected Industrial Countries

	Response Parameter Estimates 1/		
	Current	Lagged 2/	Total
Switzerland	0.32	0.12	0.44
United States	0.32	0.04	0.36
Japan	0.36	0.01	0.37
Germany	0.49	0.05	0.54
France	0.52	0.05	0.57
Italy	0.34	0.03	0.37
United Kingdom	0.30	0.44	0.74
Canada	0.58	0.04	0.62
Spain	0.60	0.04	0.64
Netherlands	0.63	0.08	0.71
Belgium	0.51	0.01	0.52
Sweden	0.96	0.12	1.08
Austria	0.47	0.02	0.49
Denmark	0.58	0.16	0.74
Finland	0.56	0.03	0.59
Ireland	0.48	0.02	0.50
Australia	0.37	0.13	0.50
New Zealand	0.53	0.12	0.65
Memorandum item:			
European Union average 3/	0.48	0.11	0.59

Source: Staff estimates.

1/ Automatic or built-in percentage point change in the ratio of general government balance to GDP in response to a 1 percentage point increase in real GDP. The calculation of the parameter estimates is described in the chapter's appendix.

2/ The lag for all countries except Switzerland is one year. For Switzerland, the lag refers to the average of years t-2 and t-3 in even tax collection years and the averages of years t-3 and t-4 in odd tax collection years.

3/ Weighted average based on GDP weights.

61. However, the significant lags in income tax collection in Switzerland imply that only a portion (about 3/4) of the estimated response parameter represents effective automatic fiscal stabilizers, as current income tax collections are likely to reflect a phase of the business cycle that is asynchronous to current cyclical conditions. At the cantonal level, there are efforts underway to mitigate the problem of lagged income tax collections. In particular, the large canton of Zürich intends to base the assessment of income taxes on the current tax year from 1999 onwards. It is expected that other cantons, and perhaps the Confederation, will eventually follow the example of Zürich, thus strengthening considerably the operation of automatic fiscal stabilizers.

62. Moreover, shortening the long income tax collection lags would be worthwhile in order to mitigate the effects of inflation on the real value of tax revenue. For example, an average collection lag of three years and an annual inflation rate of 4 percent (the average Swiss inflation rate during 1971–95) reduces the real value of income tax collections—assuming a proportional income tax and no bracket creep—by about 11 percent, equivalent to about 1 percent of GDP given current income tax collections of some 10 percent of GDP.[42]

63. The plotted co-movements of the structural general government budget balance and the cyclical output gap provide a visual impression of fiscal stances over the business cycle (Figure II-5). The shaded areas in Figure II-5 indicate periods of procyclical fiscal stance, defined as years when output gap and structural balance moved into opposite directions. This (non-parametric) evidence is suggestive of extended periods of procyclical fiscal stance. In particular, the fiscal stance was procyclical in 17 out of 26 years during the time period 1971-96. Moreover, and more importantly, the fiscal stance appears to have often been procyclical close to business cycle peaks (early 1970s, 1976, and 1990) or troughs (1976, 1983).

64. As already indicated, attempts to obtain parametric estimates of the systematic relationship between discretionary fiscal actions and the cyclical output gap are subject to severe limitations. Nevertheless, the statistical results of regressing the first difference of the structural general government balance on the first difference of the current and lagged cyclical output gap is suggestive of a procyclical stance, although the statistical evidence is not

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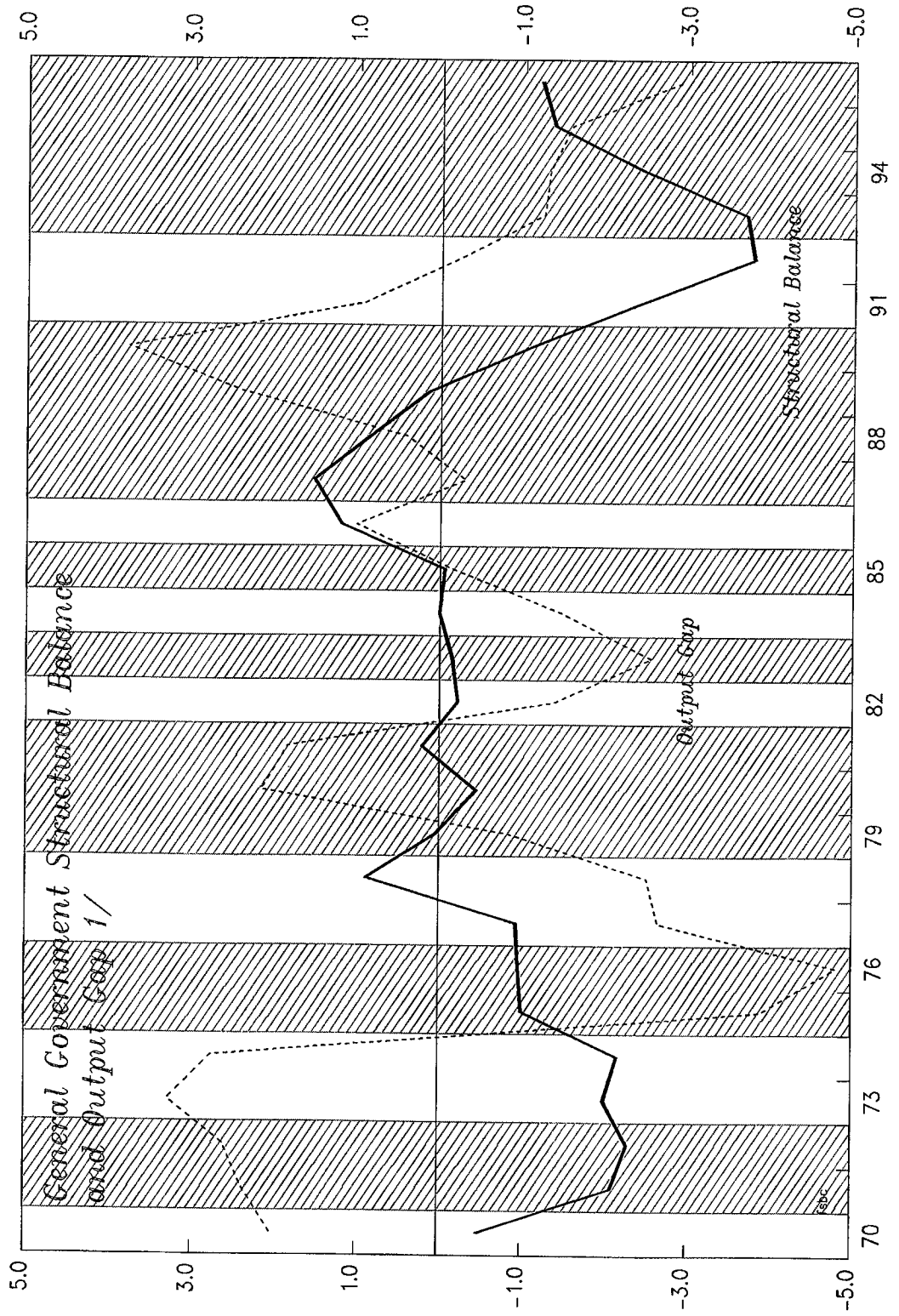
[42]For a discussion of the impact of inflation on the real value of tax revenue given tax collection lags see Vito Tanzi, "Inflation, Lags in Collection, and the Real Value of Tax Revenue," Staff Papers, International Monetary Fund, Vol. 24, pp. 154–67 (Washington, D.C.: March 1977). It is noteworthy that Tanzi's empirical analysis only considers tax collection lags of up to 2 years, while the Swiss tax system allows for lags of up to 4 years.

Figure II-5. Switzerland: Fiscal Stance of General Government and the Business Cycle, 1970-96



Source: WEO database; and staff estimates.
1/ Shaded areas indicate periods of procyclical fiscal stance, defined as periods with opposite movements of output gap and structural balance.

significant at conventional significance levels (Table II-3).[43] Moreover, running the same regressions for the different levels of government indicates that procyclical fiscal behavior is concentrated at the levels of the cantons and the communes and that it occurs with a one-year lag.

E. A New Fiscal Policy Rule for the Confederation

65. The proposed constitutional amendment (*Schuldenbremse*) to ensure budget balance at the Confederation level beyond the year 2001 envisages a combination of the structural balanced budget rule and the countercyclical budget policy rule.[44] Also, the specific policy rule proposed in the consultation report (1995) on the constitutional amendment ties deviation from a balanced budget to the real GDP growth rate (μ_t). In particular, the proposed fiscal policy rule for the Confederation could take the form:[45]

$$
\begin{aligned}
&\text{If } \mu_t < 0.5 \text{ percent, then } b_t = (\mu_t - 0.5); \\
(5) \qquad &\text{If } 0.5 \text{ percent} \leq \mu_t \leq 1.8 \text{ percent, then } b_t = 0; \\
&\text{If } 1.8 \text{ percent} < \mu_t, \text{ then } b_t = 0.5(\mu_t - 1.8).
\end{aligned}
$$

The specific fiscal policy rule (5) imposes a strict balanced budget when real GDP growth is in a range between 0.5 and 1.8 percent. The rule allows the combined deficit effects of the automatic and discretionary responses to equal the change in the real output gap for real growth below 0.5 percent. Finally, it aims for surpluses of one half of the change in the cyclical output gap for real growth above 1.8 percent. Thus, outside the growth range between 0.5 and 1.8 percent, this rule allows for the operation of automatic fiscal stabilizers as well as countercyclical discretionary responses. For example, if economic growth in a given year amounts to minus 1 percent, the rule would allow the Confederation to run a deficit of 1.5 percent of GDP. In this particular example, and assuming potential output growth would be 1.5 percent, the output gap would widen by 2.5 percent and the operation of automatic fiscal stabilizers (using a contemporaneous response coefficient of 0.16) would increase the Confederation's deficit by about 0.4 percent of GDP, and the fiscal policy rule would allow for a countercyclical discretionary response equivalent to 1.1 percent of GDP.

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[43]Employing alternative regression strategies, for example running the regression in levels, instead of first difference form, yields more conspicuous evidence but still statistically insignificant evidence of a procyclical fiscal stance.

[44]See consultation report *Vernehmlassungsbericht zur Schuldenbremse* (Bern: October 1995).

[45]This is the so-called "balance-based rule" of the consultation report. The report also discusses an alternative "expenditure-based rule fiscal rule," which, however, would not impose explicit restrictions on the budget balance but would only restrict the expenditure-GDP ratio at the Confederation level to remain within specified boundaries.

Table II-3. Switzerland: Discretionary Responses of General Government Finances to Cyclical Output Fluctuations 1/

	Discretionary Response Parameter Estimates 2/				
	Current		Lagged 3/		Total
Revenue	-0.11	(0.10)	-0.19	(0.09)*	-0.30
Expenditure	-0.03	(0.10)	-0.22	(0.10)*	-0.25
Balance	-0.08	(0.09)	0.03	(0.09)	-0.05
Confederation	-0.05	(0.05)	0.05	(0.05)	0.00
Cantons	0.00	(0.03)	-0.01	(0.03)	-0.01
Communes	-0.02	(0.03)	-0.04	(0.03)	-0.06
Social Security Funds	-0.01	(0.03)	0.03	(0.03)	0.02

Source: Staff estimates.

1/ Based on OLS regressions of first differences of structural fiscal aggregates on the first difference of the current and lagged cyclical output gap. Time range of all regressions is 1972–96.

2/ Discretionary fiscal response to a 1 percentage point change in output gap. Numbers in parentheses are standard errors corrected for heteroscedasticity.

3/ One-year lag.

*Significant at the 5 percent significance level.

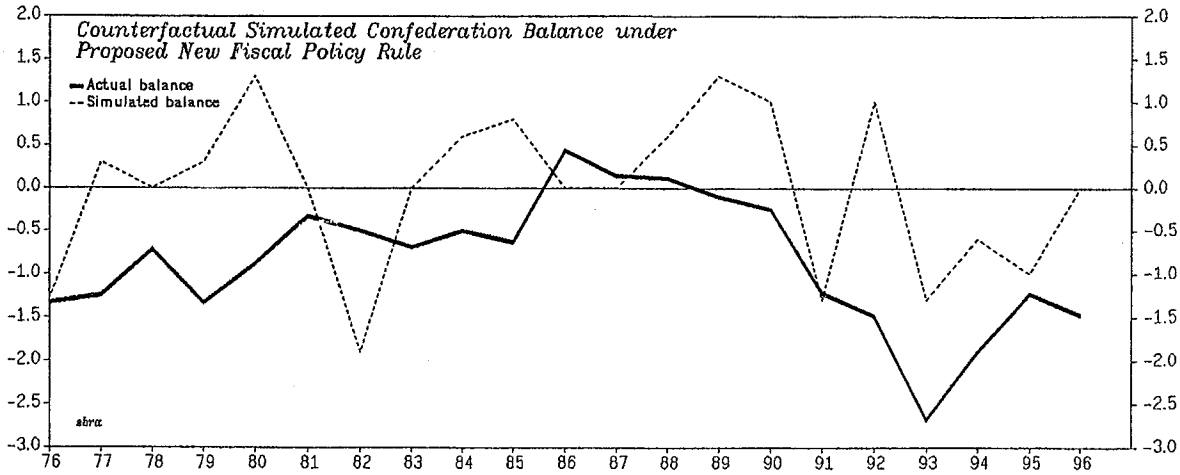
66. Budgetary planning and execution of the Confederation budget in year t under the proposed fiscal policy rule would be based on the following dates and actions (see consultation report (1995, p. 37):

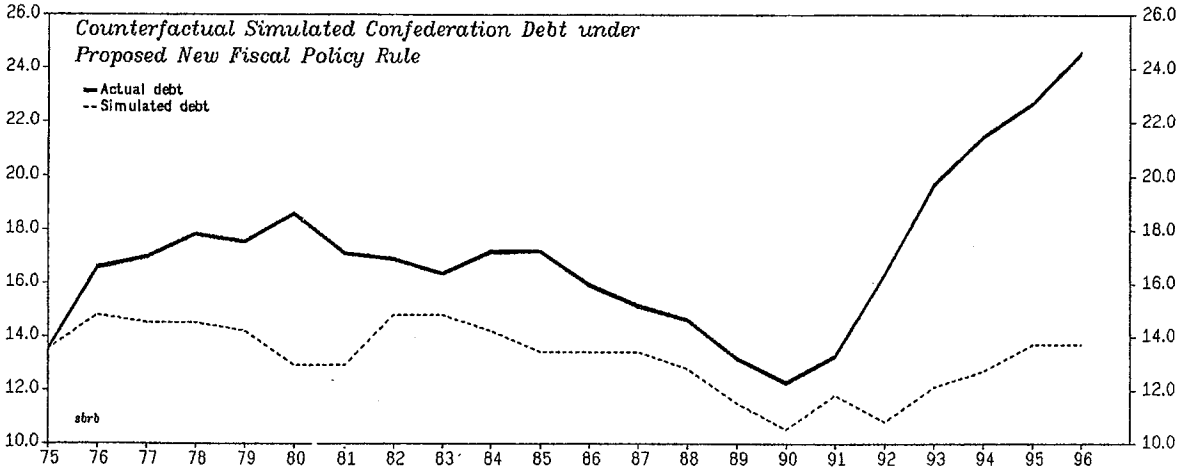
Date	Action
April t-1	Federal Council proposes a target value for the Confederation balance as a percent of GDP based on the projection of real GDP growth for year t.
June t-1	Parliament approves a target value for balance (which need not coincide with the Federal Council's proposal).
October t-1	Federal Council puts forward a budget for year t consistent with the target value passed by Parliament.
December t-1	Parliament approves the budget, with the option, however, to deviate from the target value.
t	Execution of budget.
August t+1	In case outcome deficit exceeds the target value, the Federal Council orders budget cuts effective in year t+2.

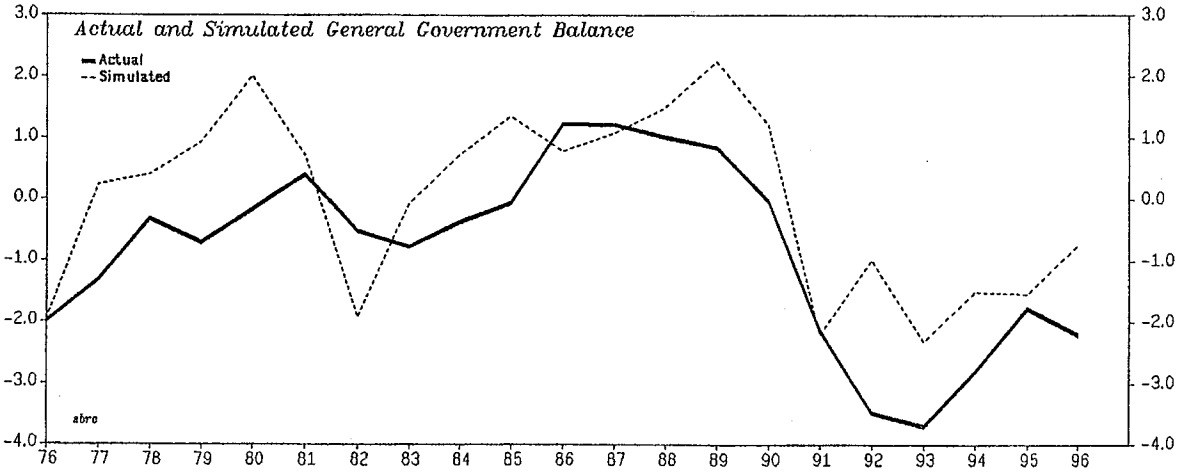
As regards the compensation for the deviation from the target in year t, the Federal Council would have some flexibility in determining the size of budget savings depending on the state of the business cycle .

67. Figure II-6 reports the results of a counterfactual simulation of the path of the Confederation's budget deficit and debt under the proposed new fiscal policy rule during 1976–96. This counterfactual simulation assumed that budget planning and the specification of the deficit target value in year t-1 were based on the GDP growth rate that actually materialized in year t (perfect foresight assumption). For the chosen time period, the deficit and debt path under the proposed fiscal policy rule represents a clear improvement on the actual outcomes. In particular, the Confederation's fiscal policy would have been restrictive during the boom period in the second half of the 1980s and the level of the Confederation's debt would have been stabilized around a level of about 14 percent of GDP. At the same time, however, the experience of the first half of the 1990s also suggests that the proposed rule would have implied a procyclical fiscal stance during this period. This reflects the conditioning of budgetary policies under the proposed rule on GDP growth rates instead of the size of the output gap. The rule requires policy makers to revert to a balanced budget once GDP growth reverts back to the "neutral range" between 0.5 and 1.8 percent, even though a prolonged period of low GDP growth could have yielded an expanding output gap.

Figure II-6. Switzerland: Simulation of Confederation Finances under Proposed New Fiscal Rule, 1976-96 (In percent of GDP)







Source: WEO database; and staff estimates.

68. Besides the issue of a likely procyclical behavior of fiscal policy during periods of persistently slow or rapid GDP growth, the proposed fiscal policy rule is subject to two additional caveats. First, the assumption of perfect foresight for GDP growth is clearly unrealistic, as illustrated by a comparison of actual GDP growth and projected GDP growth rates underlying the Confederation budgets during 1985–96 (Figure II-7). While projected real GDP growth has been consistently in the "neutral range" of 1–2 percent, actual GDP growth has fluctuated widely around the projections.[46] Using forecasted instead of actual GDP growth for calculating the path of the Confederation's deficit under the proposed fiscal policy rule shows that budget proposals would have closely followed a balanced budget rule. As the proposed rule would not have stifled the operation of automatic fiscal stabilizers in the face of lower-than-anticipated GDP growth, the Confederation's fiscal policy would in practice follow a structural balance rule. Indeed, in view of the fact that annual budgets are usually planned and approved at least one year in advance, it appears to be difficult to formulate an operative fiscal policy rule that effectively counters large cyclical disturbances that may occur well after the budget's approval. Second, the proposed fiscal rule could imply large and abrupt changes in spending under present fiscal institutions, which would likely imply inefficient spending patterns. In particular, given the long lags in income tax collections and the practice to base income tax assessment on two-year averages of incomes, the Confederation's income tax collections are usually high in even years and low in odd years.

69. In summary, the proposed constitutional *Schuldenbremse* amendment is likely to improve on present fiscal policy behavior at the Confederation level. However, given the limited accuracy of GDP growth forecasts for Switzerland, the rule would likely correspond to a version of a balanced structural budget rule. Thus, it is unlikely that the rule would allow for an effective countercyclical fiscal policy in the face of large shocks. Moreover, in periods of a persistently slow or rapid GDP growth, the rule could lead to procyclical fiscal stances. Finally, implementation of the rule would need to be preceded by reforms that assure a more steady flow of tax collections, in particular in view of the present idiosyncratic income tax collection system.

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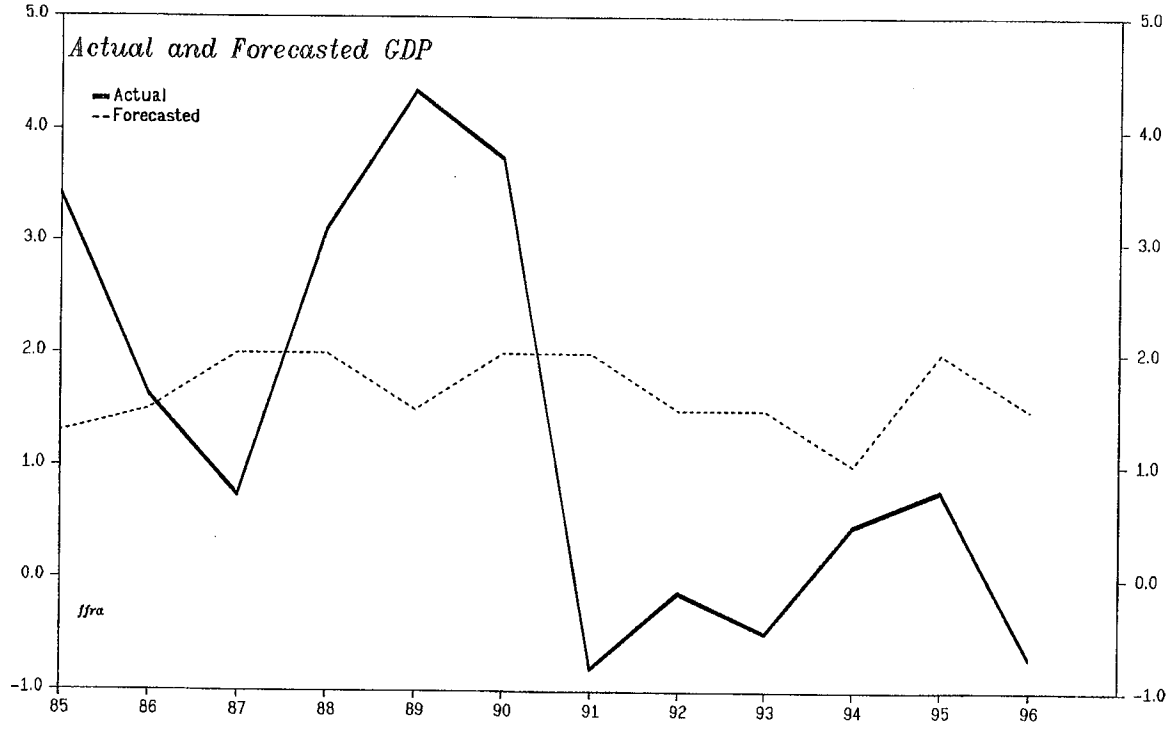
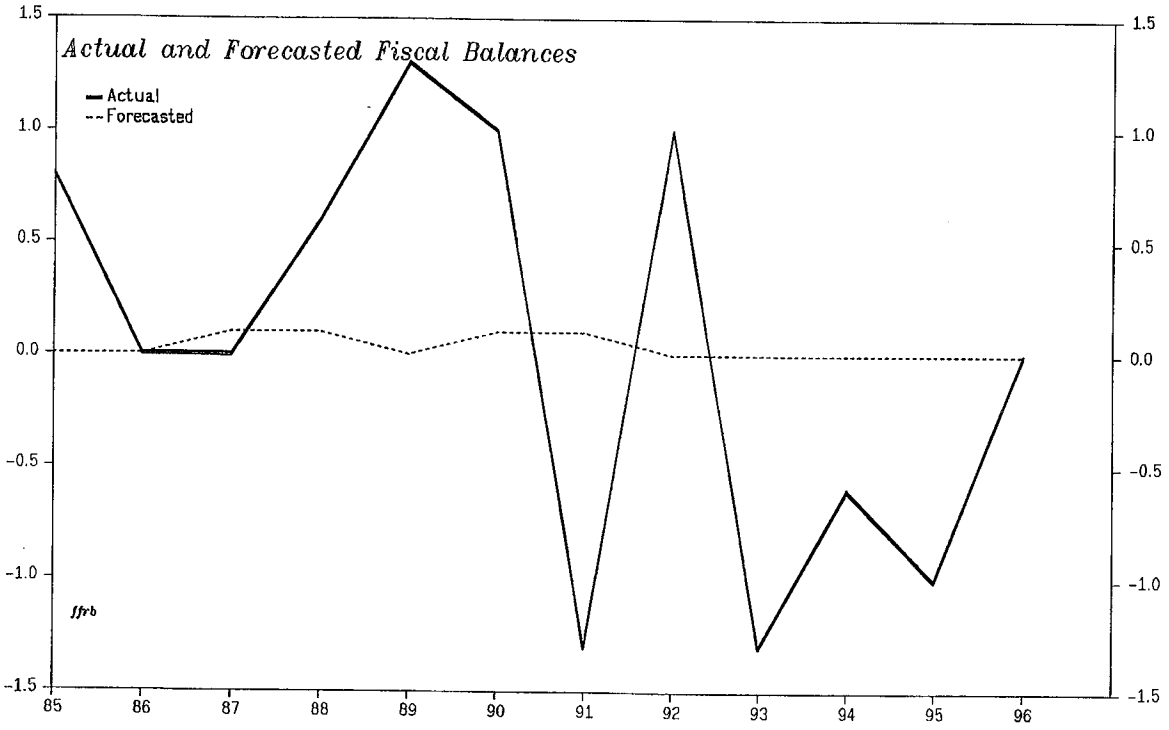
[46]Private sector and other official forecasts also persistently underprojected real GDP growth during the second half of the 1980s and persistently overprojected real GDP growth during the first half of the 1990s.

Figure II-7. Switzerland: GDP Forecasts and Fiscal Rules, 1985-96





Source: WEO database; and staff estimates.

ESTIMATION OF AUTOMATIC CYCLICAL RESPONSE PARAMETERS

70. This appendix outlines an approach for quantifying the automatic response of budget balances, expressed as a percent of GDP, to a 1 percentage point change in the cyclical output gap.[47] The actual or observed budget balance (B_t) is assumed to be the sum of two unobservable components, the structural balance (BS_t) and the cyclical balance (BC_t):

$$(A.1) \qquad B_t = BS_t + BC_t.$$

71. The structural balance is defined as the difference between structural nominal revenue (RS_t) and structural nominal expenditure (GS_t):

$$(A.2) \qquad BS_t = RS_t - GS_t,$$

while the cyclical balance is defined as the difference between cyclical nominal revenue (RC_t) and cyclical nominal expenditure (GC_t):

$$(A.3) \qquad BC_t = RC_t - GC_t.$$

72. To account for the size of the economy, the actual nominal balance is usually expressed as a ratio to nominal output (YN_t) while the structural nominal balance is expressed as a ratio to nominal potential output (YNP_t). As the structural and cyclical balance components need to add up to the actual balance component, the use of different scaling conventions for the actual and structural balances raises the issue of how to scale the level of cyclical balance. In the following, the cyclical balance is expressed as a ratio to nominal potential output. Thus, the decomposition of the actual balance into structural and cyclical components, all expressed as ratios to output, is given by:

$$(A.4) \qquad (B_t/YN_t) = (BS_t/YNP_t) + (BC_t/YNP_t) - (B_t/YN_t)GAP_t$$

$$\approx (BS_t/YNP_t) + (BC_t/YNP_t),$$

where GAP_t is the cyclical output gap, defined as $GAP_t=(YN_t-YNP_t)/YNP_t$. [48] The term $(B_t/YN_t)GAP_t$ represents a "nuisance term" introduced by the use of different scaling conventions for the actual and structural balances. This nuisance term will be small if the gap and/or the actual balance ratio are small, and the approximation given in equation (A.4) is therefore likely to work well under most circumstances. Using the same scaling conventions for the decomposition of revenue and expenditure gives:

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[47]This annex extends Annex I, pp. 99–103, of the October 1993 World Economic Outlook.

[48]Equation (A.4) is derived by dividing equation (A.1) by YNP_t and noting that (B_t/YNP_t) can be written as $(B_t/YN_t)(YN_t/YNP_t)=(B_t/YN_t)(1+GAP_t)$

(A.5) $(R_t/YN_t) = (RS_t/YNP_t) + (RC_t/YNP_t) - (Rt/YN_t)GAP_t$,

(A.6) $(G_t/YN_t) = (GS_t/YNP_t) + (GC_t/YNP_t) - (G_t/YN_t)GAP_t$.

73. By contrast to the decomposition of the balance in equation (A.4), the nuisance terms on the right-hand sides of equations (A.5) and (A.6) are likely to be large if the cyclical output gap deviates from zero, and as a consequence, to isolate cyclical revenue and expenditure ratios, it is paramount to take account of the nuisance terms when interest focusses on isolating the cyclical components of revenue and expenditure.

74. There are two possible approaches to determine the decompositions (A.5) and (A.6). The first and traditional approach determines the structural components on revenue and expenditure and derives the cyclical components as residuals. In particular, the OECD uses estimates of the cyclical elasticities of revenue and expenditure to calculate the structural revenue and expenditure components:

(A.7) $RS_t = R_t[(YPN_t/YN_t)^{\epsilon_R}(YPN_{t-1}/YN_{t-1})^{\delta_R}]$,

(A.8) $GS_t = G_t[(YPN_t/YN_t)^{\epsilon_G}(YPN_{t-1}/YN_{t-1})^{\delta_G}]$,

where ϵ_R, δ_R, ϵ_G, and δ_G denote current and lagged cyclical elasticity estimates for revenue and expenditure, respectively.[49] From equations (A.7) and (A.8), the cyclical revenue and expenditure components can be directly calculated as a function of the current and lagged cyclical output gap:

(A.7)' $RC_t = R_t[\epsilon_R GAP_t + \delta_R GAP_{t-1}]$,

(A.8)' $GC_t = G_t[\epsilon_G GAP_t + \delta_G GAP_{t-1}]$,

where (A.7)' and (A.8)' are based on the approximation $\ln(1+GAP_t) \approx GAP_t$ for GAP_t small.[50]

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[49]Equations (A.7) and (A.8) adopt two expository simplifications. First, the calculation of the structural balance may use disaggregated revenue and expenditure. Second, the operation of automatic fiscal stabilizers is restricted to a lag of one period.

[50]Equations (A.7)' and (A.8)' illustrate why ignoring the bias terms in equations (A.5) and (A.6) can lead to misleading inferences. For example, assuming that cyclical revenue is unit-elastic with respect to the cyclical output gap (ϵ_R=1, δ_R=0) and inserting (A.7)' in (A.5), it follows that $(R_t/YN_t)=(RS_t/YPN_t)$, i.e. the bias term exactly off-sets the cyclical revenue ratio, independently of the size of the cyclical output gap. It would be misleading to conclude that

(continued...)

75. The built-in flexibility parameter approach determines the cyclical revenue and expenditure ratios from:

(A.9) $(RC_t/YNP_t) = \alpha_R GAP_t + \beta_R GAP_{t-1}$,

(A.10) $(GC_t/YNP_t) = \alpha_G GAP_t + \beta_G GAP_{t-1}$.

76. In equation (A.9), the cyclical built-in flexibility parameters for revenue, α_R and β_R, describe the percentage point change in the cyclical revenue ratio for a 1 percentage point change in the current and lagged cyclical output gap, respectively. Similarly, the cyclical built-in flexibility parameters for expenditure, α_G and β_G, describe the cyclical responsiveness of expenditure. From equations (A.9) and (A.10), the cyclical balance ratio may be compactly written as

(A.11) $(BC_t/YNP_t) = \alpha GAP_t + \beta GAP_{t-1}$,

where $\alpha=\alpha_R-\alpha_G$ and $\beta=\beta_R-\beta_G$. Thus, the sum of the cyclical response parameters α and β in equation (A.11) provides a concise answer to the question: What is the total automatic response of the observed budget balance ratio to a 1 percentage point change in the cyclical output gap?

77. Comparing the equation pairs (A.7)' and (A.9) and (A.8)' and (A.10), respectively, shows that elasticity and built-in flexibility parameters are linked by the linear approximations:

(A.12) $\alpha_i \approx \epsilon_i \mu_i$ and $\beta_i \approx \delta_i \mu_i$, $i = R,G$,

where μ_R and μ_G denote averages of (R_t/YPN_t) and (G_t/YPN_t) over time, respectively. Thus, the approximations (A.12) allow to convert cyclical elasticity parameter estimates into cyclical built-in flexibility parameter estimates and vice versa.

78. While the application of these equations to the revenue side of the budget is relatively straightforward, the calculation of automatic cyclical response parameters for the expenditure side requires additional considerations. Following convention, only unemployment insurance benefits are assumed to respond automatically to cyclical output fluctuations. Unemployment insurance benefits (UIB_t) are conventionally cyclically adjusted by multiplying actual unemployment benefits by the ratio between the cyclically-adjusted unemployment rate (UN_t) to the actual unemployment rate (U_t)

(A.13) $UIBS_t = UIB_t(UN_t/U_t)$.

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[50](...continued)
the cyclical component of revenue is zero and that revenue therefore do not contribute to automatic fiscal stabilizers.

79. The cyclical rate of unemployment (U_t-UN_t) is assumed to be linked to current and lagged cyclical output gap by an Okun relationship

(A.14) $(U_t - UN_t) = aGAP_t + bGAP_{t-1}$.

80. Using (A.14) to isolate an expression for the natural rate of unemployment and inserting the expression in (A.13), dividing by YNP_t, subtracting the result from (UIB_t/YN_t), and re-arranging gives:

(A.15) $(UIBC_t/YNP_t) = (UIB_t/Y_t)(1+GAP_t)[(aGAP_t+bGAP_{t-1})/U_t]$.

81. Expanding the right-hand side of (A.15) around $GAP_t=GAP_{t-1}=0$, $(UIB_t/Y_t)=\mu_{UIB}$ and $U_t=\mu_U$, and ignoring terms of order higher than one, results in equation:

(A.16) $(UIBC_t/YNP_t) \approx \alpha_{UIB}GAP_t + \beta_{UIB}GAP_{t-1}$,

where the cyclical response parameters α_{UIB} and β_{UIB} capture the contribution of unemployment benefits to automatic stabilizers. Finally, the cyclical response parameters α_{UIB} and β_{UIB} are determined as:

(A.17) $\alpha_{UIB} = a(\mu_{UIB}/\mu_U)$ and $\beta_{UIB} = b(\mu_{UIB}/\mu_U)$,

where μ_{UIB} and μ_U denote average unemployment benefit-to-GDP ratios and the average unemployment rate, respectively. If only unemployment benefits are assumed to respond automatically to cyclical output gaps movements, the cyclical response parameters for expenditure are given by:

(A.18) $\alpha_G = \alpha_{UIB}$ and $\beta_G = \beta_{UIB}$,

and the approximations (A.12) can be used to recover the overall cyclical elasticities of expenditure.

III. The Tradeoff between Inflation and Real Activity[51]

A. Introduction and Summary

82. This chapter provides estimates of the tradeoff between inflation and cyclical measures of real activity in Switzerland. Traditionally, the short-run tradeoff is estimated using data on unemployment and inflation—an expectations-augmented Phillips curve. In the Swiss case, however, this approach has proved largely unsuccessful in the past. For example, in a recent extension of the Fund's MULTIMOD (multi-region econometric model) to Switzerland, initial estimations using Swiss data yielded such poor results that pooled data from the major industrial countries had to be employed to obtain a plausible relationship.[52] However, given the well-documented differences between labor markets in Switzerland and other industrialized countries, it is unlikely fully satisfactory parameters were obtained.[53] Moreover, Faruqee (1997)[54] estimated country-specific parameters for Phillips' curves of various industrial countries, excluding however Switzerland. He found substantial differences in these parameters across countries.

83. A principal obstacle to estimating a short-run Phillips curve for Switzerland has been the limited variability of its unemployment rate (Figure III-1). Until the 1990s, the Swiss unemployment rate has been very low—below 1 percent—for both institutional and statistical reasons. Changes in the labor market that took place during the 1980s had their consequences revealed during the economic slowdown of the 1990s, and the unemployment rate rose to record levels for Switzerland.

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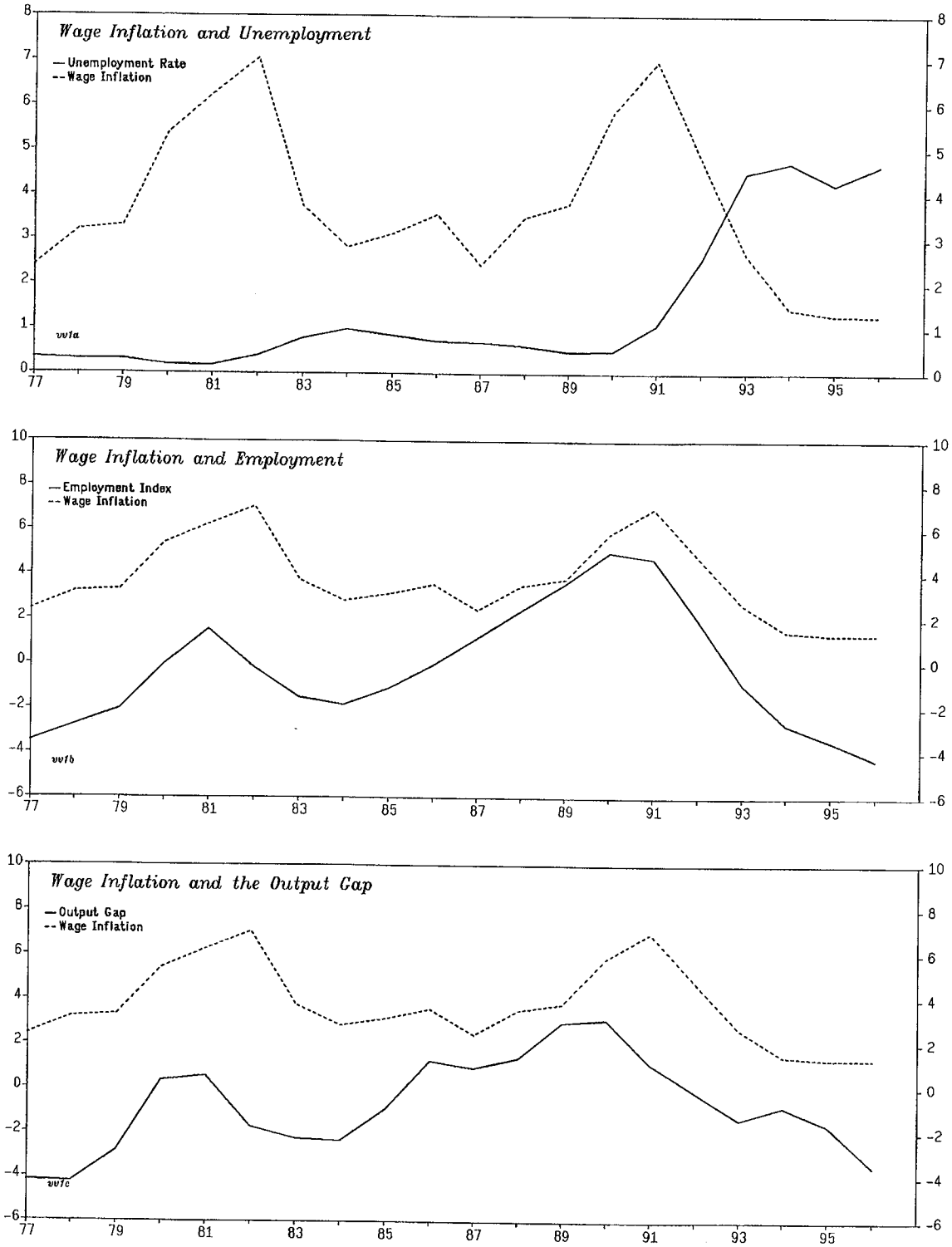
[51]Prepared by Victor Valdivia.

[52]See Douglas Laxton and Eswar Prasad (1997), "Possible Effects of European Monetary Union: An Analysis Using MULTIMOD Simulations," in *Switzerland—Selected Issues and Statistical Appendix*, SM/97/23, January 1997.

[53]For example, wage differentiation and nominal wage flexibility appear to be higher in Switzerland than in most other European industrial countries (see OECD (1996), *Economic Surveys: Switzerland*, Organization for Economic Co-operation and Development, Paris, 1996). Both of these factors imply that the short-run trade-off in Switzerland may be different than in other European countries.

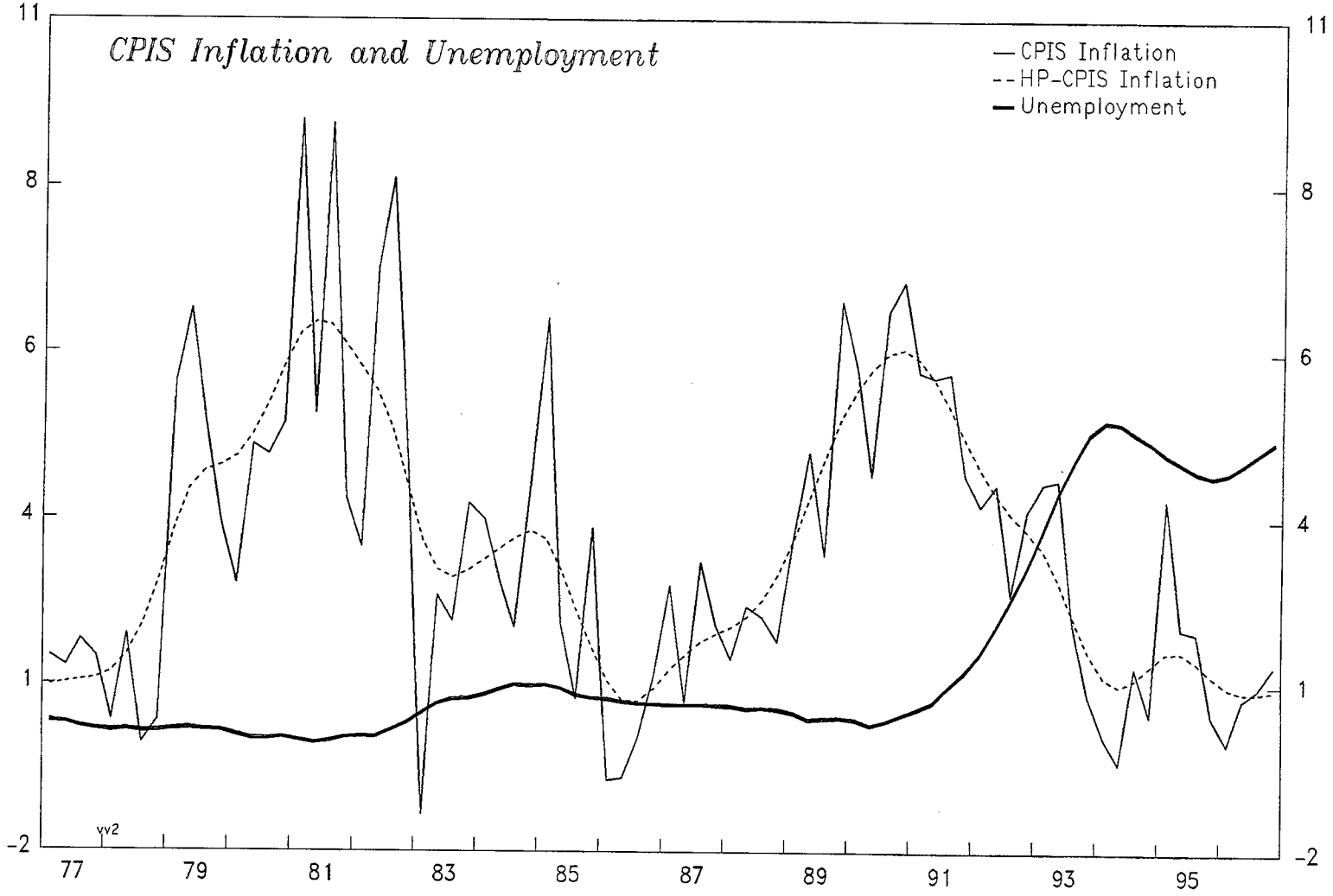
[54]See Hamid Faruqee (1997), "Labor Market Asymmetries and Macroeconomic Adjustment," in *Germany—Selected Issues and Statistical Appendix*, 1997. Parameters for non-linear Phillips curves are reported for each of the major industrial countries, as well as for Denmark, Sweden, Netherlands, Ireland and Spain.

Figure III-1. Switzerland: Inflation and Real Activity, 1977-96 (In percent)



Sources: Swiss Institute for Business Cycle Research, data tape; IMF, World Economic Outlook.

Figure III-2. Switzerland: Seasonally Adjusted Consumer Price Index Inflation (CPIS) and Unemployment



Source: Swiss Institute for Business Cycle Research, data tape.

84. Confronted with this statistical challenge to estimating a standard Phillips curve, two extensions are undertaken in this paper. One, in addition to the unemployment rate, employment and the output gap series are used as measures of real activity. As expected, the relationship between wage inflation and the employment/output gap is closer than the relationship between wage inflation and the unemployment rate (Figure III-1). Thus, greater success should be anticipated in uncovering the tradeoff between inflation and real activity based on output gap series than based on the unemployment rate. The second innovation is to estimate a non-linear relationship between various measures of real activity and inflation, instead of relying only on a linear specification. As in Laxton and Prasad (1997) and Debelle and Laxton (1996)[55], the estimates obtained in this paper for Switzerland suggest that a non-linear (convex) specification could be more appropriate than a linear one.[56]

85. A non-linear Phillips curve has important implications for the appropriate conduct of macroeconomic policy. Given a non-linear Phillips curve, the tradeoff (the sacrifice ratio) varies depending on the *level* of activity. Thus, the tradeoff is time dependent, varying with the current economic conditions. This contrasts with a linear Phillips curve, where the same tradeoff exists regardless of prevailing economic conditions. Policy miscues in a linear world have identical costs. However, with a non-linear Phillips curve, the costs associated with policy miscues depend on prevailing economic conditions. For instance, the further output is below potential, the smaller would be the increase in inflation—a lower sacrifice ratio—in response to higher aggregate demand. On the other hand, when the economy operates near or above full capacity, increased aggregate demand could result in sharply higher inflation—a high sacrifice ratio. Wide swings in aggregate demand can, therefore, prove costly both in terms of inflation and unemployment. An even moderately convex Phillips curve, thus, places a premium on the successful implementation of stabilization policies if the economy is subject to significant aggregate demand shocks.

86. The estimates obtained in this chapter appear robust to the various measures of cyclical activity and suggest that a non-linear specification appears to be marginally superior to a linear specification. Both specifications indicate that the "Phillips curve" faced by Switzerland was relatively flat at the end of the sample period—the fourth quarter of 1996. Higher aggregate demand would, thus, primarily produce increases in economic activity with only minor increases in inflation. This low sacrifice ratio contrasts with the very high sacrifice ratio that existed in the late 1980s.

87. This chapter focuses mainly on the short-run trade-off between inflation and real activity. However, the possible existence of a long-run tradeoff between inflation and

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[55]See Guy Debelle and Douglas Laxton (1997), "Is the Phillips Curve Really a Curve? Some Evidence for Canada, the United Kingdom, and the United States," *IMF Staff Papers*, International Monetary Fund, Vol. 44, No. 2.

[56]When discussing (in November 1997) an earlier version of this paper with the Swiss authorities, it was discovered that recent work by staff at the Swiss National Bank had also found a nonlinear tradeoff between inflation and real activity.

economic activity would also have important implications for the conduct of macroeconomic policies and the inflation target of the Swiss National Bank. To examine this issue more rigorously, statistical tests for a long-run tradeoff between inflation and economic activity are carried out in section D. These statistical tests did not support the existence of a long-term non-vertical Phillips curve in Switzerland. This result, however, may not hold for all inflation levels, in particular, the number of observations of very low inflation (below 1 percent) are very limited.

B. A Framework for Estimating Short-Run "Phillips Curve" Tradeoffs

88. From the interaction of wage- and price-setting behavior, a reduced form relation between price adjustments and the level of real activity can be derived.[57] This relationship is commonly expressed as an expectations-augmented short-run Phillips curve. It relates price or wage inflation to the unemployment gap—the departure of actual unemployment from the non-accelerating inflation rate of unemployment or NAIRU. Equivalent relationships can be derived between consumer (or wage) inflation and employment or the output gap. In general, a short-run relation between inflation and real activity can be expressed in the following reduced form:

$$\pi_t - \pi_t^a = f(x_t - x_t^*) \quad with\ f(0) = 0 \qquad (1)$$

Here, π_t is observed inflation, π^a_t is anticipated inflation, and $x_t - x^*_t$ is a "real activity gap" such as the output gap, employment gap, or the unemployment gap. For example, when x_t stands for output and x^*_t for potential output, then $x_t - x^*_t$ is the output gap. The condition that $f(0)=0$ ensures that unanticipated inflation is zero when the "real activity gap" is closed. Hence, this specification implies that there is no long-term trade-off between real activity and inflation. The validity of this restriction is examined in section D.

89. As in Debelle and Laxton (1996) and Fuhrer (1995),[58] anticipated inflation is based on a combination of forward- and backward looking information. Specifically,

$$\pi_t^a = (1 - \delta)\pi_{t-1} + \delta\pi^e_{t+1} \quad where\ \delta \in (0,1) \qquad (2)$$

The first term on the right hand side is the backward-looking component and is assumed to depend only on previous period inflation. The second term is the forward-looking component, and depends on expected inflation in the following period, π^e_{t+1}. Anticipated inflation is the weighted average of these two components. The weight placed on the forward-looking

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[57]See Richard Layard, Stephen Nickell, and Richard Jackman (1991), *Unemployment: Macroeconomic Performance and the Labor Market*, Oxford University Press.

[58]Jeffrey Fuhrer (1995), "The Persistence of Inflation and the Cost of Disinflation," New England Economic Review, Federal Reserve Bank of Boston, January/February 1995.

component is δ. Inflationary expectations are assumed to be rational, so expected future inflation will only differ from realized future inflation by a random error term,

$$\pi_{t+1} - \pi^{e}_{t+1} = \varepsilon_{t+1} \tag{3}$$

The error term ε_{t+1} is assumed to have a zero mean governed by a serially uncorrelated white noise process with standard deviation σ_{ε}. This specification implies that inflationary expectations will be correct on average. Combining equations (1)-(3) leads to the following equation which will be used in the estimations below,

$$\Delta\pi_t = \phi\,\Delta\pi_{t-1} + \gamma f(x_{t-1} - x^{*}_{t-1}) + \varepsilon_t \tag{4}$$

where $\Delta\pi_t = \pi_t - \pi_{t-1}$. The original model parameters can be recovered from the estimated coefficients in (4) using,

$$\delta = \frac{1}{1+\phi}, \quad \theta = -\gamma\delta \tag{5}$$

90. The model is estimated below using quarterly data. Three measures of real activity—the unemployment rate, employment, and the output gap—are utilized. Several measures of inflation are employed, including the Consumer Price Index (CPI) inflation and wage inflation (LWI). These inflation series are filtered using the Hodrick-Prescott (HP) technique (e.g. HP-CPI, and HP-LWI) to remove very high frequency components. (The HP filter smoothing parameter was 10.) In addition, several functions, *f(.)*, will be used below, including both linear and non-linear forms.

Estimates Based on Unemployment Data

91. As a staring point, the following Phillips line is considered:

$$\pi_t - \pi^{a}_t = \gamma\,(U_t - U^{*}_t) \tag{6}$$

Here, U_t is the unemployment rate and U_t^* is the time-varying NAIRU. Under the natural rate hypothesis, an unemployment rate of U_t^* is consistent with zero unanticipated inflation. In this linear specification, the parameter γ equals the time-invariant short-run trade-off between inflation and unemployment, and is the inverse of the "sacrifice ratio".

92. Measurement issues in Switzerland are very important for institutional and statistical reasons. The most important institutional factor would seem to be the role of foreigner workers in the labor market. Prior to the economic slowdown of the 1990s, the labor force had a high degree of cyclical responsiveness (*OECD Economic Survey-Switzerland*, 1996), owing in large part to swings in foreign employment. Foreign workers by leaving Switzerland acted as an unemployment buffer and were not be recorded as unemployed in Switzerland. According to the OECD (1996), for example, about 80 percent of the employment loss during the 1974–76 recession was absorbed by a shrinking foreign labor force; most of the decrease came from foreigners holding annual work permits. The restrictiveness of work permit rules declines with the cumulated time spent in Switzerland, however. The share of foreign workers with permanent resident status has, thus, risen from about 20 percent in 1970 to close to 60 percent in 1996. Consequently, the cyclical responsiveness of the labor force has declined over time.

93. Another reason for a declining cyclical responsiveness of the registered labor force was the introduction of compulsory unemployment insurance in 1977 and the subsequent increase in coverage and generosity. These changes have enhanced the economic incentives for the unemployed to register at labor offices. Data on unemployed are based on the number of persons who register for unemployment benefits at the cantonal employment offices. This measurement practice is subject to both under-and over-estimation problems. Actual unemployment could be underestimated because people fail to register when unemployed since prior to 1997 they would not receive benefits. (The 1990 census data found the number of unemployed individuals to be three-times higher than the number of registered unemployed, suggesting hidden unemployment.) Unemployment could be overstated because individuals who are not actively seeking employment remain registered in order to obtain unemployment benefits. (During 1994–95, survey-based unemployment rates have been well below the registered unemployment rates (0.9 percentage points) suggesting that unemployment benefits have boosted registered unemployment.)

94. Finally, the measurement of unemployment changed in 1991. Prior to 1991, unemployment was given by the number of unemployed workers registered with regional labor offices. From 1991 onwards, the unemployment rate has been calculated from the annual Labor Force Survey. However, the measured labor force has not been updated since the 1990 survey. Using the sum of employed and unemployed persons as an alternative measure of the labor force, the unemployment rate would be about ½ percentage point below the official figure. These various problems with the unemployment data have hampered the estimation of the short-run Phillips curve for Switzerland, and suggest that the Swiss unemployment series may not correspond closely to real economic activity or inflation.

95. The model is expressed in state-space form before estimation. The *measurement* equation is obtained by substituting equation (6) in (4) to give,

$$\Delta\pi_t = \phi\,\Delta\pi_{t-1} + \gamma\,(U_{t-1} - U^*_{t-1}) + \varepsilon_t \qquad (7)$$

or, in vector form,

$$\Delta\pi_t = \begin{bmatrix} -\gamma & \gamma U_{t-1} & \Delta\pi_{t-1} & 0 \end{bmatrix} \cdot \begin{bmatrix} U^*_{t-1} \\ 1 \\ \phi \\ \beta \end{bmatrix} + \varepsilon_t \qquad \textbf{(8)}$$

The *4* × *1* period-*t* state vector is: [U^*_{t-1} 1 ϕ β]′. As mentioned above, the error term ε_t is assumed to be a zero mean serially uncorrelated white noise process with standard deviation σ_ε. The parameter β does not enter into the data equation, (8), but is needed in the state equation below.

96. The evolution of the state variable U^*_{t-1} is assumed to follow a random walk process with a structural break in 1992,

$$U^*_t = U^*_{t-1} + \beta d_t + \eta_t \qquad \textbf{(9)}$$

Here, the variable d_t is a dummy which equals zero for all quarters before the first quarter in 1992 and equals one for all quarters after that. Thus, d_t is used to separate the two regimes in the unemployment series. The year 1992 was chosen as the break point because it was the first year after the change in unemployment definition that an output gap emerged.

97. The error term η_t in (9) is assumed to be a zero mean and serially uncorrelated white noise process with standard deviation σ_η. Using equation (9), the evolution of the state vector is described by the *state transition* equation:

$$\begin{bmatrix} U^*_t \\ 1 \\ \phi \\ \beta \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & d_t \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} U^*_{t-1} \\ 1 \\ \phi \\ \beta \end{bmatrix} + \begin{bmatrix} \eta_t \\ 0 \\ 0 \\ 0 \end{bmatrix} \qquad \textbf{(10)}$$

where, the error vector, [η_t 0 0 0]′, is normally distributed with mean [0 0 0 0]′ and a variance-covariance matrix:

$$Q = \begin{bmatrix} \sigma^2_\eta & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \qquad \textbf{(11)}$$

The state-space formulation of the model consists of the measurement equation, (8), the state transition equation, (10), and the stochastic assumptions for the shocks η_t and ε_t.

98. The model parameters σ_ε, σ_η, γ, ϕ, and β, and the series U_t^* are unknown. To identify the model, an a priori restriction on the variability of U_t^* was used to fix the value of σ_η. Since U_t^* is the natural unemployment rate, and this rate is expected to be less volatile than the observed unemployment rate, a value for σ_η was chosen so that the U_t^* series was less volatile than the unemployment rate. For this purpose the value of σ_η is set to 0.03. This value was chosen by estimating the model for different values of σ_η, and comparing the variability of the estimated U_t^* series and that of unemployment. Several values for σ_η were found that guaranteed that the U_t^* series is smoother than the unemployment rate. However, the results reported here did not change substantially with these different values for σ_η. Therefore, the results reported here are based on σ_η=0.03. With σ_η given, the model was estimated by maximum likelihood using the Kalman filter.[59]

99. The estimated parameters are shown in Table III-1a. Using equation (5), these estimates imply a value for δ of 0.53 and θ=-0.0017. The estimated natural rate is shown in Figure III-3. The estimated value of U* was 3.8 percent in 1996 with a standard error of 1.2 percent. In light of the results of Debelle and Laxton (1996) and Faruqee (1997), which support a non-linear relation over a linear one, the following nonlinear specification replaced (6),

$$\pi_t - \pi_t^a = \gamma \frac{U_t - U_t^*}{U_t} \qquad \textbf{(12)}$$

In this non-linear specification, U_t^* is the deterministic NAIRU or D-NAIRU. This specification is motivated by a traditional upward sloping supply function: as the economy approaches its capacity constraint, and the unemployment rate is below the NAIRU rate, excess demand only raises inflation without any output or employment gains. The differences between the D-NAIRU and the NAIRU are shown in Figure III-4. The D-NAIRU is the unemployment rate consistent with zero unexpected inflation ($\pi_t - \pi_t^e = 0$); whereas the NAIRU is the expected value of the unemployment rate in the stochastic steady state. Given the range of variability of the unemployment rate in Figure III-4 (i.e. symmetric shocks about the NAIRU), the convexity of the curve (which implies that excess demand is more inflationary than excess supply), implies that the NAIRU will exceed the D-NAIRU, U_t^*. In the linear model, on the other hand, U_t^* and the NAIRU are equal.

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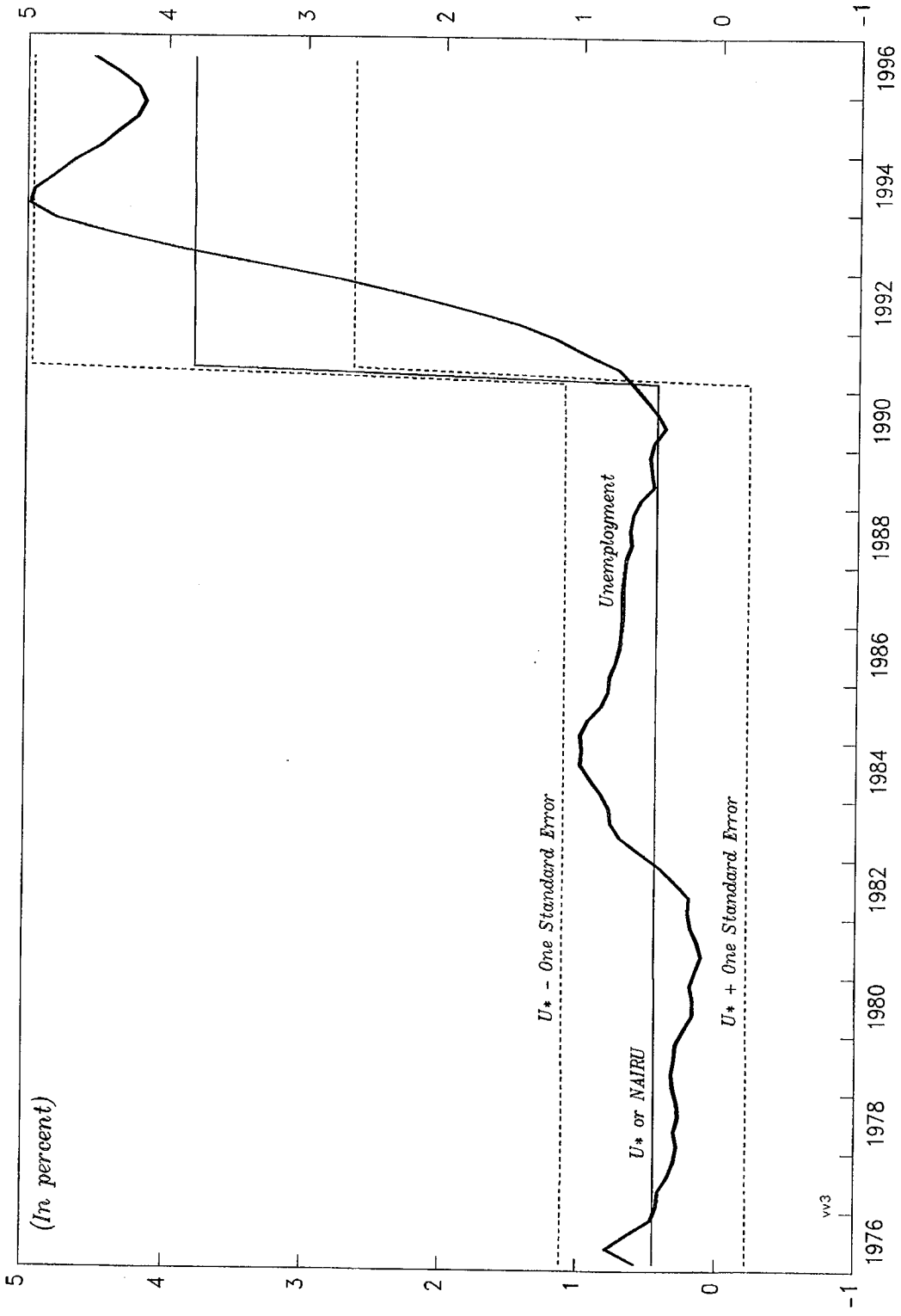
[59]The estimation procedure is described in Andrew C. Harvey (1989), *Forecasting, Structural Time Series Models and the Kalman Filter*, Cambridge University Press, Chapter 3. The standard errors of the state vector were computed using the Monte Carlo technique described in James D. Hamilton (1986), "A Standard Error for the Estimated State Vector of a State-Space Model," *Journal of Econometrics*, 33, 387–97.

Figure III-3. Switzerland: Estimated NAIRU Using a Linear Model



Source: Staff estimates.

Figure III-4. Switzerland: The Convex Phillips Curve

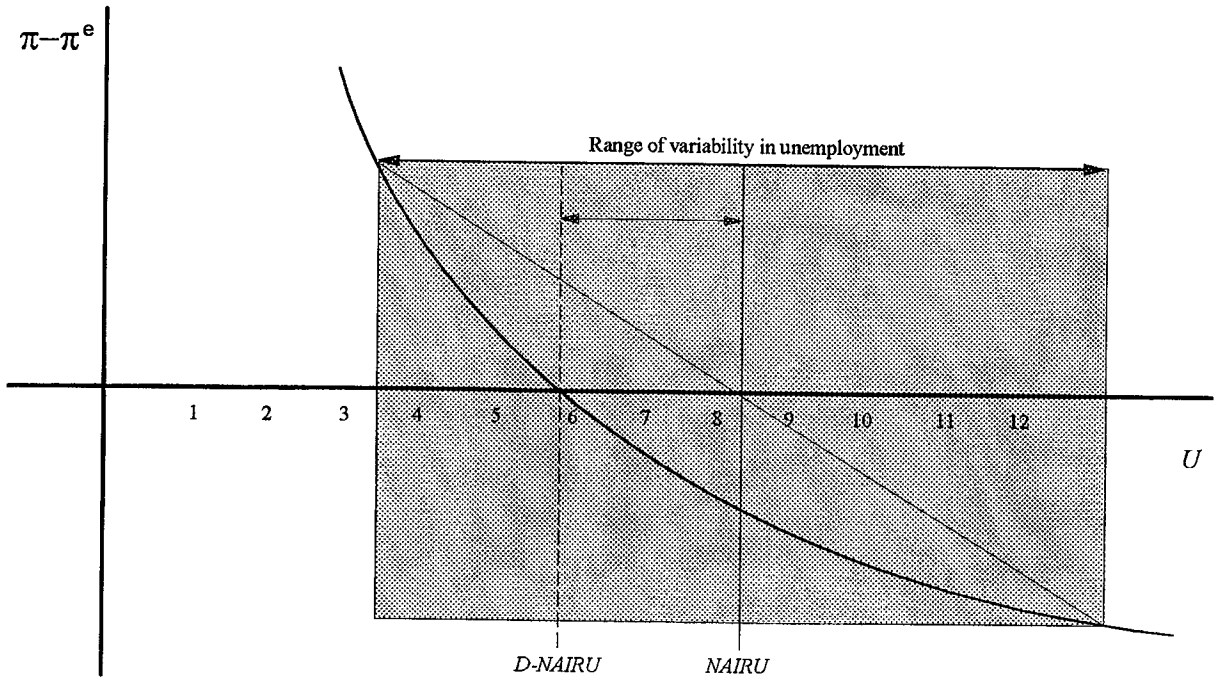


Table III-1. Parameter Estimates Allowing for a Regime Shift in 1992
Sample: 1976 (Q3) -1996(Q4)

Table III-1a. Linear Phillips Curve
Set: $\sigma_\eta = 0.03$

Estimated Parameters (standard errors)				Implied Model Parameters		Log-Likelihood
σ_ϵ	γ	ϕ	β	δ	θ	
0.17	0.03	0.88	3.36	0.53	-0.00	-4.55
(0.00)	(0.00)	(0.05)	(1.39)			

Table III-1b. Nonlinear Phillips Curve
Set: $\sigma_\eta = 0.03$

Estimated Parameters (standard errors)				Implied Model Parameters		Log-Likelihood
σ_ϵ	γ	ϕ	β	δ	θ	
0.16	0.049	0.91	1.76	0.52	-0.03	-4.13
(0.00)	(0.00)	(0.05)	(2.20)			

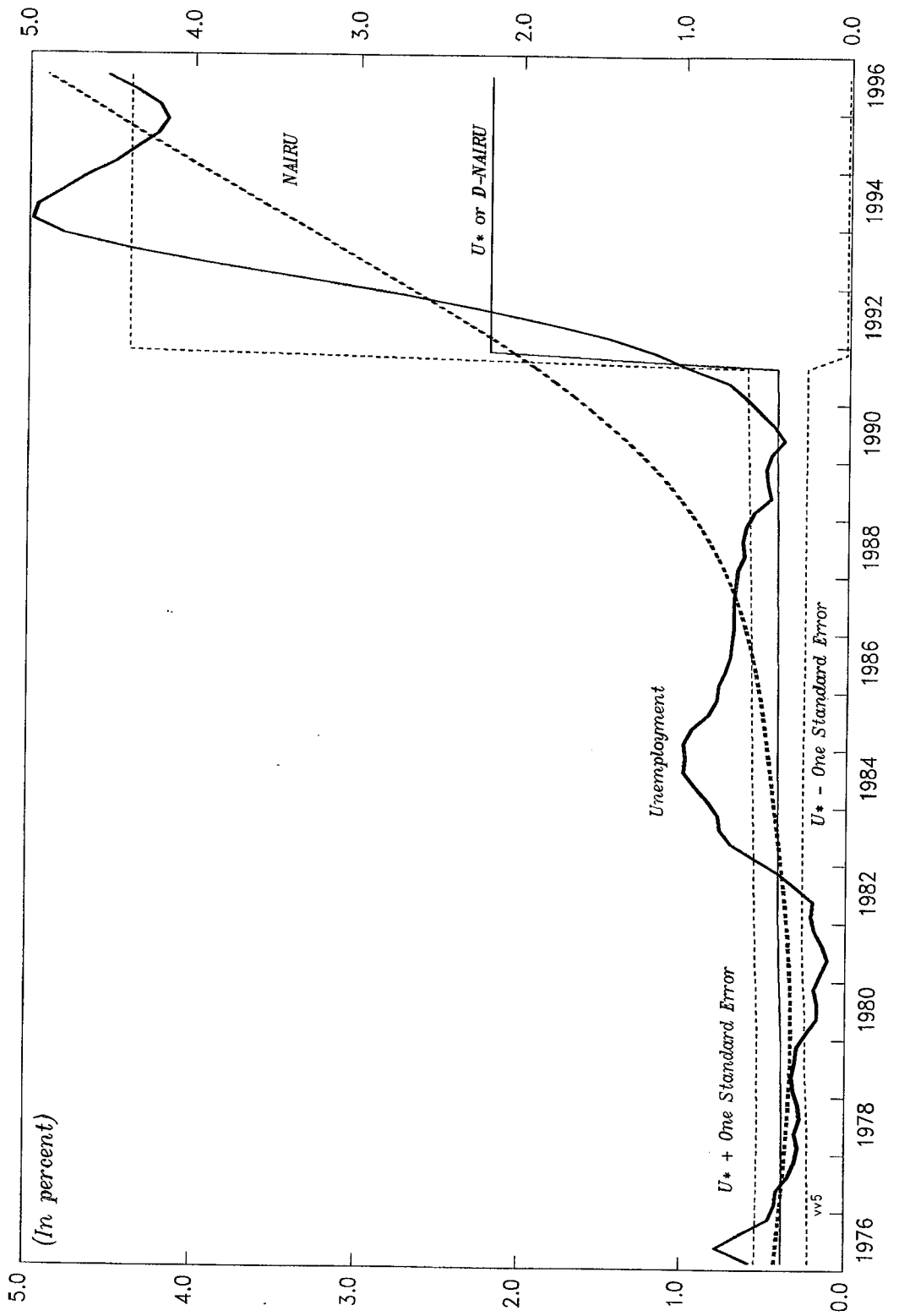
100. The non-linear model is expressed in state-space form prior to estimation. This involves replacing equation (8) by:

$$\Delta\pi_t = \begin{bmatrix} \frac{-\gamma}{U_{t-1}} & U_{t-1} & \Delta\pi_{t-1} & 0 \end{bmatrix} \cdot \begin{bmatrix} U^*_{t-1} \\ 1 \\ \phi \\ \beta \end{bmatrix} + \epsilon_t \qquad \textbf{(13)}$$

The state vector is still assumed to evolve according to (10). The Kalman filter was used to obtain the Maximum Likelihood estimates for the parameters as well as the time-varying D-NAIRU, U_t^*, with a regime shift in 1992. The estimated parameter values are presented in Table III-1b. The estimated D-NAIRU is shown in Figure III-5. The non-linear specification improves somewhat the fit compared with the linear specification, judging by the log-likelihood values. Also, the NAIRU (obtained by filtering U_t) never dips below the D-NAIRU plus one standard error (Figure III-5). Thus, the estimation results agree with the theoretical specification for a convex Phillips curve. The standard errors for the non-linear specification are smaller than those for the linear specification during the period 1976–91 (0.2 vs 0.7). However, the standard errors for the non-linear specification are significantly larger after the series break in 1992 (2.2) compared with their earlier values and compared with the standard errors for linear model for the period 1992–96 (1.2). The relatively poor performance of the non-linear model since 1991 casts doubts on the specification despite its superior performance over the entire sample period.

101. Moreover, the estimated value of γ for Switzerland is 0.05 and is substantially lower than the estimated values for other industrial countries (see the results in Debelle and Laxton (1996) or in Farquee (1997)), also casting doubt on the plausibility of the empirical results. The exceptionally low value of γ for Switzerland would imply that the Swiss Phillips curve is

Figure III-5. Switzerland: Estimated D-NAIRU
Using a Non-linear Model



Source: Staff estimates.

much flatter than in other countries—that is, a one percentage point change in the unemployment rate would have almost no impact on inflation over a wide range of the Phillips curve (Figure III-6)—an empirical result at odds with the observation that the flexibility of nominal wage setting in Switzerland appears to be higher than in most other industrial countries in Europe. The parameter δ is estimated at 0.52. This estimate implies that wage and price setters place a weight of about 52 percent on forward-looking inflation expectations. This estimate is not out of line with estimates for G-7 countries reported by Farquee (1997) and indeed were almost identical to the values for Germany and Canada. Finally, the D-NAIRU, U^*, was estimated at 2.2 percent in 1996. For comparison, OECD estimates of the NAIRU cluster around 3 percent. This value falls between the estimated average annual D-NAIRU and NAIRU for 1996 (2.2 percent and 3.9 percent, respectively).

Estimates Based on Output Gap Data

102. In this section, the output gap replaces the unemployment rate as the relevant activity measure. One disadvantage of the output gap is that it is not an observable variable, and its magnitude is subject to dispute. For example, the estimated output gap in 1996 ranged from about 2 ½ percent (Economic Policy Commission) to 3½ percent (Fund staff), to 4½ percent (SNB), to close to 5 percent (OECD).

103. In order to check the robustness of the previous results to the expectations model, unanticipated inflation is now modeled as,

$$\pi_t^a = (1-\delta)\,\pi_{t-1} + \delta\,\pi_t^{LTE} \quad where\ \delta \in (0,1) \tag{14}$$

instead of equation (2). In this specification, the forward looking component of anticipated inflation depends on long-term inflation expectations, π_t^{LTE}, as in Debelle and Laxton (1996). This π_t^{LTE} term is the difference between long-term interest rates and a measure of the world interest rate:[60]

$$\pi_t^{LTE} = r_t^{LR} - r_t^{WORLD} \tag{15}$$

This model was estimated below using quarterly data and several measures of inflation, the CPI and wages. The version of equation (1) used is:

$$\pi_t - \pi_t^a = \gamma YGAP_t \tag{16}$$

where $YGAP_t$ is the output gap and is defined as:

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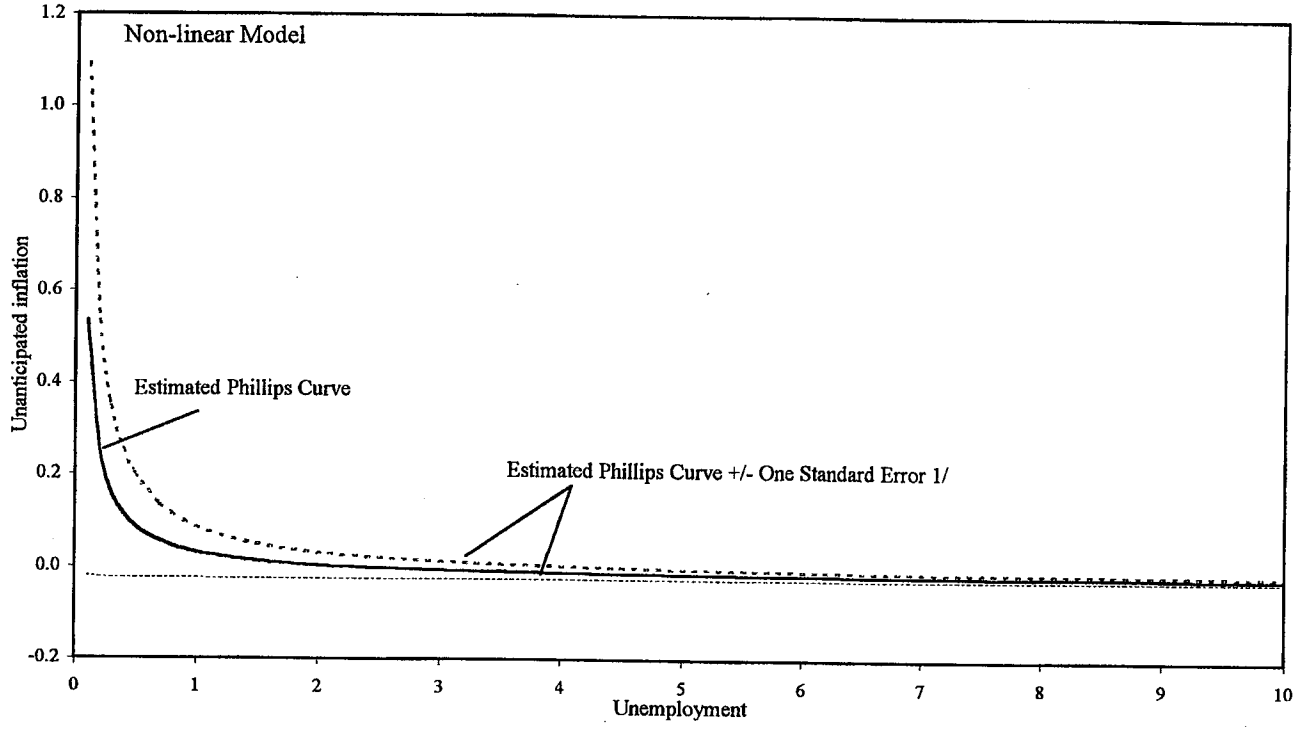
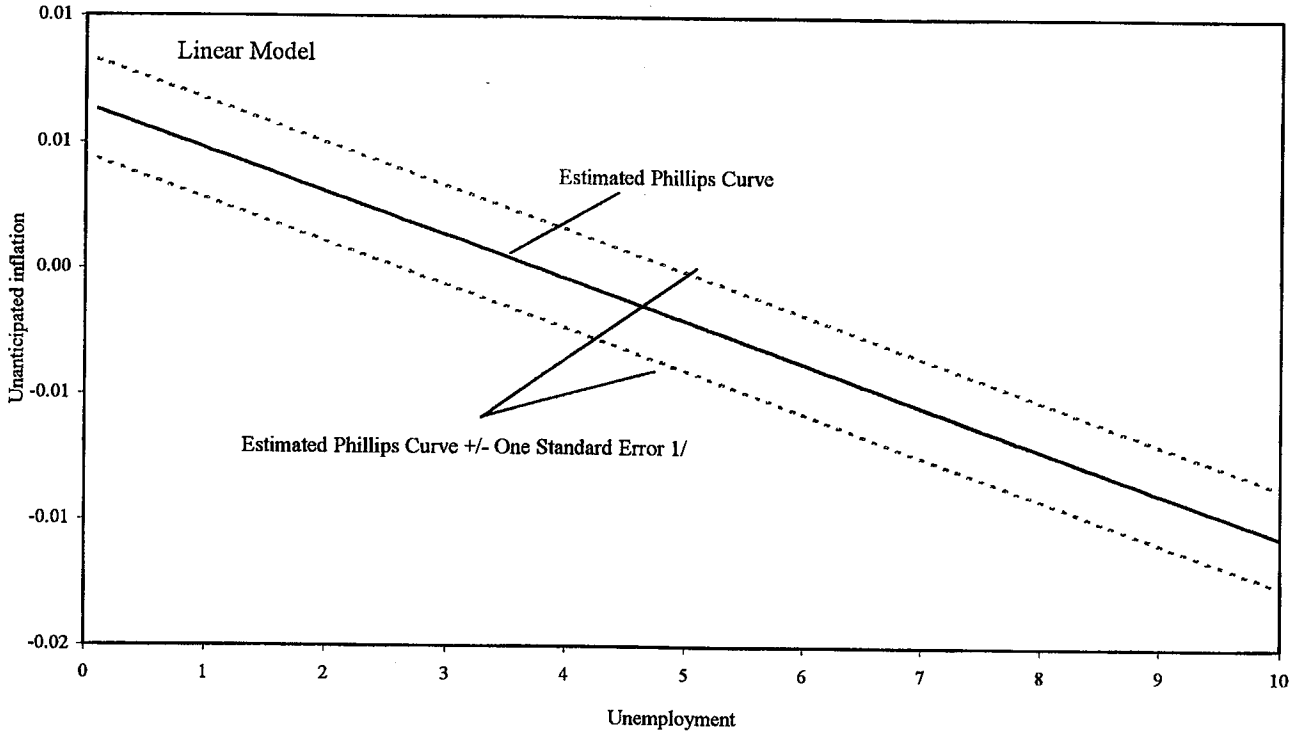
[60]See Vito Tanzi and Domenico Fanizza (1995), "Fiscal Deficit and Public Debt in Industrial Countries," International Monetary Fund Working Paper 95/49.

Figure III-6. Switzerland: The Short-run Trade-off Between Inflation and Unemployment in 1996





1/ The standard error reflects uncertainty in the estimate of U* only. Parameter uncertainty is not reflected in this chart.

$$YGAP_t = \left(\frac{Y_t - Y_t^*}{Y_t^*} \right) \cdot 100 \qquad \textbf{(17)}$$

Here, Y_t is GDP in constant prices and Y* is potential GDP. Equations (14) and (15) are substituted into (16), and the resulting equation is estimated using OLS. The estimation results are shown in Table III-2. The estimated coefficient γ has the anticipated sign and is statistically significant. The adjusted R squared is 0.97 and the F-statistic is highly significant.

104. Next, a quadratic specification is estimated instead of (16). The quadratic specification imposes a positive relation between inflation and the output gap when output is below potential, and a negative relation when output is above potential.

$$\pi_t - \pi_t^a = \gamma YGAP_t + \eta YGAP_t^2 \qquad \textbf{(18)}$$

The estimation results for equation 18 are given in Table III-3. Both coefficients had a positive coefficient that were statistically significantly different from zero. The adjusted R squared is about 0.97 or virtually unchanged from the linear specification. However, the quadratic specification has a marginally better fit using other criteria such as standard error of the regression, log likelihood, and F statistic. This suggest that the relation between inflation and the output gap may be somewhat non-linear. However, a quadratic specification may be too restrictive and appears to imply anomalous behavior for unanticipated inflation when the output gap is high.

Table III-2. Linear Relation Between Inflation and the Output Gap
Sample: 1980 (Q1) to 1996(Q4)

Regression: $\pi_t - \pi_t^a$ = C(2)*YGAP

Inflation: HP-CPIS

	Coefficient	Std. Error	T-Statistic	Prob.
C(1)	0.03	0.02	1.37	0.18
C(2)	0.09	0.02	4.49	0.00

R-squared	0.97	Mean dependent var	3.18
Adjusted R-squared	0.97	S.D. dependent var	1.81
Durbin-Watson stat	0.23	Prob(F-statistic)	0.00

Inflation: HP-LWI

	Coefficient	Std. Error	T-Statistic	Prob.
C(1)	0.03	0.01	1.78	0.08
C(2)	0.09	0.02	4.50	0.00

R-squared	0.97	Mean dependent var	3.80
Adjusted R-squared	0.97	S.D. dependent var	1.89
Durbin-Watson stat	0.14	Prob(F-statistic)	0.00

Variables:

CPIS = CPI inflation, seasonally adjusted
LWI = wage index inflation

Table III-3. Quadratic Relation Between Inflation and the Output Gap
Sample: 1980 (Q1) to 1996(Q4)

Regression: $\pi_t - \pi_t^a$ = C(2)*YGAP + C(3)*(YGAP^2)

Inflation: HP-CPIS

	Coefficient	Std. Error	T-Statistic	Prob.
C(1)	0.08	0.02	3.58	0.00
C(2)	0.10	0.02	5.39	0.00
C(3)	0.03	0.01	3.80	0.00

R-squared	0.98	Mean dependent var	3.18
Adjusted R-squared	0.97	S.D. dependent var	1.81
Durbin-Watson stat	0.27	Prob(F-statistic)	0.00

Inflation: HP-LWI

	Coefficient	Std. Error	T-Statistic	Prob.
C(1)	0.07	0.02	4.04	0.00
C(2)	0.12	0.02	5.72	0.00
C(3)	0.03	0.01	3.98	0.00

R-squared	0.98	Mean dependent var	3.80
Durbin-Watson stat	0.18	Prob(F-statistic)	0.00

Variables:

CPIS = CPI inflation, seasonally adjusted
LWI = wage index inflation

105. An alternative non-linear specification (19), which does not impose this relation, was also estimated:

$$\pi_t - \pi_t^a = \gamma \frac{YGAP_t}{\hat{Y} - YGAP_t} \qquad (19)$$

$\hat{Y}$ can be interpreted as the maximum possible output gap. Equation (19) was estimated using ordinary least squares for different values of $\hat{Y}$, selecting the value of $\hat{Y}$ that produced the best fit. The estimates are given in Table III-4.

106. The adjusted R squared is about 0.97 as in the previous two specifications. Based on some goodness-of-fit indicators (i.e., standard error of the regression and log-likelihood) the quadratic specification out performs this non-linear specification, while the non-linear specification has a higher F-statistic than does the linear specification. The non-linear specification has a slightly better fit than the linear specification based on all these goodness-of-fit indicators. Again, this suggests that the relationship between inflation and the output gap may be somewhat non-linear. The trade-offs between unanticipated inflation (HP-CPIS) and the output gap for all three specifications are shown in Figure III-7. Given the output gap estimated to prevail in 1996, the tradeoffs are similar. For the nonlinear specification, the estimated trade-off remains fairly flat and linear until the economy moves into a region of excess demand.

C. Policy Implications of a Non-Linear Short-Run Phillips Curve

107. To examine how the trade-off between inflation and unemployment has changed with the level of unemployment, the expression in (19) was solved for its slope,

$$\frac{d\,\pi_t^u}{d\,YGAP_t} = \frac{\gamma\,\hat{Y}}{(\hat{Y} - YGAP_t)^2} > 0 \quad since \;\; \hat{Y} > 0 \qquad (20)$$

Unanticipated inflation is given by $\pi_t^u = \pi_t - \pi_t^a$. This expression was used to compute the trade-off between inflation and the output gap (Figure III-8).[61] As the figure shows, the inflation cost of reducing the unemployment rate has varied. As the economy moved along the Phillips curve from a flat region to an increasingly upward sloping region, the sacrifice ratio has increased sharply. Thus, the conduct of macroeconomic policies must bear in mind the economy's current and prospective tradeoffs between inflation and growth. The convexity of the Phillips curve also places a premium on the successful conduct of stabilization policies.

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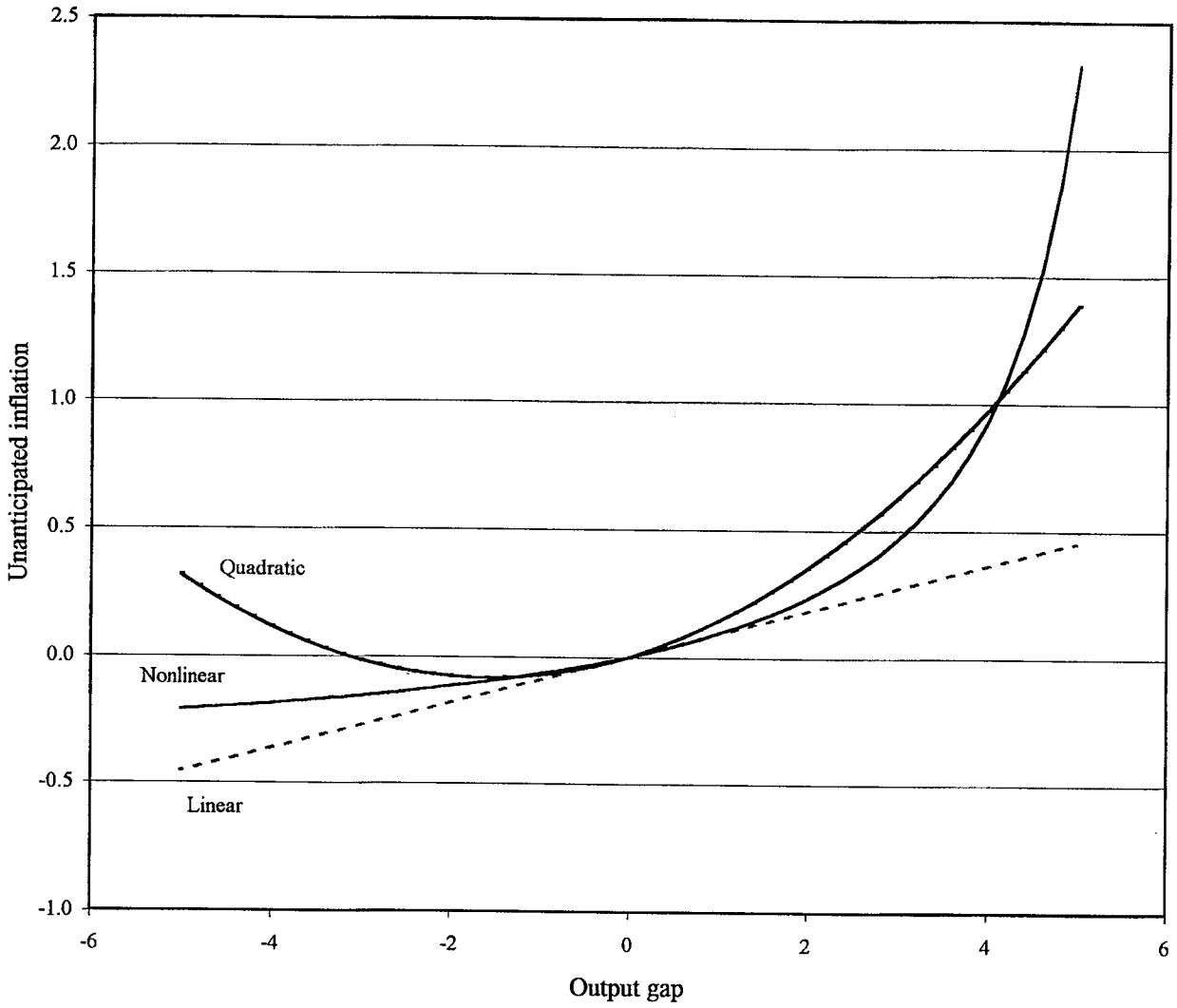
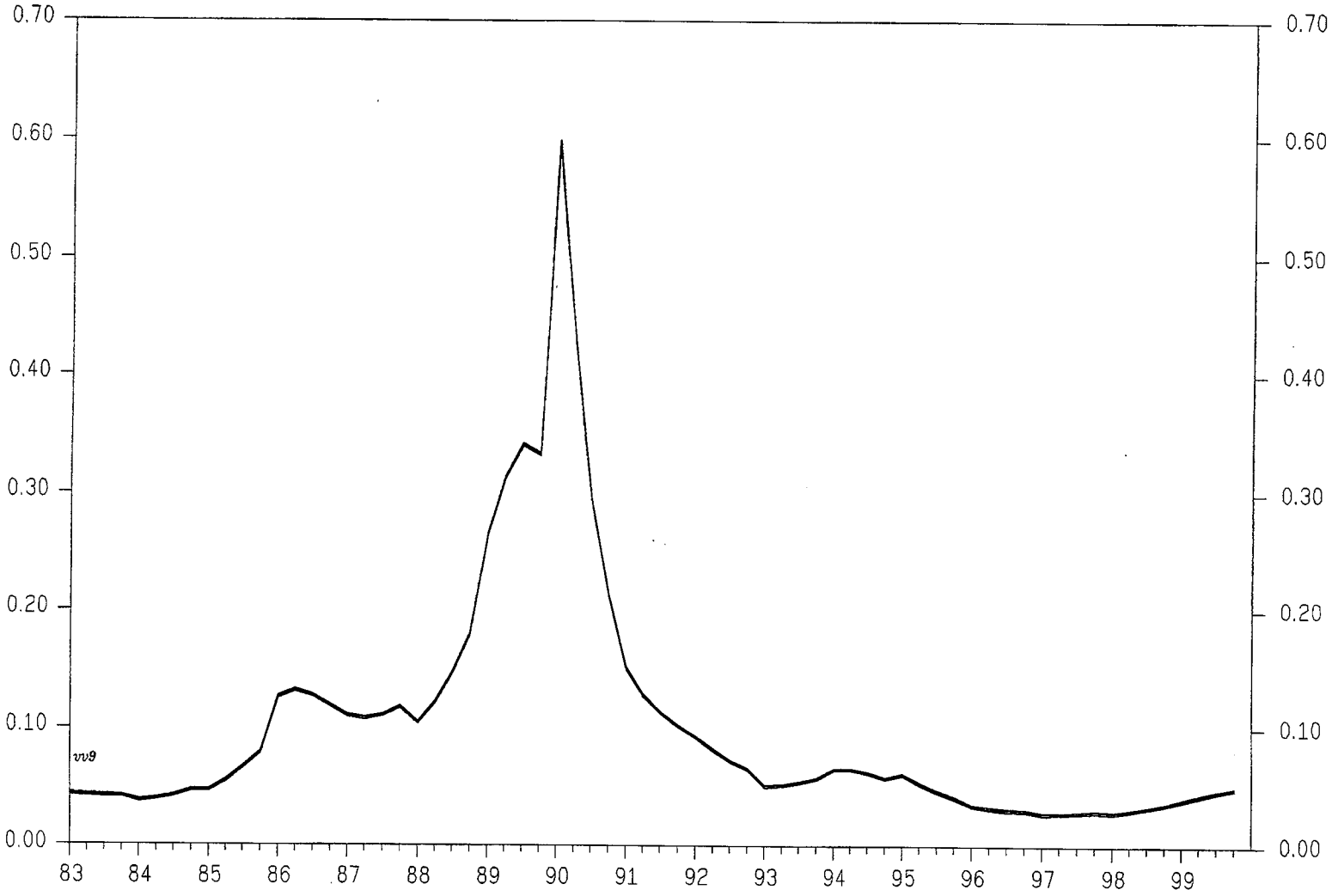
[61]However, this is a static measure of the sacrifice ratio based on a partial-equilibrium model. In order to simulate the actual path of future inflation and expectations, the present equations would need to be embedded into a complete macroeconomic model, including the response of the central bank to changes in inflation (see Fuhrer (1995) and Laxton et al (1991)).

Figure III-7. Switzerland: The Short-run Trade-off Between Inflation and the Output Gap in 1996



Source: Staff estimates.

Figure III-8. Switzerland: Short-run Trade-off
Between Inflation and Output Gap 1/



Source: Staff estimates.
1/ Increase in unexpected inflation for each year that would have resulted from a 1 percentage point lower output gap in that year.

Table III-4. Non-Linear Relation Between Inflation and the Output Gap
Sample: 1980 (Q1) to 1996(Q4)

Regression: $\pi_t - \pi_t^a$ = C(2)*YGAP/(YHAT-YGAP)

Inflation: HP-CPIS

	Coefficient	Std. Error	T-Statistic	Prob.
C(1)	0.06	0.02	3.01	0.00
C(2)	0.48	0.09	5.60	0.00

R-squared	0.97	Mean dependent var	3.18
Durbin-Watson stat	0.27	Prob(F-statistic)	0.00

Inflation: HP-LWI

	Coefficient	Std. Error	T-Statistic	Prob.
C(1)	0.05	0.01	3.44	0.00
C(2)	0.47	0.08	5.84	0.00

R-squared	0.98	Mean dependent var	3.80
Durbin-Watson stat	0.18	Prob(F-statistic)	0.00

Variables:
CPIS = CPI inflation, seasonally adjusted
LWI = wage index inflation

D. The Long-Run Tradeoff Between Inflation and Real Activity

108. The analysis in previous sections was based on the reduced-form relation of equation (1) which imposed long-run neutrality. However, evidence of a long-run trade-off between high inflation and growth has been found in cross-country studies. For example, Sarel (1996)[62] reported that when inflation was high (above about 8 percent), there was a strong and statistically significant negative correlation between inflation and growth. At low inflation levels, on the other hand, inflation appeared to have no effect, or it may have a small positive effect, on real growth. Others have reported that the welfare costs in terms of lost output of even low inflation (2–3 percent) can be high mainly due to tax distortions.[63] On the other hand, Fischer (1994)[64] and Akerlof et.al.(1996)[65] have argued that some low inflation may be

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[62]See Michael Sarel (1996), "Nonlinear Effects of Inflation on Economic Growth," *Staff Papers*, International Monetary Fund, Vol. 43, No.1.

[63]See Martin Feldstein (1996), "The Costs and Benefits of Going from Low Inflation to Price Stability," NBER Working Paper 5469, and Karl-Heinz Tödter and Gerhard Ziebarth (1997), "Price Stability versus Low Inflation in Germany," Discussion Paper 3/97, Economic Research Group of the Deutsche Bundesbank and Feldstein (1996).

[64]See Stanley Fischer (1994), "Modern Central Banking," in F. Capie, C. Goodhart, S. Fischer

(continued...)

needed in order for the economy to operate efficiently in light of nominal rigidities, particularly for wages.

109. As for Switzerland, annual inflation averaged almost 4 percent during 1960–96, while real GDP growth averaged close to 3 percent. However, periods with below average inflation have been associated with below average real growth rates, while periods of above average inflation have also been associated with below average real growth rates. Sorting real GDP growth rates by inflation rates that are above or below (by one standard deviation) the average annual inflation rate for 1960–96 (see tabulation), yields a suggestive pattern. Periods of relatively high inflation experienced below average growth rates, while periods of relatively low inflation also recorded below average growth rates. This calculation can only be regarded as illustrative for several reasons including inter alia that the direction of causation was not specified. In this section, formal tests for a long-run vertical Phillips' curve are carried out.

CPI Inflation and Real GDP Growth, 1960–96

Average Inflation Rates 1/	Average Real GDP Growth Rate
Periods when inflation was:	Average real growth was:
Less than 1.5 percent	1.7 percent
Between 1.5 percent and 5.9 percent	2.9 percent
More than 5.9 percent	1.2 percent

1/ Mean inflation was 3.7 percent with a standard deviation of 2.2 percentage points.

110. The testing procedure utilized is based on a procedure developed by Pesaran et. al.[66] and Pesaran and Pesaran (1996).[67] In contrast to the test procedure for long-run relations proposed by King and Watson (1992),[68] this estimation strategy can be applied when variables

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[64](...continued)
and N. Schnadt (eds), *The Future of Central Banking,* Cambridge University Press.

[65]See George A. Akerlof, William T. Dickens and George L. Perry (1996), "The Macroeconomics of Low Inflation," *Brookings Papers on Economic Activity*, vol. 1, 1996.

[66]See Hashem Pesaran, Yongcheol Shin, and Richard J. Smith (1996), "Testing for the Existence of A Long-Run Relationship," unpublished manuscript.

[67]Hashem Pesaran and Bahram Pesaran (1997), "Microfit 4.0," Camfit Data Limited, England.

[68]Robert King and Mark W. Watson (1992), "Testing Long Run Neutrality," National Bureau
(continued...)

are integrated of order zero or one. The first step in the procedure is to test for the existence of a long-term relation between inflation and real activity. If there is evidence for such a relation, then the coefficients of the long-run relation are estimated using an error correction model.

111. The test for a long-run relationship employs a standard F-statistic for testing the significance of the lagged levels of the variables in a first-difference regression, Specifically, the following error correction relation is estimated:

$$\Delta\pi_t = \delta_0 + \sum_{i=0}^{p} \beta_i \Delta\pi_{t-i} + \sum_{i=0}^{q} \eta_i \Delta x_{t-i} + \delta_1 \pi_{t-1} + \delta_2 x_{t-1} \qquad (21)$$

Here, the β_i and η_i coefficients capture the short-run effects, and the δ_1 and δ_2 coefficients are used to test the long-run relation between π_t and x_t —because, if $\delta_1 \neq 0$ and $\delta_2 \neq 0$, then there exists a long-run relation between the *levels* of π_t and x_t. The parameters p and q allow lags to vary. The test in (14) is undertaken under the assumption that the variable π is the "long-run forcing variable," explaining x. Replacing $\Delta\pi_t$ on the left hand side of equation (14) by Δx_t allows for a test of the existence of a long term relation when the forcing variable is x.

112. This statistical test:

$$H_0 : \delta_1 = \delta_2 = 0 \qquad (22)$$

is equivalent to testing the hypothesis: "there is no long term relation between π_t and x_t" (when the variable π is the "long-run forcing variable" for the explanation of x).

113. The alternative hypothesis is:

$$H_1 : \delta_1 \neq 0, \ \delta_2 \neq 0 \qquad (23)$$

The relevant test statistic is an F-statistic for the *joint* significance of δ_1 and δ_2. If the computed F-statistic exceeds the confidence bounds provided in Pesaran and Pesaran (1997), then the null hypothesis is rejected regardless of the order of integration.

114. The results of tests for a long-run relationship between real activity and inflation are given in Table III-5. The measure of inflation is HP-filtered seasonally adjusted CPI (HP-CPIS). Three different lag specifications of the model in (14) were employed (p=q=3, p=q=4, and p=q=5). Alternate tests were carried out using inflation and the measure of real activity as the forcing variables for each of the lag specifications. The F-statistics of each test are

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[68](...continued)
of Economic Research Working Paper 4156, September 1992.

presented in the third column of Table III-5. These F-statistics are compared with the confidence bands at the bottom of this Table. It is found that, in four of the specifications tested, the null of "no long-run relation" is rejected at the 95 percent confidence level—insufficient evidence for the existence of a long-run relation between output and inflation. However, there may be a long-run relation between unemployment and inflation and between employment and inflation.

115. In the next step, these latter two relationships were estimated. First the relation between unemployment and inflation was estimated using inflation as the forcing variable (Table III-6a). For three different lag specifications, the equation was estimated according to the Schwarz Bayesian Criterion (SBC) and the Akaike Information Criterion (AIC) (see Pesaran and Pesaran (1997)).[69] The one with the highest goodness-of-fit (for the AB and AI criteria) were selected and reported in Table III-6a. The long-run coefficients were not statistically significant different from zero for any of the specifications. Furthermore, the error correction coefficient had the wrong sign and was not significant. This suggests that the long-run Phillips curve for Switzerland is vertical.

[69]The actual number of models estimated depends on the number of maximum lags allowed.

Table III-5. The Long Run Relation Between Inflation and Real Activity
Inflation measured by HP-PCPIS
Sample Period: 1970 (Q2) to 1993 (Q4)

Test of the Long Run Relation between Inflation and Real Activity

Measure of real activity	Forcing Variable	F-statistic
p=q=3		
Unemployment	Unemployment	0.45
	Inflation	6.00 **
Employment	Employment	6.32 **
	Inflation	2.50
Output	Output	2.38
	Inflation	3.99
p=q=4		
Unemployment	Unemployment	0.73
	Inflation	3.99
Employment	Employment	6.48 **
	Inflation	1.71
Output	Output	3.21
	Inflation	3.57
p=q=5		
Unemployment	Unemployment	0.90
	Inflation	6.60 **
Employment	Employment	4.23
	Inflation	2.39
Output	Output	2.74
	Inflation	4.75

* means rejection of the null at the 90% level.
** means rejection of the null at the 95% level.
*** means rejection of the null at the 99% level.
(The null hypothesis is the absence of a long-run relation. For the specification used, the confidence intervals are: 90% confidence band: 4.042 to 4.788, 95% confidence band: 4.934 to 5.764, 99% confidence band: 7.057 to 7.815).

Table III-6. Estimate of the Long Run Relation between Inflation and Real Activity

(a) Measure of Real Activity: Unemployment. Forcing Variable: Inflation

Max. Lags	Long-Run Coefficient		Error-Correction Coefficient		R^2 of Error-correction equation	
	SBC	AIC	SBC	AIC	SBC	AIC
3	-0.22 (-0.95)	-0.13 (-1.98)	0.15 (0.85)	0.04 (2.04)	0.82	0.83
4	-0.35 (-0.50)	-0.22 (-1.05)	0.08 (0.40)	0.02 (0.85)	0.83	0.84
5	-0.35 (-0.48)	-0.22 (-1.05)	0.01 (0.40)	0.02 (0.86)	0.83	0.84

(b) Measure of Real Activity: Employment. Forcing Variable: Employment

Max. Lags	Long-Run Coefficient		Error-Correction Coefficient		R^2 of Error-correction equation	
	SBC	AIC	SBC	AIC	SBC	AIC
3	0.67 (2.37)	0.67 (2.37)	-0.14 (-1.61)	-0.14 (-1.61)	0.96	0.96
4	0.37 (2.89)	0.42 (2.44)	-0.03 (-3.58)	-0.02 (-2.30)	0.96	0.97
5	0.38 (2.93)	0.43 (2.52)	-0.03 (-3.57)	-0.02 (-2.31)	0.96	0.97

(SBC = Schwarz Bayesian Criterion, AIC = Akaike Information Criterion)

116. The employment-inflation relationship was then estimated as above, using employment as the forcing variable (Table III-6b). In this case, the long- run coefficient was found to be significantly different from zero in all three lag specifications. Moreover, the error correction coefficient was properly signed (i.e., negative) and significant in two of the three estimations. The long-run coefficients ranged from 0.37 to 0.67 (Table III-7b), implying that a 1 percentage point increase in employment would be associated with a 0.37 to 0.67 percentage points increase in long-run inflation. Moreover, while employment affects inflation, inflation does not affect employment. These results support the conventional view that an economy operating at, or above, potential on a sustained basis will tend to higher long-run inflation. However, the absence of a long-run inflation impact on long-run employment is interpreted as a consistent with vertical long-run Phillips curve.

117. To check the robustness of these results to the choice of inflation data, the previous procedure was repeated using data on wage inflation (LWI). The results are presented in Table III-7. In three cases. the hypothesis of no long-run relation was rejected—inflation and output, and inflation and employment. Selected statistics for these two relations are presented in Table III-8a and Table III-8b, respectively. The conclusion is as above, namely, that the only long-run relation is between employment and inflation, with employment as the forcing variable. On the other hand, long-run inflation has no impact on long-run employment.

Table III-7. The Long Run Relation Between Inflation and Real Activity
Inflation measured by LWI
Sample Period: 1970 (Q2) to 1993 (Q4)

Test of the Long Run Relation between Inflation and Real Activity

Measure of real activity	Forcing Variable	F-statistic
p=q=3		
Unemployment	Unemployment	1.96
	Inflation	3.60
Employment	Employment	6.98 **
	Inflation	3.99
Output	Output	1.70
	Inflation	9.00 ***
p=q=4		
Unemployment	Unemployment	1.97
	Inflation	2.74
Employment	Employment	4.94 *
	Inflation	4.44
Output	Output	1.08
	Inflation	4.12
p=q=5		
Unemployment	Unemployment	0.38
	Inflation	2.51
Employment	Employment	3.75
	Inflation	1.81
Output	Output	1.01
	Inflation	2.92

* means rejection of the null at the 90% level.
** means rejection of the null at the 95% level.
*** means rejection of the null at the 99% level.
(The null hypothesis is the absence of a long-run relation. For the specification used, the confidence intervals are: 90% confidence band: 4.042 to 4.788, 95% confidence band: 4.934 to 5.764, 99% confidence band: 7.057 to 7.815).

Table III-8. Estimate of the Long-Run Relation between Inflation and Real Activity

(a) Measure of Real Activity: Output, Forcing Variable: Inflation

Max. Lags	Long-Run Coefficient		Error-Correction Coefficient		R^2 of Error-correction equation	
	SBC	AIC	SBC	AIC	SBC	AIC
3	-5.60 (-0.64)	-7.60 (-0.86)	-0.01 (-0.76)	-0.01 (-0.90)	0.33	0.36
4	-3.70 (-0.30)	-8.37 (-0.83)	-0.00 (-0.46)	-0.01 (-0.87)	0.30	0.35
5	-8.60 (-1.30)	-7.60 (-0.93)	-0.01 (-1.44)	-0.01 (-0.98)	0.50	0.55

(b) Measure of Real Activity: Employment, Forcing Variable: Employment

Max. Lags	Long-Run Coefficient		Error-Correction Coefficient		R^2 of Error-correction equation	
	SBC	AIC	SBC	AIC	SBC	AIC
3	0.76 (8.21)	0.76 (7.03)	-0.57 (-6.27)	-0.48 (-4.79)	0.31	0.34
4	0.90 (4.11)	0.90 (4.11)	-0.25 (-2.15)	-0.25 (-2.15)	0.46	0.46
5	0.54 (2.08)	0.54 (2.08)	-0.21 (-1.97)	-0.21 (-1.97)	0.59	0.59

(SBC = Schwarz Bayesian Criterion, AIC = Akaike Information Criterion)

SHORT-RUN TRADEOFF ESTIMATES BASED ON EMPLOYMENT

118. Given the measurement issues associated with the unemployment rate in Switzerland, the model was re-estimated using employment data.[70] Employment was utilized because it is traditionally inversely related to the unemployment rate and hence is a natural analog to the standard Phillips curve. Employment has also been showed to be strongly correlated with output (see Wolter and Curti (1996) [71]). Furthermore, employment is an observable variable (unlike the output gap). A non-linear relation between inflation and employment was estimated, along with the expectation model in equations (14) and (15):

$$\pi_t - \pi_t^a = \gamma \frac{E - E_t^*}{E - \Phi_t} \qquad (24)$$

119. There is no need to allow for a regime change in this equation because, unlike for the unemployment series, there is no break in the employment series. Therefore the TSP Kalman filter routine can be used for the model estimation. The results are presented in Table III-A1. The estimate for δ ranged from 0.01 to 0.08, which is substantially lower than the estimates obtained with the expectations model in equations (2) and (3) (see Table III-1). This illustrates that the estimate of δ is sensitive to the activity measure and expectation model. These equations indicate that given the employment situation at end 1996, increasing employment to its natural rate would add minimally to inflation (0.1 percentage points).

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[70] For estimation purposes, the employment index computed by the Swiss Institute for Business Cycle Research was utilized.

[71] Wolter, Stefan C., and Monica Curti (1996), "Wachstum ohne Beschäftigung?" Die Volkswirtschaft - Magazin für Wirtschaftspolitik, 8/96.

Table III-A1. Non-Linear Relation between Inflation and Employment ($\Phi_t = 0$)

Table III-A1(a). Sample Period: 1975 (Q1) to 1993 (Q4)

π	γ	δ	log *l*	SSR	$E^*_{1993:4}$
HP-CPIS	4.34 (33.40)	0.07 (28.70)	-51.90	17.40	99.40
HP-WSSE	4.73 (69.20)	0.08 (58.30)	-40.20	12.80	96.80
HP-WR	1.34 (16.40)	0.01 (3.33)	-42.40	13.50	106.60
HP-CPI	2.17 (12.90)	0.02 (7.72)	-56.60	19.70	102.00
HP-LWI	3.30 (21.10)	0.07 (23.46)	-53.00	17.90	97.70

Table III-A1(b). Sample Period: 1975 (Q1) to 1996 (Q4)

π	γ	δ	log *l*	SSR	$U^*_{1996:4}$
HP-LWI	2.02 (10.91)	0.06 (15.30)	-52.60	15.20	95.80
filtered CPIS	2.95 (35.70)	0.06 (35.60)	-55.00	17.90	98.60

CPIS = CPI inflation, seasonally adjusted (Source: swiss.bnk)
WSSE = compensation rate inflation (Source: ADB)
WR = wage rate inflation (Source: ADB)
CPI = CPI inflation, not seasonally adjusted (Source: swiss.bnk)
LWI = wage index inflation (Source: swiss.bnk)

(t-statistics in parenthesis)

Table A1. Switzerland: Real GDP Developments

(Percentage changes at 1990 prices) 1/

	1993	1994	1995	1996	1996				1997		
					1st qtr.	2nd qtr.	3rd qtr.	4th qtr.	1st qtr.	2nd qtr.	3rd qtr.
Private consumption	-0.9	0.9	0.9	0.7	0.8	0.7	0.4	0.8	-0.2	1.3	1.2
Public consumption	-0.1	2.0	-0.8	0.7	-0.3	1.4	0.8	1.0	-0.5	-0.4	-0.4
Gross fixed investment	-2.7	6.5	1.9	-2.7	-1.0	-3.4	-3.8	-2.1	-2.8	-1.6	-0.1
Construction	-1.0	7.0	-3.8	-6.2	1.6	-5.8	-9.4	-7.7	-5.9	-5.6	-5.1
Machinery and equipment	-5.0	5.8	10.1	1.7	-3.2	-0.2	5.0	4.4	0.1	3.6	6.5
Final domestic demand	-1.2	2.5	0.9	-0.2	0.3	-0.3	-0.7	0.1	-0.8	0.2	0.6
Inventory accumulation 2/	0.2	-0.0	1.3	-0.1	-1.6	-2.3	0.7	-2.4	0.1	0.4	-1.0
Total domestic demand	-1.0	2.5	2.3	-0.2	0.5	-0.6	0.2	-1.1	-0.4	0.3	0.5
Exports of goods and nonfactor services	1.5	2.1	1.3	2.5	3.2	2.4	2.0	2.3	-0.2	8.3	10.2
Imports of goods and nonfactor services	0.1	7.9	5.4	2.4	4.1	0.7	3.5	1.4	0.6	8.2	9.4
Foreign balance 2/	0.5	-1.9	-1.5	0.0	2.8	2.2	-0.4	1.4	-0.0	-0.7	0.9
GDP	-0.5	0.5	0.8	-0.2	0.2	0.0	-0.4	-0.7	-0.7	0.2	0.8

Source: Swiss Institute for Business Cycle Research, data tape.

1/ For quarterly data, growth rates are with respect to the same quarter of the previous year.

2/ Contribution to growth of GDP.

Table A2. Switzerland: Components of Nominal GDP

(In millions of Swiss francs, at current prices)

	1993	1994	1995	1996
Private consumption	206,800	211,000	217,000	221,200
Public consumption	53,500	54,800	54,800	55,300
Gross fixed investment	75,500	78,700	77,700	72,400
Construction	42,500	45,400	43,800	39,100
Machinery and equipment	33,000	33,300	33,900	33,300
Final domestic demand	329,730	339,040	345,825	347,245
Inventory accumulation	-3,100	-3,600	800	100
Total domestic demand	332,700	340,900	350,300	349,000
Exports of goods and nonfactor services	125,300	127,400	127,500	131,100
Imports of goods and nonfactor services	108,100	111,100	113,200	116,400
Foreign balance	17,200	16,300	14,300	14,700
GDP	349,900	357,200	364,600	363,700

Source: Swiss Institute for Business Cycle Research, data tape.

Table A3. Switzerland: Components of Real GDP

(In millions of Swiss francs, at constant 1990 prices)

	1993	1994	1995	1996
Private consumption	181,114	182,718	184,424	185,723
Public consumption	48,370	49,355	48,944	49,290
Gross fixed investment	75,797	80,738	82,306	80,093
Construction	44,325	47,432	45,641	42,823
Machinery and equipment	31,472	33,306	36,665	37,270
Final domestic demand	305,281	312,811	315,674	315,106
Stockbuilding	-3,304	-3,361	860	649
Total domestic demand	301,977	309,450	316,534	315,755
Exports of goods and nonfactor services	117,765	120,194	121,811	124,846
Imports of goods and nonfactor services	106,890	115,346	121,603	124,530
Foreign balance	-3,415	-8,708	-12,635	-11,905
GDP	312,852	314,298	316,742	316,071

Source: Swiss Institute for Business Cycle Research, data tape.

Table A4. Switzerland: Implicit Price Deflators

(Percent changes)

	1993	1994	1995	1996
Gross domestic product	2.7	1.6	1.3	-0.0
Total domestic demand	1.8	-0.0	0.5	-0.1
Private consumption	3.4	1.1	1.9	1.2
Public consumpion	0.3	0.4	0.8	0.2
Gross fixed investment	-1.3	-2.1	-3.2	-4.2
Construction	-2.9	-0.2	0.3	-4.9
Machinery and equipment	1.0	-4.6	-7.5	-3.4
Exports of goods and nonfactor services	1.1	-0.4	-1.3	0.3
Imports of goods and nonfactor services	-2.0	-4.8	-3.4	0.4
Memoranda items:				
Final domestic demand	1.8	0.1	0.5	0.0
Total demand	1.2	-0.6	0.2	0.2

Source: Swiss Institute for Business Cycle Research, data tape.

Table A5. Switzerland: Household Disposable Income and Savings

(Percent change, unless otherwise indicated)

	1993	1994	1995	1996
National income	2.9	1.6	3.2	-0.5
Income from property and entrepreneurship	8.9	3.0	5.4	-6.1
Gross income from dependent employment	0.9	1.0	2.4	1.5
Personal income from property and entrepreneurship	8.6	0.1	-0.0	-3.2
Transfers to households	9.4	2.9	2.7	2.0
Taxes and transfers paid	5.4	3.9	2.1	3.3
Direct taxes	0.4	7.6	-2.6	2.4
Social security contributions	8.0	2.2	4.1	3.2
Transfers to government	5.0	7.2	2.8	-0.5
Transfers abroad	-1.1	0.4	2.6	-0.5
Household disposable income	3.3	0.0	2.5	0.2
Saving	11.3	-16.3	-0.9	-18.1
Saving ratio (in percent)	10.8	9.1	8.8	7.2
Private consumption, nominal	2.4	2.0	2.8	1.9
Private consumption deflator	3.4	1.1	1.9	1.2
Private consumption, real	-0.9	0.9	0.9	0.7

Source: Swiss Institute for Business Cycle Research, data tape.

Table A6. Switzerland: Labor Market

(In millions)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Population	6.62	6.67	6.72	6.80	6.87	6.94	6.99	7.04	7.08	7.12	...
Labor force	3.54	3.63	3.72	3.84	3.91	3.90	3.95	3.96	3.96	3.97	...
Employment	3.52	3.61	3.70	3.82	3.87	3.80	3.78	3.79	3.80	3.80	...
Unemployment	0.02	0.02	0.02	0.02	0.04	0.09	0.16	0.17	0.15	0.17	0.19
Unemployment rate (In percent)	0.7	0.6	0.5	0.5	1.1	2.5	4.5	4.7	4.2	4.7	5.2
Standardized unemployment rate 1/	...	...	...	...	1.8	2.8	3.8	3.7	3.2	3.5	...

Source: Swiss Institute for Business Cycle Research, data tape; Federal Statistical Office.

1/ Survey-based. Schweizerische Arbeitskraefte-Erhebung (SAKE).

Table A7. Switzerland: Prices, Wages, and Productivity

(Percentage changes) 1/

	1994	1995	1996	1996		1997		
				3rd qtr.	4th qtr.	1st qtr.	2nd qtr.	3rd qtr.
Wholesale price index	-0.3	0.0	-2.4	-2.9	-2.4	-1.3	-0.1	0.9
Raw materials prices	5.5	10.1	3.3	6.6	11.8	6.8	0.3	-3.8
Consumer price index	0.9	1.8	0.8	0.6	0.8	0.7	0.5	0.5
Goods	0.2	0.3	0.2	-0.0	0.8	0.7	0.3	0.7
Services	1.4	3.0	1.3	1.1	0.8	0.7	0.7	0.3
Gross wage income per employed person	1.2	2.2	1.4	...	...	...	...	...
Hourly wages 2/	4.9	2.9	1.4	...	...	...	...	...
Real hourly wages 2/ 3/	1.0	-0.3	0.5	...	...	...	...	...
Real GDP per employed person	0.4	0.3	-0.2	-0.6	-1.0	...	...	...
Unit labor cost, economy-wide	0.6	1.6	1.7	...	...	...	...	...
Export prices 4/	-2.1	-3.7	-0.0	0.3	1.6	3.6	4.9	2.9
Import prices 4/	-5.8	-4.2	1.0	-1.0	0.9	3.8	5.5	5.1

Sources: Swiss Institute for Business Cycle Research, data tape; IMF, World Economic Outlook database.

1/ For quarterly data, growth rates are with respect to the same quarter of the previous year.

2/ Gross wages per employee, economy-wide.

3/ Deflated by consumer price index.

4/ Deflators for goods.

Table A8. Switzerland: Federal Government Finances

(In billions of Swiss francs)

	1993	1994	1995	1996	1997 Budget	1998 Budget
Expenditure 1/	40.6	41.3	40.6	43.8	44.2	47.6
(In percent of GDP)	(11.8)	(11.7)	(11.1)	(12.0)	(12.0)	(12.5)
Current expenditure	34.0	35.9	36.3	38.8	38.3	40.5
(In percent of GDP)	(9.9)	(10.2)	(10.0)	(10.7)	(10.4)	(10.6)
Personnel	4.8	5.0	4.9	4.9	4.7	4.8
Goods 2/	5.3	5.4	5.4	5.4	5.2	5.1
Interest	2.5	3.1	3.1	2.9	3.3	3.4
Transfers	21.4	22.4	22.9	25.5	25.1	27.1
Cantons Municipalities	6.1	8.1	8.2	8.7	9.2	9.4
Social security and other	15.3	14.4	14.7	16.8	15.9	17.8
Capital expenditure 3/	6.6	5.5	4.3	5.0	6.0	7.1
Revenue	31.4	34.6	36.2	38.5	38.5	40.0
(In percent of GDP)	(9.2)	(9.8)	(9.9)	(10.6)	(10.4)	(10.5)
Taxes	28.6	31.4	32.1	35.1	34.6	36.1
Other	2.8	3.2	4.0	3.4	3.9	3.9
Fiscal balance (cash basis)	-9.2	-6.7	-4.5	-5.4	-5.8	-7.6
(In percent of GDP)	(-2.7)	(-1.9)	(-1.2)	(-1.5)	(-1.6)	(-2.0)
Railway loans	0.5	0.6	1.0	1.0	0.0	0.0
Fiscal balance (adjusted)	-9.4	-7.4	-5.5	-6.4	-5.8	-7.6
(In percent of GDP)	(-2.7)	(-2.1)	(-1.5)	(-1.7)	(-1.6)	(-2.0)
Memorandum item:						
Defense expenditure	5.8	5.9	5.9	5.9	5.5	5.4
(In percent of GDP)	(1.7)	(1.7)	(1.6)	(1.5)	(1.5)	(1.4)

Source: Federal Ministry of Finance.

1/ Up to 1996 excluding railway loans.
2/ Includes military procurement.
3/ Includes loans to unemployment insurance fund.

Table A9. Switzerland: Federal Government Tax Revenue

(In billions of Swiss francs)

	1992	1993	1994	1995	1996	1997 Budget	1998 Budget
Direct federal tax	8.3	7.9	9.0	8.2	8.9	9.4	8.9
Withholding tax	4.0	1.9	3.5	2.1	3.3	3.0	3.6
Stamp duties	2.0	2.2	2.0	1.7	2.0	1.9	2.4
Turnover tax/VAT 1/	9.8	9.4	9.4	12.4	12.1	12.5	13.2
Fuel taxes	3.3	4.0	4.3	4.3	4.4	4.2	4.5
Other	3.1	3.3	3.3	3.4	3.5	3.6	3.5
Total	30.4	28.6	31.4	32.1	34.2	34.6	36.1
(In percent of GDP)	(9.0)	(8.3)	(8.9)	(8.9)	(9.4)	(9.1)	(9.5)

Source: Federal Ministry of Finance.

1/ VAT was introduced at the beginning of 1995.

Table A10. Switzerland: Federal Government Assets and Liabilities

(End-of-period; in billions of Swiss francs)

	1991	1992	1993	1994	1995	1996
Assets	50.9	60.8	74.8	83.4	94.8	98.0
Financial assets	14.5	19.7	25.0	26.5	33.0	30.3
Administrative and other	15.8	16.5	19.0	20.3	20.2	20.5
Balancing item 1/	20.6	24.6	30.9	36.6	41.6	47.2
Liabilities	50.9	60.8	74.8	83.4	94.8	98.0
Gross financial debt	45.8	55.6	69.8	78.3	89.2	91.7
(In percent of GDP)	(13.8)	(16.4)	(20.3)	(22.3)	(24.6)	(25.2)
Current payables	3.7	3.8	5.1	6.9	4.9	3.2
Short-term debt	9.2	13.5	17.6	19.3	22.6	26.9
Medium- and long-term debt	14.4	18.3	26.1	29.8	32.0	34.8
Other 2/	18.6	20.0	20.9	22.4	29.7	26.8
Valuation adjustments	3.0	3.3	3.6	3.8	4.0	4.5
Other	2.1	1.8	1.4	1.2	1.5	1.9
Memorandum item:						
Net financial debt 3/	31.3	36.0	44.9	51.8	56.3	61.4
(In percent of GDP)	(9.5)	(10.6)	(13.1)	(14.7)	(15.5)	(16.9)

Source: Federal Ministry of Finance.

1/ Amount by which liabilities exceed all other assets.
2/ Largely deposits of federal pension fund (EVK) with the federal government.
3/ Difference between gross financial debt and financial assets.

Table A11. Switzerland: General Government Finances

	1990	1991	1992	1993	1994	1995	1996	1997 Budget	1998 Budget
				(In billions of Swiss francs)					
Federal government 1/									
Revenue	30.8	31.5	32.8	31.4	34.6	36.1	38.5	39.0	40.0
Expenditure	31.6	35.5	37.8	40.6	41.3	40.5	43.8	44.7	47.6
Balance	-0.8	-4.0	-5.0	-9.2	-6.7	-4.5	-5.4	-5.8	-7.6
Cantons									
Revenue	39.3	41.8	44.2	47.0	48.8	50.1	52.9	53.9	54.4
Expenditure	41.1	45.6	48.3	52.4	52.5	52.1	55.1	57.0	58.6
Balance	-1.9	-3.8	-4.2	-5.4	-3.7	-2.0	-2.0	-3.1	-4.2
Communes									
Revenue	29.4	31.1	33.3	35.9	37.0	37.6	39.0	39.2	39.8
Expenditure	30.2	33.2	36.0	37.1	37.9	38.4	39.0	39.7	40.4
Balance	-0.8	-2.2	-2.6	-1.2	-0.9	-0.8	0.0	-0.5	-0.6
Territorial authorities									
Revenue	83.2	86.3	91.1	94.5	100.2	103.5	106.9	106.8	108.7
Expenditure	96.6	96.3	103.0	110.2	111.5	110.7	114.5	116.2	121.1
Balance	-3.5	-10.0	-11.8	-15.8	-11.3	-7.2	-7.5	-9.4	-12.4
Social security									
Revenue	29.7	32.2	33.8	38.1	38.8	40.9	40.9	41.3	42.0
Expenditure	26.4	29.3	33.8	35.0	37.4	40.2	39.7	41.8	42.3
Balance	3.3	2.9	0.0	3.1	1.4	0.7	1.2	-0.5	-0.3
General government									
Revenue	105.0	109.9	115.7	122.3	127.8	132.7	135.6	135.8	137.5
Expenditure	105.1	117.0	127.5	135.0	137.7	139.2	142.0	145.6	150.2
Balance	-0.1	-7.1	-11.8	-12.7	-9.9	-6.4	-6.3	-9.8	-12.7
Gross debt									
Federal government	38.5	43.9	55.3	66.0	73.3	79.9	86.0	90.2	97.8
Cantons	30.5	35.0	40.8	47.0	51.6	53.4	56.0	59.0	63.2
Communes	29.0	31.0	33.8	35.0	36.0	37.0	37.0	37.5	38.1
General government debt (gross)	98.0	109.9	129.8	147.9	160.9	170.4	179.0	186.7	199.1
				(In percent of GDP)					
Federal government 1/									
Revenue	9.8	9.5	9.7	9.2	9.8	10.0	10.6	10.6	10.6
Expenditure	10.1	10.7	11.2	11.8	11.7	11.2	12.1	12.1	12.7
Balance	-0.2	-1.2	-1.5	-2.7	-1.9	-1.2	-1.5	-1.6	-2.0

Table A11 (concluded). Switzerland: General Government Finances

	1990	1991	1992	1993	1994	1995	1996	1997 Budget	1998 Budget
Cantons									
Revenue	12.5	12.6	13.0	13.7	13.8	13.9	14.5	14.7	14.5
Expenditure	13.1	13.8	14.3	15.3	14.9	14.4	15.1	15.6	15.6
Balance	-0.6	-1.1	-1.2	-1.6	-1.1	-0.5	-0.6	-0.8	-1.1
Communes									
Revenue	9.4	9.4	9.8	10.5	10.5	10.3	10.7	10.7	10.6
Expenditure	9.6	10.0	10.6	10.8	10.7	10.5	10.7	10.8	10.8
Balance	-0.3	-0.6	-0.8	-0.3	-0.3	-0.2	0.0	-0.1	-0.2
Territorial authorities									
Revenue	26.5	26.1	26.9	27.6	28.4	28.4	29.4	29.1	28.9
Expenditure	27.6	29.1	30.4	32.2	31.6	30.4	31.5	31.7	32.2
Balance	-1.1	-3.0	-3.5	-4.6	-3.2	-2.0	-2.1	-2.6	-3.3
Social security									
Revenue	9.5	9.7	10.0	11.1	11.0	11.2	11.2	11.3	11.2
Expenditure	8.4	8.9	10.0	10.2	10.6	11.0	10.9	11.4	11.2
Balance	1.1	0.9	0.0	0.9	0.4	0.2	0.3	-0.1	-0.1
General government									
Revenue	33.4	33.2	34.1	35.7	36.2	36.4	37.3	37.0	36.6
Expenditure	33.5	35.3	37.6	39.4	39.0	38.2	39.0	37.0	40.0
Balance	-0.0	-2.1	-3.5	-3.7	-2.8	-1.8	-1.7	-2.7	-3.4
Debt									
Federal government	12.3	13.3	16.3	19.2	20.8	22.1	23.7	24.6	26.0
Cantons	9.7	10.6	12.0	13.7	14.6	14.8	15.5	16.1	16.8
Communes	9.2	9.4	10.0	10.2	10.2	10.2	10.2	10.2	10.1
General government debt (gross)	31.2	33.2	38.3	43.2	45.6	47.0	49.2	50.9	53.0
Memorandum items:									
General government interest payments	1.5	1.6	1.9	2.0	2.2	2.1	2.3	2.3	2.3
Pension fund surplus	0.6	0.6	0.6	0.4	0.5	0.3	0.3	0.3	...
Railway loans	0.4	0.3	0.2	0.0	0.2	0.3	0.3	0.3	...
Defense expenditure	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5

Source: Federal Ministry of Finance.
1/ Excluding cash surplus of the civil servant pension fund from 1997 onwards including railway loans.

Table A12. Switzerland: Interest Rates and Equity Prices

	3-month Euromarket rates		Return on federal bonds	Stock market index
	Sw F	DM		
1991	8.12	9.15	6.24	732.39
1992	7.78	9.38	6.40	841.92
1993	4.82	7.16	4.55	1,054.97
1994	4.04	5.23	4.96	1,266.05
1995	2.95	4.38	4.52	1,340.42
1996	1.92	3.18	4.00	1,736.68
1994				
I	3.99	5.76	4.31	1,359.65
II	4.06	5.15	4.91	1,275.10
III	4.14	4.87	5.30	1,219.38
IV	4.00	5.14	5.32	1,210.09
1995				
I	3.78	4.95	5.18	1,215.59
II	3.25	4.45	4.72	1,282.80
III	2.75	4.26	4.41	1,379.76
IV	2.02	3.88	3.78	1,483.51
1996				
I	1.63	3.31	4.08	1,631.40
II	2.07	3.21	4.19	1,758.17
III	2.18	3.14	4.02	1,728.46
IV	1.80	3.07	3.70	1,828.68
1997				
I	1.69	3.07	3.50	2,144.66
II	1.51	3.07	3.29	2,426.51
III	1.37	3.14	3.33	2,624.16
1996				
Jan.	1.64	3.46	4.12	1,537.58
Feb.	1.60	3.21	4.07	1,601.28
Mar.	1.66	3.25	4.04	1,755.33
Apr.	1.70	3.19	3.94	1,762.36
May	2.00	3.16	4.33	1,724.74
June	2.51	3.27	4.31	1,787.42
July	2.52	3.26	4.20	1,661.96
Aug.	2.21	3.17	4.05	1,743.86
Sep.	1.80	3.00	3.81	1,779.56
Oct.	1.55	3.01	3.71	1,771.36
Nov.	1.85	3.08	3.75	1,840.84
Dec.	2.00	3.11	3.63	1,873.85
1997				
Jan.	1.70	3.01	3.69	2,077.64
Feb.	1.61	3.05	3.25	2,139.34
Mar.	1.78	3.15	3.56	2,217.01
Apr.	1.77	3.12	3.43	2,316.78
May	1.53	3.06	3.26	2,342.95
June	1.23	3.02	3.18	2,619.79
July	1.42	3.03	3.24	2,754.88
Aug.	1.38	3.17	3.35	2,484.53
Sep.	1.32	3.20	3.39	2,633.06
Oct.	1.73	3.48	3.44	2,515.66
Nov.	1.92	3.65	3.39	2,615.42
Dec.	1.72	3.75	3.35	2,935.76

Source: Swiss Institute for Business Cycle Research, data tape.

Table A13. Switzerland: Monetary Aggregates

(Percentage changes over a year earlier)

	1991	1992	1993	1994	1995	1996	1997 October
Banknotes	2.2	0.1	1.5	1.9	0.7	2.4	2.8
Sight deposits with SNB	-6.2	-9.9	3.9	1.0	-4.0	14.1	14.0
Monetary base	1.3	-0.9	1.7	1.8	0.3	3.4	4.0
Sight deposits	0.5	-0.3	13.2	7.9	6.3	15.6	12.3
M1	1.9	2.0	10.5	5.6	6.8	11.7	9.3
Saving deposits	1.4	3.6	21.5	14.2	3.4	12.1	3.0
M2	1.7	2.8	16.1	10.2	4.9	11.9	5.8
Time deposits	4.4	0.9	-17.5	-7.5	-5.8	-9.6	-3.1
M3	2.7	2.1	3.9	5.1	2.2	6.9	4.1
Domestic credit	3.9	2.4	3.6	3.5	2.8	-0.2	0.8
Public sector	8.6	6.6	27.5	3.9	1.5	3.8	2.9
Private sector	3.6	2.2	1.8	3.5	2.9	-0.6	0.6

Sources: Swiss Institute for Business Cycle Research, data tape; IMF, International Financial Statistics database.

Table A14. Switzerland: Exchange Rate Developments

	Sw F/$	DM/Sw F	FF/Sw F	Sw F/£	Nominal Effective Exchange Rate 1/	Real Effective Exchange Rate 2/
1990	1.3892	1.1648	3.9248	0.7860	100.0	100.0
1991	1.4340	1.1577	3.9360	0.8158	98.5	99.5
1992	1.4062	1.1112	3.7671	0.8022	96.6	97.8
1993	1.4776	1.1189	3.8332	0.9857	99.8	100.1
1994	1.3677	1.1867	4.0609	0.8948	106.3	104.7
1995	1.1825	1.2125	4.2237	0.7493	113.3	111.5
1996	1.2360	1.2183	4.1422	0.7915	111.6	108.4
1997	1.4513	1.1949	4.0219	0.8866	105.1	...
1994						
I	1.4534	1.1864	4.0335	0.9772	104.8	103.7
II	1.4089	1.1795	4.0369	0.9375	104.8	103.3
III	1.3120	1.1907	4.0807	0.8463	107.6	105.9
IV	1.2965	1.1904	4.0924	0.8183	107.9	105.8
1995						
I	1.2431	1.1910	4.1606	0.7860	110.4	108.8
II	1.1549	1.2090	4.2582	0.7232	113.9	112.1
III	1.1809	1.2127	4.1907	0.7506	113.0	111.2
IV	1.1506	1.2375	4.2853	0.7374	116.1	113.8
1996						
I	1.1903	1.2338	4.2303	0.7774	114.4	111.7
II	1.2429	1.2249	4.1506	0.8155	111.8	108.6
III	1.2230	1.2248	4.1655	0.7869	112.2	109.0
IV	1.2870	1.1896	4.0225	0.7861	107.8	104.4
1997						
I	1.4356	1.1553	3.8986	0.8811	102.8	98.9
II	1.4462	1.1852	3.9958	0.8844	104.7	100.1
III	1.4899	1.2137	4.0861	0.9175	105.4	100.0
IV	1.4326	1.2254	4.1072	0.8633	107.5	...
1996						
Jan.	1.1796	1.2391	4.2436	0.7709	115.1	112.7
Feb.	1.1953	1.2265	4.2169	0.7782	113.9	111.2
Mar.	1.1959	1.2356	4.2303	0.7831	114.3	111.2
Apr.	1.2175	1.2370	4.1938	0.8035	113.4	110.2
May	1.2541	1.2226	4.1394	0.8281	111.4	108.1
June	1.2569	1.2151	4.1185	0.8150	110.7	107.6
July	1.2340	1.2196	4.1275	0.7943	111.6	108.4
Aug.	1.2032	1.2324	4.2054	0.7764	113.3	110.1
Sep.	1.2317	1.2226	4.1636	0.7899	111.8	108.5
Oct.	1.2586	1.2142	4.1051	0.7941	110.3	107.0
Nov.	1.2746	1.1860	4.0137	0.7666	107.7	104.3
Dec.	1.3276	1.1686	3.9486	0.7977	105.3	101.8
1997						
Jan.	1.3915	1.1530	3.8929	0.8384	102.9	99.3
Feb.	1.4521	1.1533	3.8941	0.8932	102.5	98.6
Mar.	1.4633	1.1596	3.9087	0.9116	103.0	98.8
Apr.	1.4620	1.1703	3.9416	0.8975	103.7	99.5
May	1.4343	1.1875	4.0041	0.8782	105.2	100.6
June	1.4423	1.1976	4.0416	0.8774	105.1	100.3
July	1.4817	1.2094	4.0789	0.8867	104.9	99.6
Aug.	1.5145	1.2165	4.0971	0.9447	105.3	99.8
Sep.	1.4734	1.2153	4.0823	0.9211	106.1	100.6
Oct.	1.4525	1.2094	4.0571	0.8905	106.0	100.6
Nov.	1.4074	1.2314	4.1269	0.8339	108.2	102.9
Dec.	1.4381	1.2354	4.1376	0.8656	108.3	...

Source: IMF, International Financial Statistics database.
1/ Against the 21 most important trading partners.
2/ Against the 10 most important trading partners and based on relative consumer prices.

Table A15. Switzerland: Balance of Payments

(In billions of Swiss francs)

	1992	1993	1994	1995	1996
Current account balance	21.3	28.8	23.9	25.3	26.4
Merchandise trade balance	-1.4	2.5	2.2	1.0	1.1
Exports	95.4	96.8	99.4	99.9	102.2
Imports	96.8	94.4	97.2	98.8	101.1
Non factor services balance	15.1	16.8	15.6	15.2	15.6
Exports	29.6	31.7	31.7	30.9	32.4
Of which: Tourism	11.5	11.3	11.3	11.4	11.1
Imports	14.5	14.9	14.9	15.3	16.9
Of which: Tourism	8.7	8.8	8.8	8.8	9.3
Factor services balance	11.7	13.5	10.7	13.9	14.3
Capital services balance	19.2	20.7	17.5	20.8	21.2
Capital income	35.6	35.6	35.1	35.8	37.9
Capital payments	16.4	14.9	17.6	15.0	16.7
Labor services balance	-7.5	-7.2	-6.9	-6.9	7.0
Labor income	1.3	1.4	1.5	1.5	1.4
Labor payments	8.8	8.5	8.3	8.3	8.4
Net unrequited transfers	-4.2	-4.1	-4.7	-4.8	-4.7
Capital account balance	-22.8	-30.5	-22.4	-17.7	-30.0
Foreign direct investment	-7.4	-13.1	-10.2	-11.8	-11.6
Abroad	8.0	13.0	14.8	14.4	14.3
Into Switzerland	0.6	-0.0	4.6	2.6	2.7
Portfolio investment	-8.6	-26.4	-24.8	-4.6	-8.6
Abroad	13.6	44.8	26.1	10.5	24.5
Into Switzerland	5.0	18.5	1.3	5.9	15.9
Banking sector	-8.7	14.1	14.8	-1.1	-17.5
Of which:					
Increase in credit claims	6.8	3.6	26.3	-11.2	-74.5
Increase in credit liabilities	-1.0	6.0	41.4	1.9	60.7
Net increase in fiduciary funds	0.8	14.7	-0.5	7.6	-3.0
Enterprises	0.1	1.0	-2.0	1.5	0.0
Increase in claims	4.3	0.8	11.9	1.2	-2.8
Increase in liabilities	4.4	0.2	9.8	0.3	2.8
Other private sector	2.1	-6.0	-0.1	-2.0	8.1
Other public sector	-0.2	-0.1	-0.1	0.2	0.0
Changes in national bank reserves (- = increase)	-6.9	-1.4	0.9	3.7	-7.8
Revaluation of national bank reserves (- = increase)	0.7	0.8	-2.3	-3.5	4.4
Errors and omissions	7.8	2.5	0.2	-7.6	7.2

Source: Swiss National Bank.

Table A16. Switzerland: Volumes and Values of Merchandise Trade 1/

	1991	1992	1993	1994	1995	1996
	(In billions of Swiss Francs unless otherwise indicated)					
Exports						
Volume (at 1990 prices)	0.1	0.1	0.1	0.1	0.1	0.1
Percent change	-3.1	4.0	1.4	3.4	2.6	2.0
Unit value index 2/	103.0	103.8	103.8	103.1	100.9	101.3
Percent change	3.0	0.8	0.0	-0.7	-2.1	0.4
Value	0.1	0.1	0.1	0.1	0.1	0.1
Percent change	-0.2	4.8	1.5	2.7	0.4	2.4
Imports						
Volume (at 1990 prices)	0.1	0.1	0.1	0.1	0.1	0.1
Percent change	-1.6	-4.9	-0.3	8.1	4.0	2.5
Unit value index 2/	100.0	102.3	100.1	95.3	93.2	93.0
Percent change	-0.1	2.3	-2.2	-4.8	-2.2	-0.2
Value	0.1	0.1	0.1	0.1	0.1	0.1
Percent change	-1.7	-2.7	-2.5	3.0	1.6	2.3
Terms of trade index 3/	103.0	101.4	103.7	108.1	108.3	108.9
Percent change	3.0	-1.5	2.2	4.3	0.1	0.6

Source: Swiss Institute for Business Cycle Research; data tape.

1/ On a national accounts basis.

2/ Value divided by volume.

3/ Export unit value divided by import unit value.

Table A17. Switzerland: Composition of Foreign Trade

(In billions of Swiss francs, current prices)

	1992	1993	1994	1995	1996
Exports, total	86.1	86.7	90.2	92.0	94.1
Agriculture	3.4	3.4	3.6	3.5	3.5
Energy	.1	.1	.1	.1	.1
Textiles	4.6	4.3	4.3	4.0	3.7
Paper	2.3	2.2	2.3	2.5	2.5
Leather, rubber, plastics	2.6	2.7	2.9	2.9	2.7
Chemicals	21.3	22.3	23.5	23.6	26.0
Minerals	.7	.7	.7	.7	.7
Metals	7.7	7.4	7.8	8.3	8.2
Machinery	25.4	24.8	26.1	27.3	28.0
Vehicles	2.1	1.8	1.7	1.9	2.4
Precision instruments, watches	14.5	15.3	15.5	14.9	14.7
Other	1.6	1.6	1.7	1.6	1.7
Imports, total	86.7	83.8	87.3	90.8	92.0
Agriculture	8.0	7.9	8.3	8.1	8.3
Energy	3.9	3.4	3.0	2.7	3.4
Textiles	8.8	8.5	8.4	7.9	7.8
Paper	3.8	3.7	3.9	4.2	4.0
Leather, rubber, plastics	3.5	3.4	3.6	3.6	3.5
Chemicals	11.5	11.9	12.5	13.0	13.5
Minerals	1.9	1.9	2.0	2.0	2.0
Metals	7.7	7.3	7.9	8.9	8.0
Machinery	18.2	18.0	19.0	20.5	20.8
Vehicles	9.9	8.4	9.2	10.6	11.2
Precision instruments, watches	5.8	5.9	5.8	5.6	5.8
Other	3.7	3.5	3.6	3.7	3.8
Exports, total	86.1	86.7	90.2	92.0	94.2
Raw materials and semi-finished products	25.7	25.0	26.5	27.0	26.7
Energy	.1	.1	.1	.1	.1
Equipment goods	31.1	30.1	31.3	33.3	34.1
Consumption goods	29.3	31.4	32.3	31.6	33.2
Imports, total	86.7	83.8	87.3	90.8	92.0
Raw materials and semi-finished products	26.8	25.7	27.4	28.7	27.1
Energy	3.9	3.4	3.0	2.7	3.4
Equipment goods	22.4	21.2	22.3	26.0	26.8
Consumption goods	33.6	33.4	34.5	33.4	34.7

Source: *Die Volkswirtschaft.*