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6 Israel's Stabilization: Some Important Policy Lessons

Gil Bufman and Leonardo Leiderman

6.1 Introduction

The Israeli stabilization program is considered a success: it resulted in a sharp and rapid reduction in the rate of inflation from over 400% per year in the mid-1980s to less than 20% per year thereafter. While the benefits from this heterodox program on the inflation front were visible from the beginning, some of the costs associated with stabilization appeared with a considerable lag. After a pronounced consumption boom and an economic activity boom at the start of the program, a recession emerged in early 1988, and no major transition from stabilization to growth was observed. Clearly, some of these developments could be explained by changing conditions that were not necessarily associated with the stabilization program per se. In order to determine which elements of the program could be applied to other countries, it is important to evaluate whether there could have been ways to improve the benefits and/or reduce the costs of the program.

Two important lessons from stabilization in Israel are quite uncontroversial.[1] First, an important role in the design and success of the heterodox program was played by a set of social-political agreements (a sort of social pact) that were reached at that time. This took the form of a national-unity coalition that was built by the main political parties, and broad agreements among representatives of labor, government, and industry, setting patterns for prices, wages,

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The views expressed in the paper are solely the responsibility of the authors.

1. Earlier work evaluating the Israeli stabilization program includes Bruno (1986); Bruno and Piterman (1988); Bruno and Meridor (1991); Helpman and Leiderman (1988); Kiguel and Liviatan (1989); Leiderman and Liviatan (1990); and Leiderman (1993).

and the exchange rate. Second, the stabilization effort was supported by external aid in the first two years of the program. Without this aid, more stringent (and probably less feasible) fiscal adjustments would have been required to achieve the same degree of disinflation that was observed ex post. Similarly, foreign aid provided support to the exchange rate targets that were chosen and helped avoid any balance-of-payments crises.

With the benefit of hindsight, this paper draws some lessons from two key aspects of Israel's disinflation; the transition (or lack thereof) from stabilization to growth, and exchange rate policy. Accumulated experience indicates that both these issues can play a key role in the success of a disinflation program. That is, major political and economic difficulties were encountered by stabilizations that were associated with a slowdown in economic activity and did not eventually produce a transition to growth. Similarly, there are several well-known episodes in which an exchange rate–based stabilization failed because of speculative attacks on foreign currencies—attacks that emerged in the face of lack of compatibility between exchange rate policy and the underlying fiscal and monetary fundamentals.

This paper is organized as follows. Section 6.2 provides an updated set of empirical regularities associated with the stabilization plan of 1985. Section 6.3 discusses issues related to the transition from stabilization to growth. Various aspects of exchange rate policy are discussed in section 6.4. Section 6.5 provides our main conclusions.

6.2 Results from Stabilization

In this section, we discuss the main empirical regularities after the 1985 stabilization program in Israel. We focus on periods immediately before and after stabilization; for the latter we consider 1986–88. Clearly, care is suggested in interpreting the evidence, as not all facts were associated with inflation stabilization per se, and other things were not equal. The main regularities are discussed here.

Rapid disinflation. A marked reduction in inflation was already observed in the first few months following the implementation of the program in mid-1985. From annual rates of inflation in the triple-digit range, the program quickly succeeded in bringing inflation down to about 16–20% per year in the period from 1986 to 1991. Only in 1992 were there strong forces to bring annual inflation to the single-digit range; see figure 6.1. Various price increase indicators are shown in table 6.1.

Real exchange rate appreciation. While the nominal exchange rate of the new Israeli shekel (NIS) was held fixed for long periods, domestic prices rose at a higher rate than foreign prices, resulting in a real exchange rate appreciation (table 6.1). The real exchange rate of the NIS against the U.S. dollar appreciated at the considerable rates of 16% in 1986, 7% in 1987, and 11% in 1988.

Table 6.1 The Exchange Rate and Relative Prices (rates of change)

	Nominal Exchange Rate (avg./avg.) (%)			Real Exchange Rate (avg./avg.) (%)			Terms of Trade (exports) (%)
	Currency Basket[a]	Dollar	Nondollar Basket	Currency Basket[b]	Dollar[c]	Nondollar Basket[c]	
1980	103.6	101.5	106.2	−2.6	−2.4	−7.8	—
1981	105.7	122.9	84.9	−0.4	8.1	−14.4	—
1982	103.0	112.4	89.5	−5.6	−2.9	−12.9	—
1983	124.4	131.7	112.4	−7.9	−5.4	−13.3	1.0
1984	399.7	421.4	361.3	4.0	7.1	−4.4	−1.7
1985	305.5	302.1	312.3	10.6	10.6	9.1	1.1
1986	37.2	26.2	58.8	−8.2	−15.5	9.7	4.1
1987	14.4	7.2	25.5	−2.1	−7.1	5.8	−3.1
1988	2.4	0.3	5.2	−9.0	−11.4	−9.9	5.2
1989	16.1	19.9	11.4	0.9	3.7	−8.1	−0.6
1990	10.9	5.3	18.6	1.0	−2.6	5.5	1.1

	Prices (%)					
	CPI (Dec./Dec.)	Wholesale (Dec./Dec.)	Tradable[d] (avg./avg.)	Nontradable	Price of Exports vs. Domestic Uses (%)	Services Price Index Compared to Wholesale Price Index
1980	132.9	138.1	—	—	—	—
1981	101.5	130.5	—	—	−2.7	—
1982	131.5	136.9	117.2	121.8	−5.0	—
1983	190.7	199.7	238.5	149.8	−3.0	100.0
1984	444.9	446.9	389.9	386.2	0.8	88.1
1985	185.2	152.8	285.0	246.3	1.5	95.5
1986	19.7	14.3	40.7	54.5	−11.6	119.3
1987	16.1	20.7	17.5	28.3	−4.3	135.0
1988	16.4	15.7	11.5	22.6	−3.3	141.1
1989	20.7	19.3	17.5	22.5	0.6	143.2
1990	17.6	12.6	—	—	−2.7	151.9

Sources: Bank of Israel Annual Report; Statistical Abstract of Israel.

[a]The five-currency basket was established in August 1986. For the period prior to August 1986 the basket exchange rate is computed using the weights of the currency basket.

[b]Using the effective rate in export.

[c]Using the official rate.

[d]Based on CPI prices (Ben-Basat 1992).

When expressed against a basket of foreign currencies, the real exchange rate appreciated at about 8% in 1986, 2% in 1987, and 9% in 1988. In August 1986, a trade-weighted currency basket was officially adopted for fixing the exchange rate, instead of the U.S. dollar. The composition of one currency basket unit is 0.6 U.S. dollar, 0.4177 deutsche mark, 0.067 pound, 0.3394 French franc, and 7.7 yen. The effective weights of the various currencies in the currency basket vary according to the cross-currency rates. Accordingly,

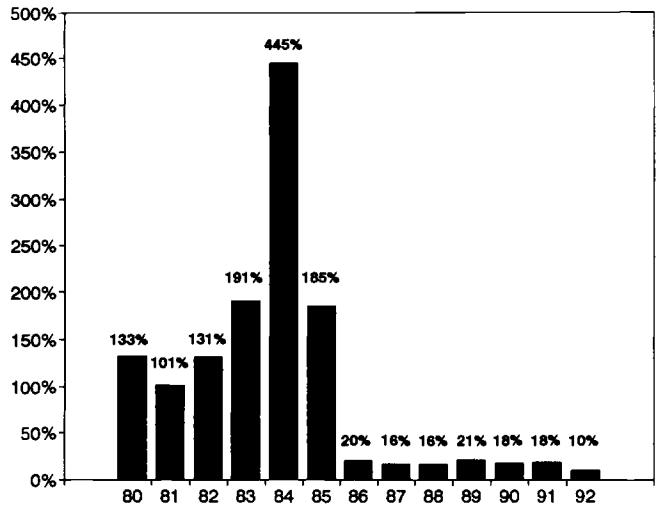

Fig. 6.1 Annual rate of inflation
Source: Statistical Abstract of Israel; Central Bureau of Statistics.

the composition of the currency basket has been 55–60% of the U.S. dollar, 35–40% of European currencies, and about 5% of Japanese yen. Consequently, the real exchange rate against nondollar components of the basket depreciated at 10% in 1986 and 6% in 1987, and it appreciated at 10% in 1988.[2] The considerable real exchange rate appreciation that followed the program is evident in various measures of relative prices. Specifically, the cumulative increase in the relative price of nontraded to traded goods over 1986–88 was 32%; the relative price of exports against domestic uses decreased over that period by 20%; and the relative price of services to manufacturing goods rose by 48%. Notice that, at the same time, no major shifts were observed in Israel's terms of trade.

Fiscal adjustment. Three main features highlight the major fiscal adjustment after the program. First, there was a major fall in the domestic government budget deficit, from 16% of GDP in 1984 to 1.3% of GDP in 1986–88; see table 6.2. This reflects an increase of about 8% of GDP in domestic revenues from 1984 to 1986–87, and a reduction of about 7% of GDP in domestic gov-

2. In comparison, the real exchange rate of the NIS vis-à-vis the U.S. dollar evolved quite differently, as it appreciated 16% in 1986, 7% in 1987, and 11% in 1988. This marked difference in real exchange rate development may have contributed to changes in the geographic composition Israel's trade. More specifically, during 1986–88 the share of exports to European destinations as percentage of total exports of Israeli goods increased from 36% to 38%, while the share of exports to the United States decreased from 33% to 31%. Exports to Asia rose from 10% to 16%, and exports to all other destinations, which are conducted mainly in U.S. dollars, declined from 21% to 16%.

ernment expenditures. As far as the latter is concerned, the main items of government expenditures that were reduced (as percentage of GDP) after the program were grants and subsidies (including credit subsidies and subsidies for production of basic goods and utilities), and domestic defense expenditures. These trends show up in government's total budget deficit, which also includes foreign revenues and expenditures. In this context, an important role was played by the special foreign aid received from the United States, amounting to $1.5 billion in 1985 and 1986. Second, the stronger fiscal stance was reflected in a reversal in the time path of domestic and foreign public debt ratios, from increasing trends before 1985 to marked reductions after 1985; see figure 6.2. Specifically, domestic public sector debt decreased from 112% in 1985 to 90% of GDP in 1989, and foreign public sector debt fell from 53% in 1985 to 24% in 1989; see table 6.2. Third, seigniorage played no major role in inflation or disinflation: it remained relatively stable at about 2–3% of GDP before and after stabilization. Put differently, changing trends in the behavior of inflation were more closely associated with fluctuations in public debt ratios than with government seigniorage.

Consumption boom. Prior to the stabilization program (i.e., between 1980 and 1984), total private consumption grew at an average annual rate of about 5% and consumption of durables (which were on average 13% of total consumption) grew at about 8% per year; see table 6.3. The consumption boom began at the first quarter after the program (i.e., the last quarter of 1985), when total private consumption increased by 13% in comparison to the previous quarter. This was led by a sharp increase in consumption of durable goods, which registered a *36% increase* in comparison to the previous quarter. The year of 1986 is the most salient example of the consumption boom phenomenon. In that

Table 6.2 **Public Expenditure, Revenue, and Deficit (% of GDP)**

			Deficit(−)/Surplus(+)			Public Sector Debt (net)		
	Expenditure	Revenue	Total	Domestic	Foreign	Domestic[a]	Foreign	Seigniorage
1983	66.0	61.4	−4.6	−7.0	2.4	112.9	38.6	3.1
1984	72.0	60.2	−11.9	−16.0	4.2	106.9	48.7	3.0
1985	69.8	71.5	1.7	−6.3	8.0	111.8	52.9	3.1
1986	64.3	67.6	3.3	−1.2	4.5	110.6	40.3	2.6
1987	61.1	61.1	0.0	−1.2	1.3	100.5	31.2	2.3
1988	58.0	57.6	−0.3	−1.4	1.1	88.9	25.5	−1.4
1989	57.4	53.4	−4.0	−6.0	2.0	89.8	23.6	0.7
1990	57.0	54.3	−2.7	−5.5	2.8	88.9	20.1	0.5

Source: Bank of Israel Annual Report.

[a]Excluding government liabilities to the public associated with the 1983 bank share arrangement.

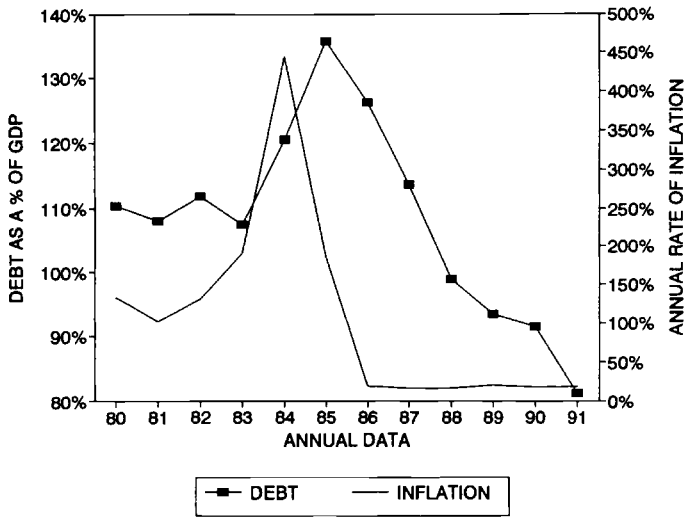

Fig. 6.2 Public sector domestic net debt and inflation

Source: Statistical Abstract of Israel; Central Bureau of Statistics; *Bank of Israel Annual Report*

Note: The domestic debt shown here includes government liabilities to the public that are associated with the 1983 bank share arrangement. This definition differs slightly from that shown in table 6.2.

year, private consumption rose by 15% (i.e., over 13% per capita), and consumption of durables *increased by 50%*. These figures clearly imply that the consumption boom applied to *both* durable and nondurable goods. Most of the increase in durable goods consumption was translated into an increase in imports of consumer goods; however, notice that imports of nondurable consumption goods also increased, outpacing nondurable domestic consumption. The consumption boom continued, though somewhat moderated, in 1987. Total consumption rose by 9% in that year, and consumption of durables grew at 13%. The boom lasted for about two and a half years and came to a half after the first quarter of 1988. In 1989, total private consumption remained unchanged from the level of the previous year, while consumption of durable goods declined by 13%.

Completing a cycle: Postboom recession. To a large extent, these developments in private consumption spending were reflected in fluctuations in economic activity. In the two years after the program, that is 1986–87, the rate of growth of GDP was 5% per year, which is double the rate of growth that prevailed for 1984; see table 6.4. This boom in economic activity was not spread evenly across various sectors in the economy. That is, while there was a strong growth performance in the nontradables sector, whose output grew at 7.5% per year in 1986–87 compared to less than 2% per year in 1981–85, rates of growth for

Table 6.3 Private Consumption (rates of change, real terms)

	Population Growth (%)	Consumption (%)			Imports of Consumption Goods (%)			Durable Consumption Growth beyond Total Consumption Growth (%)
		Total	Nondurables	Durable Goods	Total	Nondurables	Durable Goods	
1981	2.4	13.0	9.4	43.6	—	—	—	13.5
1982	1.8	8.0	7.2	13.3	9.1	11.5	6.1	14.2
1983	2.0	8.7	6.7	20.9	8.5	−5.9	24.2	15.7
1984	1.2	−7.0	−2.4	−31.8	−18.8	−13.3	−27.5	11.5
1985	2.0	0.7	0.8	−0.0	−4.6	1.4	−12.9	11.5
1986	1.8	14.8	10.3	49.7	39.3	31.6	52.5	14.9
1987	1.6	9.0	8.5	13.2	13.5	11.7	16.0	11.7
1988	1.7	4.3	4.1	5.8	12.7	10.0	15.5	11.9
1989	1.7	0.0	1.7	−12.8	−8.4	2.3	−19.7	10.4
1990	3.1	5.3	4.0	17.1	12.6	2.1	27.1	11.5

	Consumption Prices[a]			
	Total (%)	Nondurables (%)	Durable Goods (%)	Relative Price Index: Durables/Nondurables
1981	118.3	121.1	100.6	100.0
1982	118.5	120.7	105.4	93.1
1983	144.0	145.6	135.7	89.4
1984	391.8	388.9	414.4	94.0
1985	295.9	301.8	250.2	81.9
1986	46.0	46.5	42.9	79.9
1987	19.9	20.2	17.6	78.2
1988	16.3	17.0	11.0	74.2
1989	20.8	22.0	10.5	67.2
1990	15.9	16.8	8.7	62.5

Sources: Bank of Israel Annual Report; Statistical Abstract of Israel.

[a]Based on national account consumption prices, annual averages.

the tradables sector remained unchanged at about 4.5% per year.[3] Along similar lines, the rate of growth of output in manufacturing rose modestly from 4–5% per year from the period before to after the program, yet the rate of growth of output in the services and commerce sector almost doubled, from 4% to 7% per year, from 1981–85 to 1986–87. *These trends were reversed in 1988–89.* On average, GDP growth slowed down to about 2% per year in that period, and there was a *decline* in output of the traded goods sector of about 1% per year, led by a decline in industrial sector's production of about 2.4%

3. The tradable sector includes manufacturing, agriculture, sea and air transportation, and tourism.

Table 6.4 **Economic Growth (rates of change, real terms, %)**

		Gross Product Growth				Total Factor Productivity	
	Population Growth	Total Domestic	Business Sector	Industrial Sector	Services & Commerce	Business Sector	Industrial Sector
1981	2.4	4.5	6.0	3.5	8.4	1.5	—
1982	1.8	1.1	−0.1	−2.2	2.6	1.6	—
1983	2.0	2.8	3.4	3.4	4.1	1.5	—
1984	1.2	2.5	2.9	7.3	0.9	−2.3	—
1985	2.0	4.0	6.0	7.2	7.6	1.0	1.6
1986	1.8	3.8	6.3	7.1	9.4	1.4	2.2
1987	1.6	6.2	8.6	7.0	8.8	3.7	3.3
1988	1.7	2.6	2.4	−0.8	5.8	−0.6	−1.0
1989	1.7	1.7	2.1	−2.0	3.8	0.0	−2.4
1990	3.1	5.4	6.8	5.9	4.3	4.3	4.3

Sources: Bank of Israel Annual Report; Statistical Abstract of Israel.

per year. The slowdown was also present in the nontraded sector, whose output's growth was reduced yet remained positive at 3.4% per year. Interestingly, the program was followed initially by a rise in both total factor productivity and labor productivity relative to their levels prior to stabilization. Productivity further increased in 1990, along with a process of restructuring and rationalization of operations in business and activity.

Rise in wages beyond productivity. Coupled with wage controls, the devaluation and rises in controlled prices at the start of the program were associated with a decrease in the real wage in 1985 of 9% over all sectors; see table 6.5. However, the relaxation of controls and the heating up of the economy in 1986–87 were accompanied by marked real wage increases of 8% per year, which clearly *outpaced* increases in labor productivity (by about 6 percentage points per year). The program did not result in a noticeable change in the economy's rate of unemployment. Only after four years into the program did the rate of unemployment markedly rise, to 9.6% in 1990. Increased employment was associated, to a large extent, to a cumulative decline of about 5% in industrial sector employment during the recession years of 1988–89, and with an increase in the participation rate in the labor force.

Monetary expansion. Disinflation in Israel was followed by substantial expansion of monetary aggregates, both in nominal and real terms. This is particularly the case of M1 and M2 growth in 1986–87. Broader aggregates, such as M3 and M4, showed much more moderate increases. To a large extent, these movements reflect a shift in the financial portfolio of the private sector, away from indexed bonds and foreign exchange assets to nonindexed short-term do-

Table 6.5 **Labor and Wages (rates of change, real terms, %)**

	Real Wage per Employee Post[a]			Employment			Output per Labor Hour		
	All Sectors	Business Sector	Industrial Sector	All Sectors	Business Sector	Industrial Sector	Business Sector	Industrial Sector	Unemp. Rate
1980	−3.1	−0.5	0.1	1.1	1.7	−1.0	3.9	0.3	4.8
1981	11.6	12.4	10.4	2.0	2.6	2.5	2.3	5.0	5.1
1982	−1.5	−0.3	3.5	1.4	1.5	1.2	0.3	−0.8	5.0
1983	6.2	4.7	5.2	3.2	4.3	2.2	1.4	2.3	4.5
1984	−0.4	−1.2	1.9	1.5	1.8	0.3	−1.6	2.7	5.9
1985	−9.0	−6.5	−7.4	0.7	1.9	−0.2	2.1	3.2	6.7
1986	7.8	9.1	7.0	1.4	1.7	4.2	1.5	1.6	7.1
1987	7.9	8.0	7.1	2.6	3.9	1.9	3.1	4.9	6.1
1988	6.0	4.7	3.7	3.5	3.2	−2.1	2.2	1.5	6.4
1989	−1.3	−1.7	0.9	0.5	−0.0	−2.5	0.5	4.4	8.9
1990	−1.0	−1.6	0.0	2.1	2.1	2.8	3.9	7.4	9.6

Sources: Bank of Israel Annual Report; Statistical Abstract of Israel.

[a]Excluding labor from territories.

Table 6.6 **Monetary Aggregates (nominal terms)**

	Inflation (avg./avg.) (%)	Asset Growth (%)				Velocity (*Y/M*)				Total Credit Growth (%)
		M1	*M2*	*M3*	*M4*	*M1*	*M2*	*M3*	*M4*	
1981	116.8	93.2	117.4	120.7	117.3	26.8	18.1	5.4	3.3	58.8
1982	120.3	100.4	140.7	133.7	130.1	30.2	16.9	5.2	3.3	148.3
1983	145.7	113.5	165.4	171.4	147.6	36.5	16.5	5.0	3.4	136.1
1984	373.8	225.0	315.0	435.2	372.4	55.6	19.7	4.6	3.6	366.2
1985	304.6	351.6	553.2	309.7	301.2	45.8	11.2	4.2	3.3	317.5
1986	48.1	169.4	128.5	44.3	56.1	26.6	7.7	4.5	3.3	64.1
1987	19.9	60.2	71.6	37.1	38.0	21.1	5.7	4.2	3.1	39.4
1988	16.3	31.9	25.9	19.3	17.5	19.7	5.5	4.3	3.2	22.7
1989	20.2	27.8	20.3	20.7	24.8	18.8	5.6	4.4	3.2	41.4
1990	17.2	28.3	25.1	23.1	24.5	18.1	5.6	4.4	3.1	23.8

Sources: Bank of Israel Annual Report; Statistical Abstract of Israel.

mestic currency assets, most of which are included in M2 (see table 6.6, in particular the drop in velocities of M1 and M2). This picture of monetary expansion held despite the initial attempt to use a restrictive credit policy as a key ingredient of monetary policy under disinflation—an attempt that was not effective enough over time. In fact, real credit to the public showed marked increases from mid-1986 onward. While monetary expansion was accompanied by a sharp reduction in nominal interest rates, ex post real interest rates remained extremely high (i.e., at about 35% for debitory rates) during 1986–87

Table 6.7 **Interest Rates: Short-Term Credit**

	1983	1984	1985	1986	1987	1988	1989
Nominal interest rates							
Total credit	205.5	576.8	234.5	31.9	39.0	33.2	33.4
Directed[a]	176.2	567.0	188.9	11.9	16.2	13.1	34.1
Nondirected	214.8	582.8	260.5	40.6	46.5	38.4	32.8
Debitory rate	181.6	771.0	443.7	61.5	61.9	46.2	34.3
Real interest rates (ex post)							
Total credit	5.1	24.2	17.3	10.2	19.7	14.4	10.5
Directed	−5.0	22.4	1.3	−6.5	0.1	−2.8	11.1
Nondirected	8.3	25.3	26.4	17.5	26.2	18.9	10.0
Debitory rate	−3.1	59.8	90.6	34.9	39.4	25.6	11.3
Average interest rate, real terms (ex post)[b]							
Business sector	7.9	32.6	17.5	6.9	16.2	11.6	—
Industrial sector	4.7	33.8	11.7	1.4	10.1	6.3	11.1
Share of directed credit in short-term credit usage							
Business sector	41.6	43.3	43.9	39.1	34.1	28.7	—
Industrial sector	75.0	76.8	76.1	66.4	59.3	54.1	50.1
Total short-term credit per output							
Whole economy	24.8	22.6	25.6	26.6	31.5	35.0	39.3
Industrial sector	30.8	28.3	28.1	27.6	30.1	34.3	36.7

Sources: Bank of Israel Annual Report; Statistical Abstract of Israel; Ben-Rawe (1989); Bruno and Meridor (1991).

[a]Directed credit is credit allocated by the government. The interest rate of this credit is typically below the market (i.e., nondirected) rate. Total credit is the sum of short-term directed and nondirected credit.

[b]Weighted average based on the actual composition of credit usage according to directed/nondirected credit and credit in domestic/foreign currency.

(table 6.7). Starting in 1988, there was a gradual process of reduction in ex post real interest rates, which still remained relatively high. In any case, it should be stressed that ex ante real interest rates may well have behaved quite differently from ex post rates precisely at times of change in policies.[4]

Reduction in investment and improvement of the current account. In the two years following the implementation of the stabilization program, the current account registered an average annual surplus in the order of 5% of GDP. This surplus contrasts the current account deficit in the order of 6% of total national that existed in 1981–84. Not surprisingly, this surplus was partly associated

4. Interest rate trends over this period also reflected the impact of various monetary and capital market reforms.

with the marked increase in foreign aid. On average, a current account surplus of 1.5% of GDP prevailed during 1988–89, mainly due to a decrease in the import surplus, which partially offset the decrease in unilateral transfers to Israel; see table 6.8.

Alternatively, we can examine current account developments in terms of fluctuations in gross national saving and investment. Following this approach, the current account surplus of 1986–87 was a result of a decline in investment and unchanged savings (as a percentage of total national income). Following the implementation of the stabilization program there was a marked decline in investment from over 20% of GDP during 1981–84 to 18% in 1986–87; this was due mainly to a decline in investment in residential construction. Gross national savings varied slightly around 18% of GDP during 1981–84, increased somewhat to about 20% in 1986–87, and returned to about 18% in 1988–89. Although total national savings did not change much, there were marked changes in the composition of savings, as the public sector shifted from being a negative-saving sector prior to the stabilization program to a positive-saving sector in the first two years after the program. As the saving ratio of the public sector increased, there was a decrease in the saving ratio of the private sector. Put differently, the private consumption boom of 1986–87 resulted in a saving ratio deduction from 27% to about 16% of GDP. These offsetting trends in components of national saving, much as in a Ricardian equivalence framework, are depicted in figure 6.3.

In our view, a unified overall theoretical explanation of the foregoing empirical regularities is still missing. While the observed inflation/unemployment developments do not conform with traditional, money-based disinflations, they can be partly explained by invoking models of exchange rate–based disinflation. Other developments can be explained by lack of full credibility of policymakers. Models such as Fischer's (1986) and Calvo's and Végh's (1991) predict that an immediate drop in inflation and a real exchange rate appreciation follow an exchange rate–based stabilization program. By pointing out the lack of credibility, Calvo and Végh (1991) are able to account for a consumption boom in the aftermath of disinflation. However, their explanation is not complete, in that it does not seem to fully account for the rise in real interest rates[5] after the program. Another somewhat puzzling feature of the data is that both inflation and disinflation were not tightly linked to fluctuations in seigniorage. This feature provides some scope for models based on economic agents' expectations of future monetary and fiscal adjustments in response to observed underlying trends in public debt. In this context, there is a remarkable comovement between public debt ratios and the behavior of the rate of inflation, much in the spirit of Sargent and Wallace (1981).

5. Notice that money-based stabilization models are capable of explaining increases in the real interest rate but at the same time cannot explain a consumption boom, as in exchange rate–based models.

Table 6.8 **External Balance**

	Billions of Dollars, Deficit(−)/Surplus(+)[a]					% of GDP				
	Trade Balance	Import Surplus	Unilaterial Transfers (net)	Current Account	Foreign Debt (net)	Trade Balance	Import Surplus	Unilaterial Transfers (net)	Current Account	Foreign Debt (net)
1981	−2.46	−4.06	3.10	−0.96	12.59	−10.6	−17.5	13.4	−4.1	54.4
1982	−2.92	−4.36	2.46	−1.90	15.24	−11.9	−17.7	10.0	−7.7	62.0
1983	−3.49	−4.65	2.71	−1.94	17.54	−12.7	−17.0	9.9	−7.1	64.0
1984	−2.45	−4.56	3.28	−1.28	18.69	−9.4	−17.5	12.6	−4.9	71.8
1985	−1.94	−3.88	5.00	1.12	18.42	−8.0	−16.1	20.7	4.6	76.5
1986	−2.35	−3.73	5.38	1.65	18.21	−7.9	−12.5	18.0	5.5	61.1
1987	−3.25	−5.63	4.77	−0.86	18.21	−9.2	−15.9	13.5	−2.4	51.4
1988	−2.84	−5.17	4.51	−0.66	18.52	−6.5	−11.9	10.4	−1.5	42.7
1989	−2.36	−3.77	4.86	1.10	16.24	−5.3	−8.5	11.0	2.5	36.6
1990	−3.53	−5.09	5.79	0.70	15.56	−6.8	−9.8	11.1	1.4	29.9

Sources: Bank of Israel Annual Report; Statistical Abstract of Israel.

[a]Current prices.

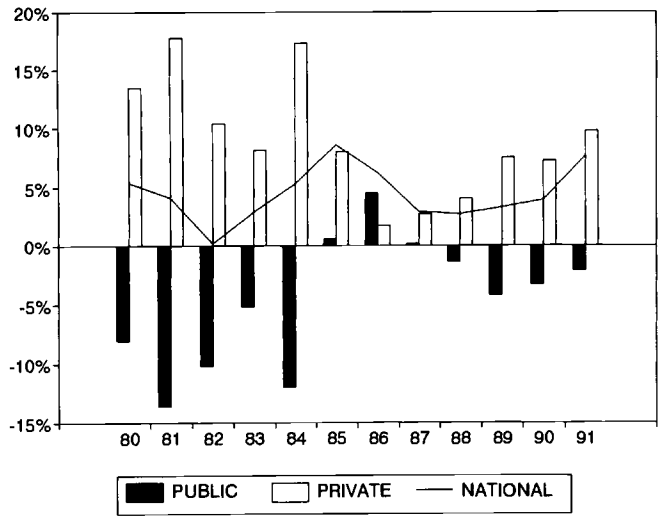

Fig. 6.3 Net savings as a percentage of GDP
Source: Statistical Abstract of Israel; Central Bureau of Statistics.

6.3 Transition (or Lack Thereof) from Stabilization to Growth

Disinflation in Israel was not accompanied by a fast transition to sustained growth. In fact, the growth performance of the economy deteriorated considerably after the late 1970s. In the decades of the 1950s and 1960s, real GDP grew annually at an average rate of about 10%, and total factor productivity grew at about 4.55 per year. In the late 1970s, GDP growth became 3% per year, and total factor productivity grew by less than 1% per year. While the consumption boom at the initial stages of the 1985 stabilization program contributed to maintain and even accelerate the level of economic activity, the latter was not sustained. In fact, a recession developed in 1988–89, and the growth rate became less than 2% per year. Underlying these developments were decreases in the rates of growth of public and private sector investments, which made the transition to growth more difficult. In this section, we examine the links between private and public investment and growth, as well as the relation between exports and growth.

Figure 6.4 provides evidence on various indicators of investment and growth. The period after the stabilization program was characterized by relatively low ratios of public and private sector investment to GDP. These ratios were low both by Israeli historical standards and by international comparisons. While total investment reached about 27% of GDP in the 1970s, it declined to a level of 17% of GDP between 1985 and 1990. The deterioration in the pattern of investment is reflected in a marked decrease in the capital/output ratio, depicted in figure 6.4. In particular, *notice the marked decrease in the capital/*

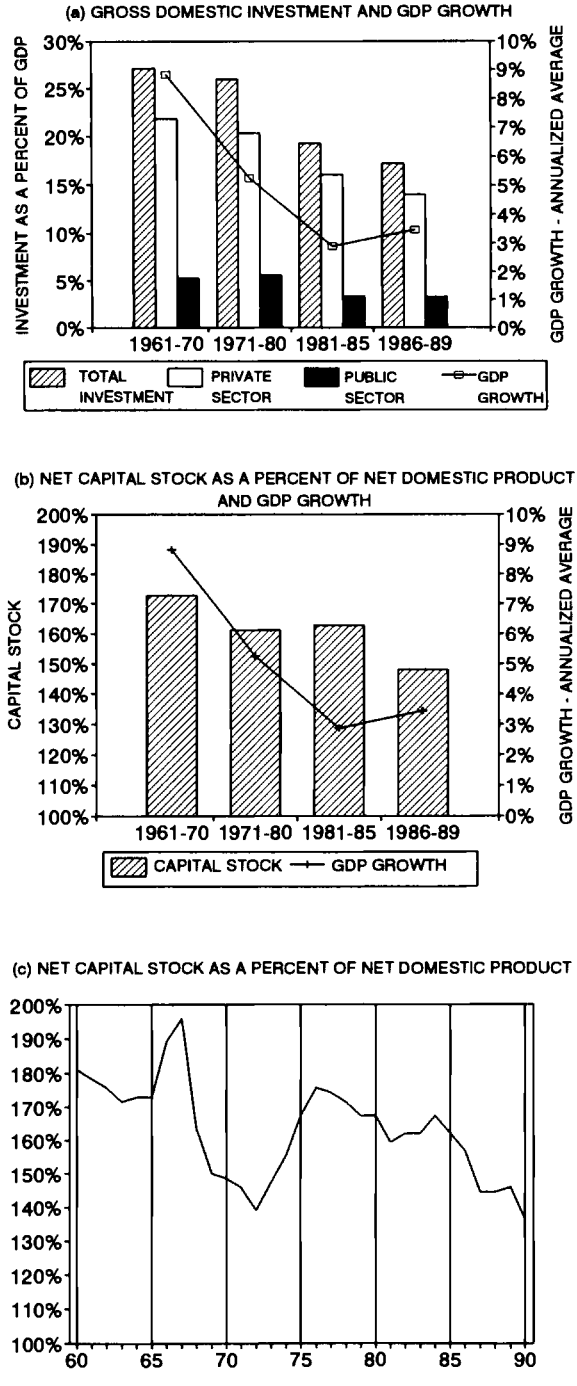

Fig. 6.4 Indicators of investment in Israel

Source: Statistical Abstract of Israel; Central Bureau of Statistics; *Bank of Israel Annual Report.*

output ratio after 1985. As far as international comparisons are concerned, investment as a percentage of GDP was about 21% in industrialized countries, and it was 22% in the rapidly growing East Asian developing countries (see figure 6.5).

The finding that there is an empirical relation between economic growth and the share of investment in GDP has been documented in numerous studies of various countries; hence, is is not unique to Israel. For example, in a cross-section regression including 101 countries over the period 1960–89, Levine and Renelt (1990) confirmed the robustness of earlier findings that the coefficient on the ratio of investment to GDP has significant explanatory power for the rate of growth of real per capita income. Similar results were reported by Fischer (1991), based on a pooling of cross section and time series for the period 1972–85. This relation is also clear from figures 9 and 10 in Dornbusch (1991), which plot the investment/GDP ratio against GDP growth for thirty-three developing countries for the periods 1965–73 and 1974–84. Perhaps Chile is the best-known example of a close relation between strong economic growth in recent years and a marked increasing trend of the investment share in GDP; see figure 6.6. The relation is also characteristic of comparisons involving industrialized countries. To take two extremes, over the period 1963–90 Japan's GDP grew at a rate of 6% per year, and the investment/GDP ratio was equal to 0.22. Over the same time period, the United Kingdom's GDP growth rate was 1% per year, and the share of investment in GDP was about 0.125 (see Auerbach 1992).[6] The notion that, other things equal, an increase in the share of investment in GDP will be associated with an increase in the rate of growth of output is familiar from standard growth accounting. The latter implies that an $x\%$ increase in the investment ratio increases output growth by that $x\%$ times the product of the output/capital ratio and capital's share in production. Yet growing evidence indicates that the observed effects of increases in the investment/GDP ratio on growth are much larger than what is implied by such arithmetics of growth (see, e.g., Auerbach 1992 and De Long and Summers 1991). Put differently, it can be argued that capital accumulation has not only direct effects on growth but also, and not less important, indirect effects in the form of increased inducements for innovation and for the adoption of new technologies that lead to an increase in total factor productivity. Some of these indirect effects may well take the form of "spillovers," social returns to investment that are not fully captured by individual investors, as emphasized in the recent endogenous growth literature; see Helpman (1992).

Work by De Long and Summers (1991) has emphasized that investments in machinery and equipment are one category of investment that is characterized by these spillover effects. Based on the cross-sectional distribution of growth rates across economies in the post–World War II period, the authors find evidence in support of the hypothesis that investments in machinery and equip-

6. Obviously, these findings must be interpreted with care because other things may not be equal.

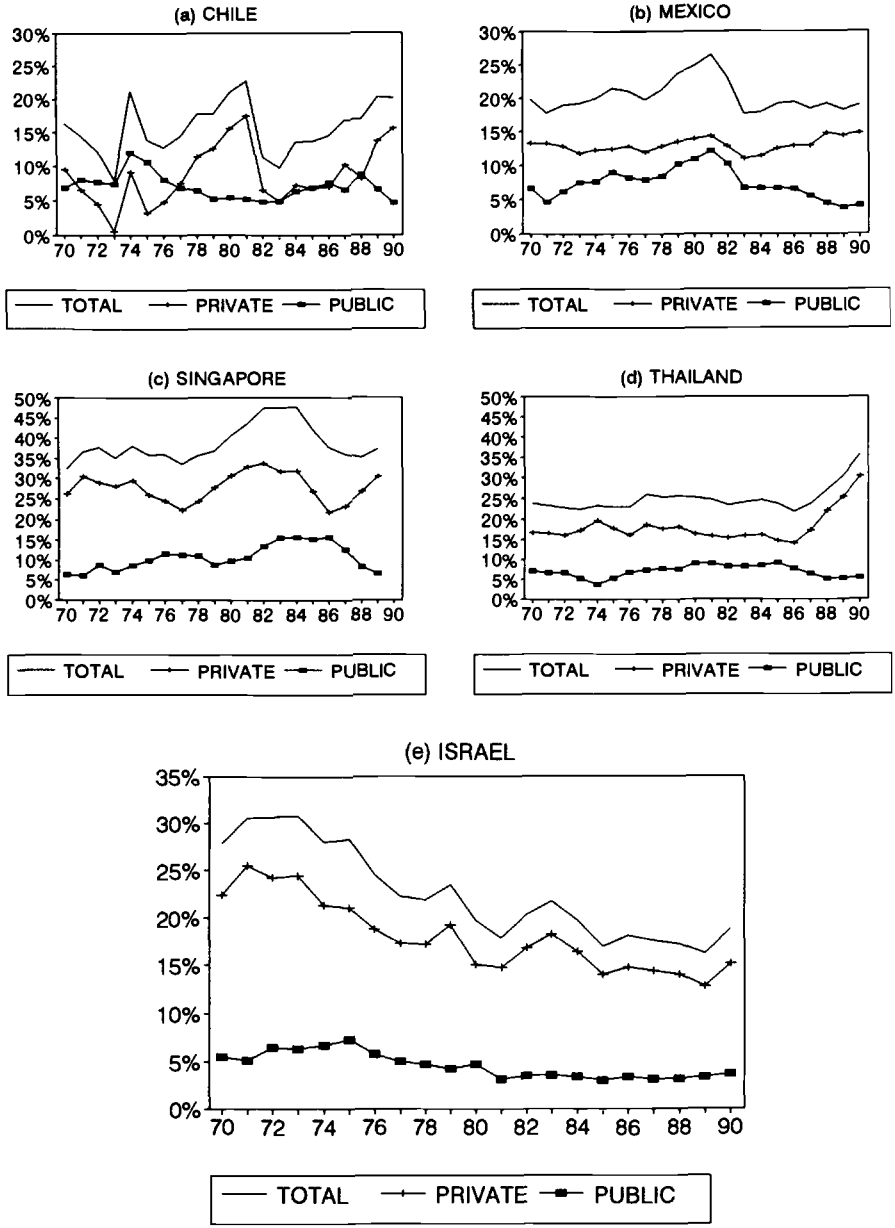

Fig. 6.5 Investment in various countries as a percentage of GDP
Source: International Financial Statistics, International Monetary Fund.

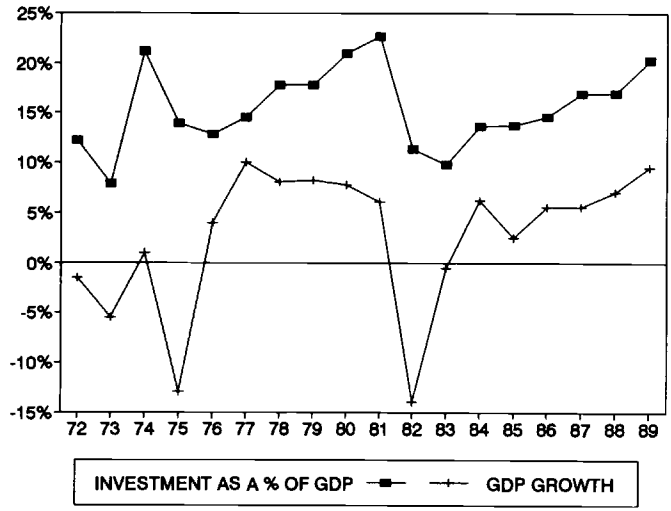

Fig. 6.6 Chile: GDP growth and investment as a percentage of GDP
Source: International Financial Statistics, International Monetary Fund.

ment are a strategic factor in growth, and do carry substantial benefits. Figure 6.7 illustrates these relations based on time series for Israel (using three-year moving averages). It is seen that the marked decrease in the rate of growth of total factor productivity observed after 1987 was preceded by a marked decrease in net growth of machinery and equipment, and that other periods have a close link between these variables.

Public sector investments, in particular in infrastructures, are another important category of total investment, one that has been associated with public good–type spillovers. As shown in table 6.9 and figure 6.8, there has been a clear trend of decrease in the ratio of investment in infrastructure to GDP in Israel, which was equal in the 1980s to only 50% its level in the 1960s. Although some increase in the ratio was registered after the 1985 program, the level is much lower than what is given by the historical standards.[7] Investments in infrastructures picked up only recently, in response to the wave of migration from the former Soviet Union. The role of public sector capital for growth has been assessed for Israel using time series and a production function–growth accounting framework, in which the rate of growth of output is related to the rates of growth of private and public capital and employment, by Hercowitz, Leiderman, and Siddi (1992), who find evidence in support of constant returns to scale on the private sector inputs and a coefficient of 0.4, which is statisti-

7. Similarly, a temporary increase (of 13.5%) in overall gross investment in fixed assets is also noted in 1987. This increase is mainly compensatory after three years of decline in investment, which cumulatively amounted to an 18% decline. The 1987 increase merely restored the real level of gross investment in fixed assets to the 1982–83 average.

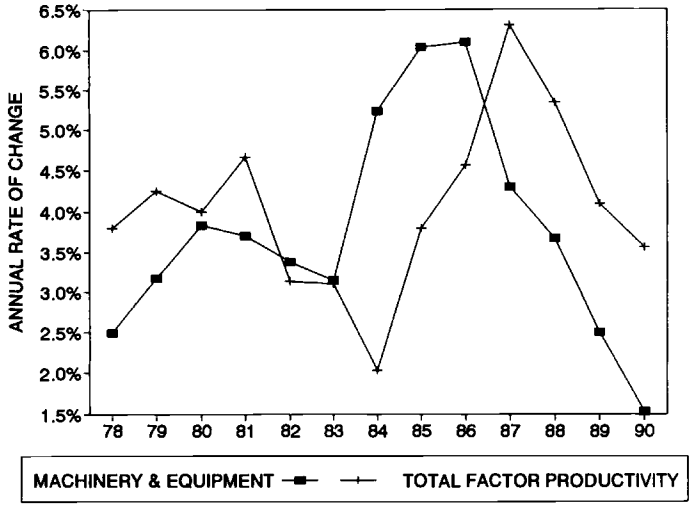

Fig. 6.7 Israel: net growth of machinery and equipment stock and total factor productivity change
Source: Bank of Israel Annual Report.
Note: Three-year moving averages used.

Table 6.9 **Investment in Infrastructure as a Percentage of Israel's GDP (five-year averages)**

1965–70	4.3
1970–75	3.9
1975–80	3.3
1980–85	2.8
1985–90	2.6

cally significant, on public sector capital.[8] Similar results were obtained by Bregman and Marom (1992), based on a pooling of time series and cross section for Israel. These results are quite similar to those obtained by Aschauer (1989) for the United States. While these findings are certainly controversial, because of their strength and the simplicity of the methodology used they all point to a relation that is less controversial in both theory and casual evidence.

Does the recovery of growth after stabilization necessarily require real exchange rate depreciation and export-led growth? The independent role of exports as percentage of GDP in the process of growth is less clear and more controversial, in theory and facts, than that of the investment share discussed above. Figure 6.9 provides evidence for three countries: Chile, Mexico, and

8. The authors used annual data for these variables from 1960 to 1988.

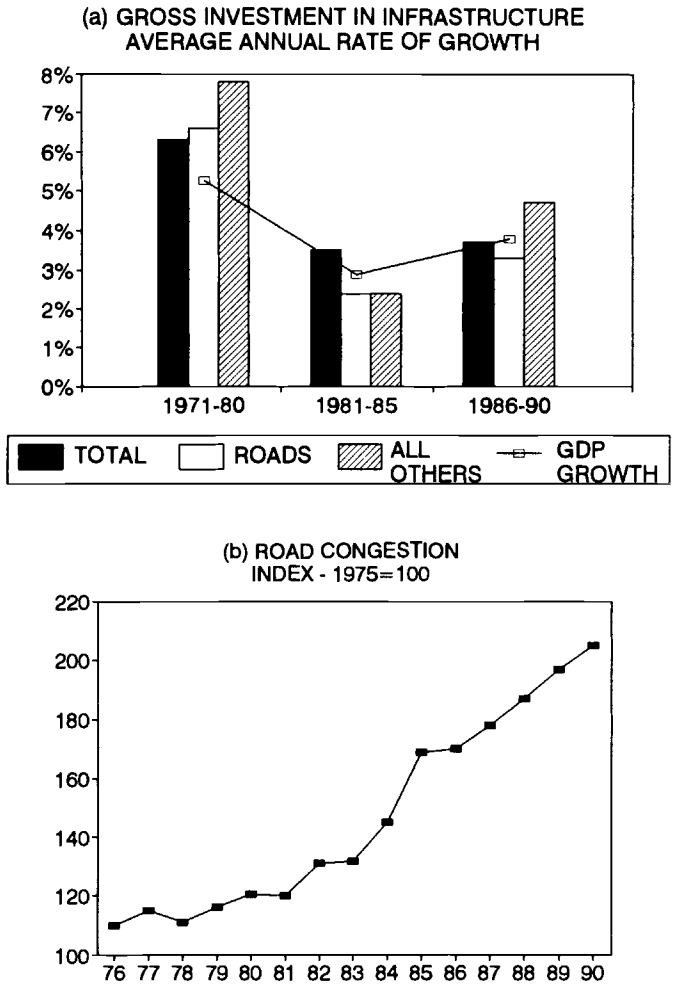

Fig. 6.8 Israel: infrastructure, investment, and strain
Source: Bank of Israel Annual Report (1990).

Israel. Chile represents an example of export-led growth. Between 1981 and 1986, the authorities succeeded in producing a real devaluation of nearly 40%. At the same time, there was a boom in exports. Similar evidence about the relation between GDP growth, investment growth, and the export/GDP ratio holds for Mexico, yet after considering different subperiods. At variance with Chile, however, there was a real exchange rate appreciation throughout.

What are the lessons for stabilization policy? We have documented the fact that, as far as investment and growth are concerned, *the initial conditions of the 1985 program were not strong.* This was especially the case for the stock

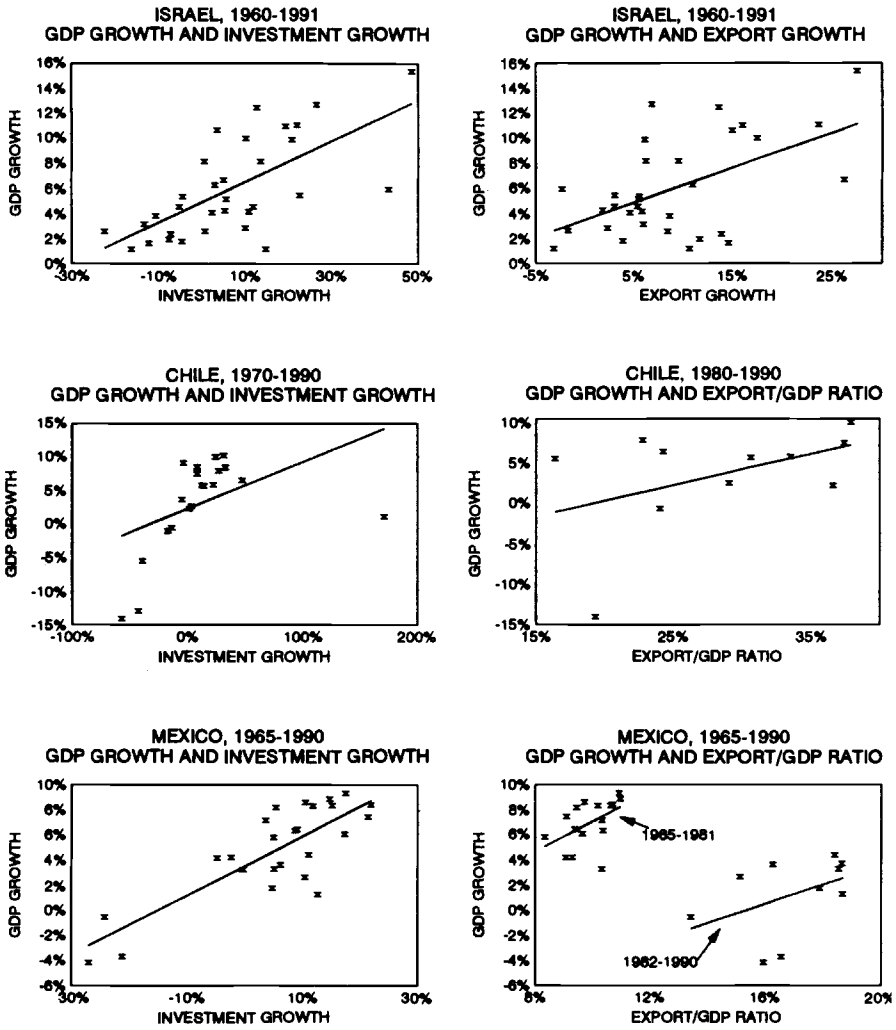

Fig. 6.9 GDP growth versus investment and exports
Source: International Financial Statistics, International Monetary Fund.

of public sector capital, including infrastructures. Moreover, after the program (and until the beginning of the immigration from the former Soviet Union) there was no marked renewal of investment and growth. Although some of these developments were due to factors not necessarily related to the stabilization program,[9] the program embodied no specific direct policy measures aimed

9. These factors include (1) the uprising in the administered territories, which had adverse effects on tourism, increased absenteeism of labor supply from the territories, created a decline in

at reversing this state of affairs. The policy was one of "stabilize inflation first, and deal with growth later." It was also argued at the time that the reduction in inflation per se would lead to a reallocation of resources, away from the financial sector and back into the real sector, that would increase measured output and productivity. Perhaps the main lesson here is that, already at the stage of disinflation, it is important to undertake policies that would facilitate a rapid transition to growth, for example, increasing public investment in infrastructure. This would be especially important in countries such as Israel, where the initial conditions are not extremely conducive to investment and growth, and in countries in which investors face a relatively large option value of waiting (see Dornbusch 1991). The recovery of investment takes time, especially at times of transition in economic policies. There are fiscal and industrial policies that can speed up the transition from stabilization to growth. However, the real dilemma for policy is to find the resources that would enable adopting these measures without jeopardizing a key ingredient of stabilization: a reduction in government spending and in the budget deficit. Perhaps the resolution of this dilemma is in the role of international institutions in providing support in the form of long-term loans, heavily conditioned on implementation of new policies, aimed at enhancing the transition from stabilization to growth (see Dornbusch 1991).

6.4 Evolution of Exchange Rate Policy

We begin this section by discussing the various stages of exchange rate policy in Israel after stabilization. Then we shift to a discussion of Israel's exchange rate band, a regime that was adopted in January 1989. Last, we provide new evidence on the relation between real exchange appreciation, world demand, and the performance of exports.

6.4.1 Exchange Rate–Based Stabilization

As indicated, the nominal exchange rate was used as a key anchor for disinflation in Israel. There were three main stages in the evolution of exchange rate policy after 1985. First, a fixed exchange rate of 1.5 NIS per U.S. dollar was adopted at the start of the program after an initial devaluation of 19.1%. The authorities themselves made no commitment to keep the exchange rate irrevocably fixed. In fact, announcements were made that the exchange rate would be adjusted if there were wage increases or other pressures, on prices, beyond the original targets.

Still as part of the original fixed exchange rate policy, there was a technical

demand for Israeli output by the territories, and produced greater uncertainty and increased domestic defense expenditure; (2) the cancellation of the Lavi aircraft project; and (3) severe financial distress in several major segments of the manufacturing sector (Koor, the kibbutzim). Factors 2 and 3 are not unrelated to the stabilization program per se.

change in August 1986, when it was decided to peg the domestic currency's exchange rate to a basket of foreign currencies (instead of to the U.S. dollar). The change was clearly motivated by the sharp fluctuations in international exchange rates at that time (i.e., the U.S. dollar was depreciating in world currency markets) and by the fact that, in addition to the United States, European countries are important trading partners of Israel.

Throughout the second half of 1985 and during 1986 domestic prices rose at a higher rate than foreign prices, resulting in a gradual loss of competitiveness of domestic products. In January 1987, there was a 10% devaluation of the domestic currency against the basket. Domestic prices continued to rise at a higher rate than foreign prices in 1988, at which time devaluation expectations built up considerably. Figure 6.10 shows the increasing trend in foreign currency purchases by the private sector associated with this buildup of expectations. In late December 1988 and early 1989, another devaluation was effected, this time as part of a shift to the second stage of exchange rate policy: the unilateral adoption of an exchange rate band.

Israel's exchange rate band from 1989 to 1991 was characterized by a preannounced fixed nominal reference (or central parity) exchange rate and a specific band width; see Helpman and Leiderman (1992) and Helpman, Leiderman, and Bufman (1994) for further analysis and details. Initially the width of the band was set at $\pm 3\%$ around the reference rate. The width was expanded to $\pm 5\%$ in 1990. Various parameters and characteristics of the exchange rate band are shown in table 6.10. The adoption of an exchange rate band was viewed as a useful way to allow for short-run flexibility of the nominal exchange rate without necessarily abandoning the role of the exchange rate as a

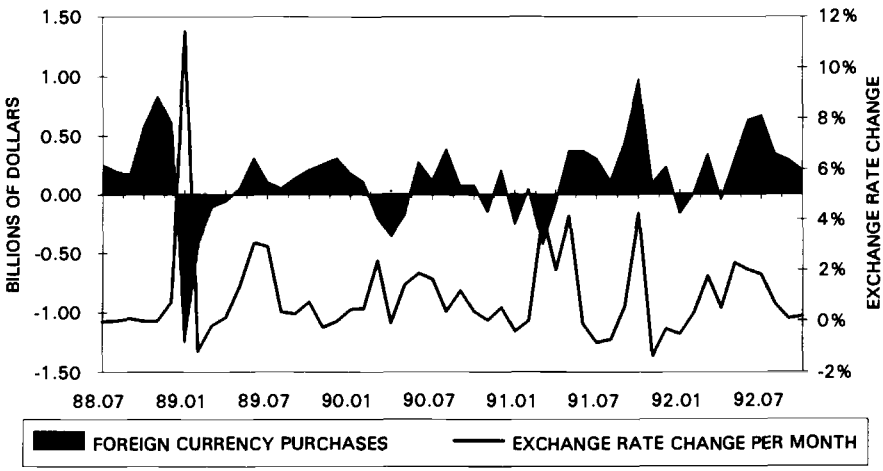

Fig. 6.10 Sales of foreign currency to the Israeli public
Source: Bank of Israel, Research Department database.

Table 6.10 **Israel's Exchange Rate Band: Band Characteristics, Exchange Rate, Interest Rates, Prices, and Foreign Currency Reserves**

	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6 Crawling Band
	1989.01–89.06	1989.07–90.02	1990.03–90.08	1990.09–91.02	1991.03–91.11	1991.12–92.10
Band characteristics and the exchange rate (using daily data)						
Midband rate (NIS/basket)	1.95	2.07	2.19	2.41	2.55	—
Band width +/−(%)	3	3	5	5	5	5
Crawl of midband rate, annualized (%)	—	—	—	—	—	9
Average exchange rate	1.92	2.07	2.20	2.29	2.52	2.69
Average deviation of exchange rate from midband (%)	−1.51	−0.05	0.29	−4.88	−1.06	−1.45
Standard deviation from midband (%)	1.06	0.69	2.29	0.32	2.31	1.71
Interest rates (using weekly data, % per month)						
Average domestic interest rate (monetary auction rate)	1.07	1.12	1.15	1.09	1.19	0.91
Standard deviation of domestic interest rate	0.18	0.22	0.09	0.08	0.29	0.09
Average foreign interest rate (LIBID)[a]	0.71	0.71	0.71	0.69	0.58	0.50
Average interest differential (Israel-foreign)	0.36	0.40	0.43	0.40	0.61	0.41
Annualized average interest differential	4.42	4.95	5.31	4.85	7.61	5.06
Standard deviation of interest rate differential	0.20	0.21	0.09	0.07	0.30	0.08

(continued)

Table 6.10 (continued)

	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6 Crawling Band
	1989.01–89.06	1989.07–90.02	1990.03–90.08	1990.09–91.02	1991.03–91.11	1991.12–92.10
Inflation (using monthly data, % per month)						
Average domestic inflation rate (CPI)	1.11	1.01	1.34	0.88	1.47	0.66
Average foreign inflation rate (CPI)[a]	0.44	0.30	0.35	0.25	0.27	0.25
Average inflation differential (Israel-foreign)	0.67	0.71	0.98	0.63	1.19	0.41
Annualized average inflation differential	8.38	8.83	12.47	7.85	15.28	5.07
Standard deviation of inflation differential	0.07	0.15	0.04	0.02	0.12	0.28
Foreign currency reserves (nongold) (using monthly data, in millions of dollars per month)						
Average change in reserves	203	0	−28	238	−32	−96
Standard deviation of change in reserves	525	212	258	363	500	398

Sources: Bank of Israel; Central Bureau of Statistics, Israel.

[a]Weighted average, using Israel's currency basket weights. LIBID = London interbank interest on deposits.

key nominal anchor—a role that was now attributed to the preannounced central parity rate.

Figure 6.11 depicts the behavior of the nominal exchange rate of the NIS against the basket of foreign currencies under the band. It is evident that during the first months after the adoption of the band the exchange rate was positioned in the lower half of the band. This may have well been the result of market forces, but there is evidence that official intervention, aimed at avoiding inflationary pressures of currency depreciation, played a role in ensuring such an outcome. As domestic prices continued to increase at a higher rate than foreign prices, there were several realignments (i.e., upward adjustments, or devaluations, in the central parity rate) of the band with the objective of avoiding a deterioration in the less international competitiveness of exports. In fact, *there were five such realignments in less than two years!* (see table 6.10 and figure 6.11). Although these periodic adjustments of the central parity rate contributed to avoiding real exchange rate appreciation and were not accompanied by a rise in inflation, during the 1989–91 period, there was substantial uncertainty about the timing and size of these exchange rate adjustments. Increased uncertainty, lack of full credibility, and a buildup of expectations toward a realignment were associated with increases in the domestic-foreign interest rate differential, which then decreased after realignments. Figure 6.12 illustrates the important degree of interest rate volatility that was associated with this period. The increased speculative purchases of foreign currencies and increased domestic interest rates that were observed in Israel in anticipation of devaluations

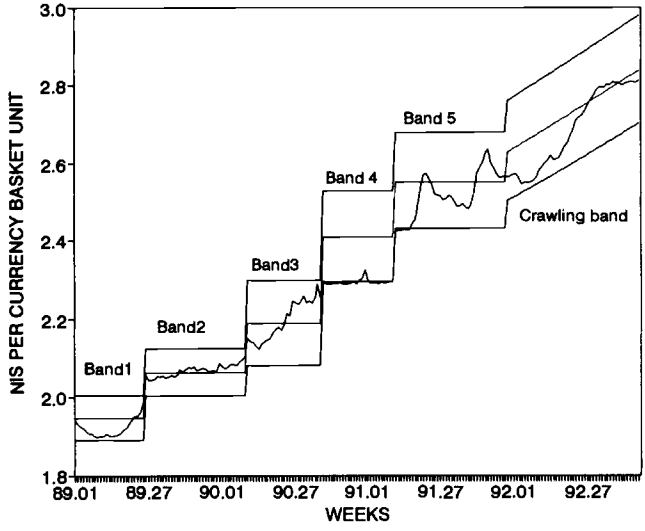

Fig. 6.11 Israel's exchange rate band
Source: Bank of Israel, Research Department database.

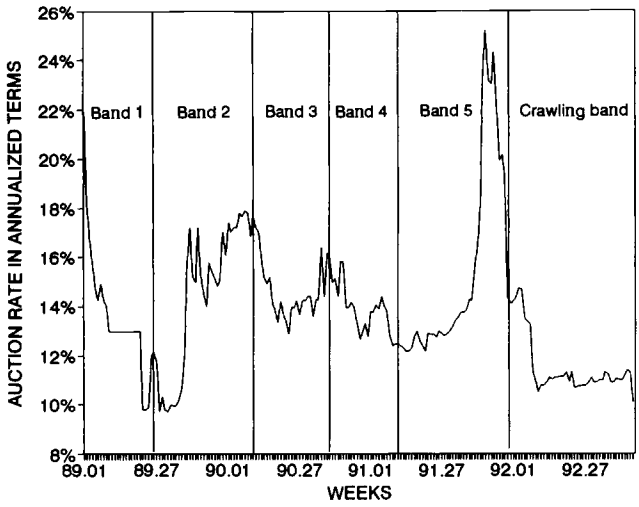

Fig. 6.12 Israel's monetary auction rate
Source: Bank of Israel, Monetary Department database.

are quite similar to those observed before realignments in Europe under the European monetary system (EMS); see Helpman and Leiderman (1992) for a comparison.[10]

The frequent realignments and speculative attacks, coupled with the increased volatility in interest rates that they induced, motivated a shift toward a third, and so far last, stage in exchange rate policy, the shift to a crawling band effected in December 1991. The adoption of a crawling central parity rate was seen as a more credible commitment than the earlier regime, and this rate was still assigned the role of a key nominal anchor. After making a 3% upward adjustment in the central parity rate, the authorities announced that the latter would not be fixed at a nominal value; instead, it would crawl daily at a preannounced rate of 9% per year.[11] It was hoped that such an annual nominal depreciation of 12% would be more than enough to prevent deterioration in the competitiveness of exports associated with a positive differential between domestic and foreign inflation. The crawling band is shown in figure 6.11. The main motivation for this regime was to reduce as much as possible the uncertainty about the size and timing of realignments of the central parity rate, and

10. See Pessach and Razin (1990) for an earlier empirical application of target zone models to Israel.

11. This crawling band differs from the one adopted in Chile in one important aspect: while Israel's band features a preannounced crawling path for the nominal central parity exchange rate, Chile's central parity rate is set within the year to accommodate differences between domestic and foreign inflation. Thus, Chile's system is more accommodative, and therefore could have a weaker stabilizing impact on inflation expectations, than Israel's. For a more detailed comparison of performance under these two systems, see Helpman and Leiderman (1992).

consequently to attempt to reduce the extent of domestic interest rate volatility. Indeed, the level and volatility of domestic interest rates were considerably reduced since the adoption of this new system (see fig. 6.12).

The experience accumulated thus far illustrates the costs and benefits of exchange rate–based stabilization. Fixing the exchange rate at the outset of the 1985 stabilization program played a key role in quick disinflation and served as a visible anchor to the nominal system and to inflation expectations. However, as long as domestic inflation does not reach world inflation levels, pressures arise for exchange rate adjustments in order to attenuate the degree of real exchange rate appreciation.[12] These adjustments, that is devaluations, give rise to serious policy dilemmas because of concerns with their possible destabilizing impact on inflation expectations and on increased interest rate volatility. While the shift to an exchange rate band allowed more day-to-day flexibility in exchange rate determination, it did not remove from the system the uncertainty about future realignments and therefore was also accompanied by substantial interest rate volatility. If credible, a crawling band system, such as the one adopted in December 1991, has the potential of reducing this interest rate volatility while at the same time avoiding a deterioration in the competitiveness of exports. Overall, with the benefit of hindsight, we conclude that the adoption of a fixed exchange rate at the beginning of the stabilization program played a major role in its success. However, we believe that beginning with 1988 there was room for a more flexible exchange rate policy, such as the adoption of a crawling exchange rate band, designed to prevent real appreciation and some of the increased unemployment.

6.4.2 Devaluation Expectations and the Exchange Rate Band

We argued that the observed level and volatility of domestic interest rates during the period 1989–91 can be related to expectations of realignments, or more broadly a lack of credibility of the existing exchange rate band. Under an exchange rate band, the domestic-foreign interest rate differential set at a point in time may reflect both expectations of exchange rate depreciation within the existing band, and expected realignments of the central parity rate (or devaluations). While expected depreciations within the band need not be equal to zero even under full band credibility, it is clear that nonzero expected devaluations do represent lack of full credibility. This section provides a quantitative assessment of these expectations, using a methodology similar to Svensson (1991).

At each point in time, the log of the spot exchange rate (s_t) can be expressed

12. In this context, Dornbusch has argued that "[t]he key issue then is to select the initial level of the exchange rate so that even with moderate inflation for a few months, the real exchange rate is not overvalued from the start. Moreover, very soon, exchange rate policy should shift from a fixed rate to a crawling peg to offset inflation differentials and maintain competitiveness. . . . But if the decision is postponed too long, the real exchange rate becomes starkly overvalued, and the program ultimately fails" (1991, 27).

as the sum of two components: the log of central parity (c_t) and percentage deviation from such central rate (x_t).[13] That is,

$$s_t \equiv x_t + c_t. \tag{1}$$

Accordingly, the percentage depreciation in the exchange rate from t to $t + 1$ can be expressed as the sum of exchange rate depreciation within the band and of the rate of realignment (defined as the percentage change in the central parity rate):

$$\Delta s_{t+1} \equiv \Delta x_{t+1} + \Delta c_{t+1}. \tag{2}$$

Taking expectations of both sides of equation (2) conditional on time t information yields an expression for expected exchange rate depreciation:

$$E_t \Delta s_{t+1} \equiv E_t \Delta x_{t+1} + E_t \Delta c_{t+1}. \tag{3}$$

That is, the expected total rate of depreciation equals the expected rate of depreciation within the band (i.e., $E_t \Delta x_{t+1}$) plus the expected rate of realignment (i.e., $E_t \Delta c_{t+1}$).

In order to make this equation operational, additional assumptions are required since all three variables are unobservable. Assuming that uncovered interest parity holds, the left-hand side of the above equation is equal to the domestic-foreign interest rate differential. While this assumption makes total expected depreciation observable, further assumptions are needed to decompose this depreciation into its two components. To do so, we assume that expectations of exchange rate depreciation within the band are approximated by a linear equation of the form

$$x_{t+1} - x_1 = \sum_{j=1}^{n} [\beta_{0j} d_j] + \beta_1 x_t + \varepsilon_{t+1}, \tag{4}$$

where d_j is a dummy for regime j (each period between realignments) and the $n + 1$ parameters to be estimated are β_{0j} for $j = 1$ to n and β_1. Assuming that the error term in this equation is orthogonal to the explanatory variables, these parameters can be estimated by least squares. Alternatively, the expected future exchange rate within the band may be estimated, as in equation (5). Clearly, the estimation of equation (5) is equivalent to the estimation of equation (4).

$$x_{t+1} = \sum_{j=1}^{n} [\gamma_{0j} d_j] + \gamma_1 x_t + \eta_{t+1} \tag{5}$$

The coefficients and error terms of (4) and (5) are related by $\gamma_{0j} = \beta_{0j}$, $\gamma_t = \beta_1 + 1$, and $\eta_{t+1} = \varepsilon_{t+1}$.

To summarize, using the interest differential for $E_t \Delta s_{t+1}$ and the fitted values from equation (4) or (5), we are able to construct a series for expected devalua-

13. We obviously assume that the log of one plus the percentage deviation of the exchange rate from the central parity is well approximated by such percentage deviation itself.

tion, which is equal to expected total exchange rate depreciation minus expected depreciation within the band (conditional on no realignment).

This procedure was implemented on weekly time series for Israel for the period of January 1989 through July 1992. The interest rate differential, $\delta_t = i_t - i_t^*$ is defined as the difference between the weekly Israeli monetary auction rate and a weighted basket (using the currency basket weights) of foreign treasury bill rates. The exchange rate used is Israel's currency basket. The number of band regimes is $n = 6$, where band number 6 is the crawling band regime that was described earlier. In all cases, we excluded from the sample all weeks in which a devaluation occurred. The estimation results using equation (5) are shown in table 6.11.

In addition, we considered expanding equation (5) to include a lag of the depreciation within the band, x_{t-1}, and nonlinear elements as explanatory variables. The modified equation is

$$x_{t+1} = \sum_{j=1}^{n} \gamma_{0j} d_j + \gamma_1 x_t + \gamma_2 x_t^2 + \gamma_3 x_t^3 + \gamma_4 x_{t-1} + \eta_{t+1}, \tag{6}$$

and the estimation results are shown in table 6.12.

Figure 6.13 describes the outcomes of these calculations. Despite the use of weekly data, the estimated version of equation (6) fits quite well the actual behavior of exchange rate depreciation within the band. The estimated expected rate of devaluation exhibits the following patterns. During the first band, there was a gradual decrease in devaluation expectations, which was reversed a few weeks before the end of the band, resulting in a buildup of expectations and increase in the domestic-foreign interest rate differential.

The second band exhibits positive expected devaluation throughout its existence, with a gradual upward trend until the next realignment. The third band shows an initial decrease in expected devaluation, followed by a sharp increase

Table 6.11 **Estimation Results of Equation (5)**

	Parameter Estimate	Standard Error
γ_{01}	−0.0016	0.0017
γ_{02}	0.0001	0.0011
γ_{03}	−0.0004	0.0031
γ_{04}	−0.0064	0.0031
γ_{05}	−0.0010	0.0017
γ_{06}	−0.0022	0.0017
γ_1	0.8700	0.0613
R^2	0.87	
D.W.	1.191	
N	180	
σ	0.0236	

Table 6.12 **Estimation Results of Equation (6)**

	Parameter Estimate	Standard Error
γ_{01}	0.0006	0.0008
γ_{02}	0.0002	0.0023
γ_{03}	0.0039	0.0006
γ_{04}	−0.0036	0.0008
γ_{05}	0.0006	0.0023
γ_{06}	0.0009	0.0006
γ_1	1.4374	0.2264
γ_2	−8.4456	3.0722
γ_3	−174.84	58.905
γ_4	−0.5003	0.2542
R^2	0.89	
D.W.	1.628	
N	180	
σ	0.0236	

in these expectations, also reflected in the interest differential. The shift to the fifth band was apparently unexpected. However, the shift to the sixth band was preceded by a speculative run on foreign currencies and by sharply increased expectations of devaluation. In this episode, these expectations were met with massive central bank intervention in the foreign exchange market, intervention that succeeded in bringing expected devaluation down subsequently. Thus, there was an important surprise element in the shift to a crawling band. During the first eight months of the new regime, no expectations of major devaluations arose.

To test for the joint credibility of the various bands, we estimated the following equation for expected devaluation:

$$\Delta\hat{c}_{t+1} = \alpha + \beta(\bar{e}_t - e_t). \tag{7}$$

Under the null hypotheses that the bands were credible, intercept = slope = 0, and the residuals ought to be white. Notice that we used the position of the exchange rate within the band as the main explanatory variable, as it appeared from figure 6.11 that there is a link between this variable and expectations of devaluation.[14] The estimation results of equation (7) are shown in table 6.13.

14. For a model that has such an implication, see Cukierman, Kiguel, and Leiderman (1992). We have conducted similar tests using monthly Israeli data and have found the qualitative results to be similar to those shown here. In addition, we have examined whether macroeconomic variables (such as the money supply, industrial production, the real exchange rate, and foreign reserves) can explain the expected rates of devaluation. We do so by adding macroeconomic variables to the right-hand side of equation (7) as explanatory variables. We find the main results are unchanged: the value of the parameter β is unchanged, the constant remains significantly higher than zero, and there is evidence of serially correlated errors. For a comparison of these results

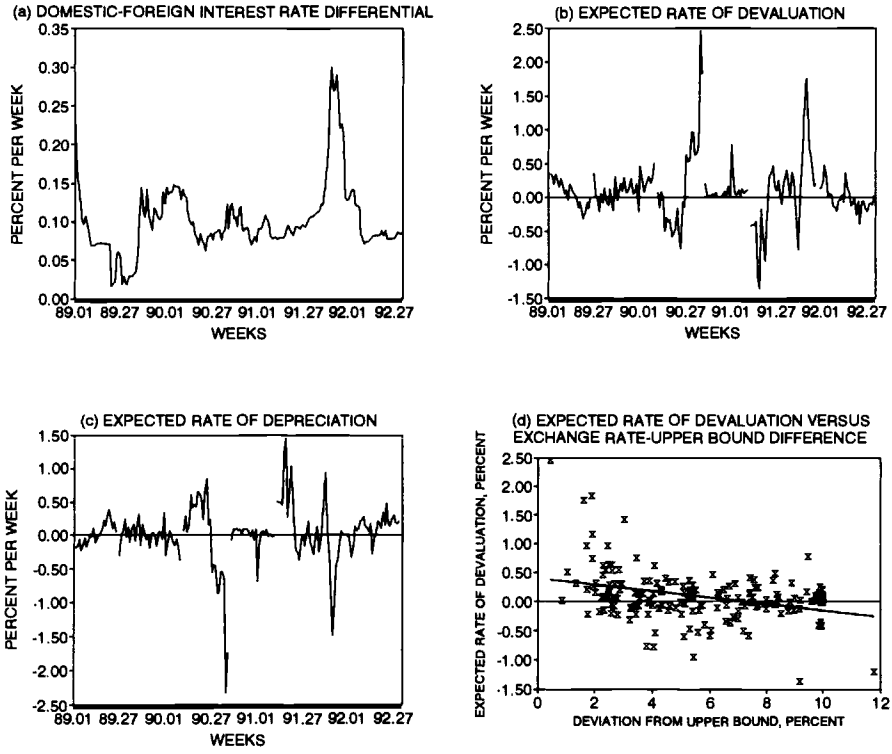

Fig. 6.13 Elements of devaluation expectations

Source: For *a*, Bank of Israel, Research Department database.

Note: Weekly data, January 1989 through July 1992. Breaks in data indicate a devaluation.

The results indicate an important degree of lack of credibility of exchange rate bands.[15] Lack of credibility shows in that the intercept and slope coefficients are significantly different from zero, and the residuals are serially correlated. The sample mean for expected devaluation throughout the total sample period and each of the various bands is shown in table 6.14. Figure 6.14 presents the expected rate of devaluation with 95%-significance confidence intervals for zero devaluation expectations within each band.

We conclude that, although the adoption of exchange rate bands in 1989 was an important step in making exchange rate policy more flexible, the fixity of the central parity rate in each band was not considered credible by market participants. This was reflected in the behavior of expected devaluation and in

with results of other countries with unilateral bands (such as Finland, Norway, Sweden, and Chile), see Bufman, Kiguel, and Leiderman (1992).

15. This confirms the conclusions of Helpman and Leiderman (1992) using less formal methods.

Table 6.13 **Estimation Results of Equation (7)**

	Parameter Estimate	Standard Error
α	0.0041	0.0001
β	−0.0554	0.0140
R^2		0.12
D.W.		0.558
N		180
σ		0.0044

Table 6.14 **Mean of Expected Rate of Devaluation (% per week)**

Period	Mean	t-Statistic of Mean
Total period	0.08	2.568
Band 1	0.06	1.511
Band 2	0.11	3.657
Band 3	0.19	1.266
Band 4	0.09	2.925
Band 5	0.07	0.716
Crawling band regime	−0.01	−0.401

interest rate volatility. These considerations certainly played an important role in the transition toward a band regime with a crawling central parity rate, like the one adopted in December 1991.

6.4.3 Real Exchange Rate Appreciation and Exports

As shown in section 6.2, inflation stabilization was accompanied by substantial appreciation of the real exchange rate and by a shift of resources toward the nontraded sector. Thus, it was argued that these developments discouraged production and entry of firms into the exports sector, which shared a sizable burden in exchange rate–based stabilization. While these arguments have their merits, it is difficult to determine how much of observed real exchange rate appreciation was due to the nominal exchange rate policy per se and how much was due to fundamentals. In any case, the purpose of this section is to take a new look at the relation between real exchange rate appreciation and exports, controlling for other factors that may affect exports as well.

Specifically, we estimate here a reduced-form equation for the rate of growth of exports of industrial goods as a function of the rates of growth of the real exchange rate, world imports, the real wage per labor hour in industry, and the real ex post interest rate in industry. We used quarterly data expressed as annual rates of growth (except for the interest rate). We focused on industrial exports excluding diamonds, and examined their statistical relation to fluctuations in the real interest rate, the real cost of labor, real effective exchange rate, and an external impulse (world imports). The real interest rate applied here is a

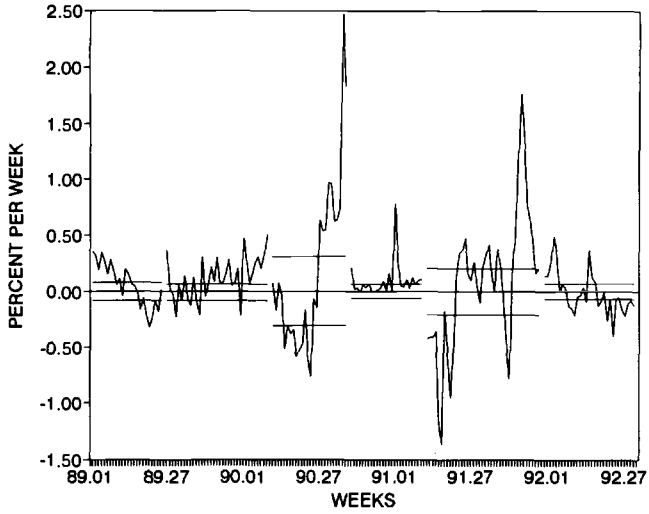

Fig. 6.14 Expected rate of devaluation
Note: Horizontal lines mark 95%-significance confidence intervals of zero devaluation expectations. Breaks in data indicate a devaluation.

weighted average of the following four rates (using the relevant weights for industry in each period): credit in NIS allocated by the government (i.e., directed credit), directed credit in foreign currency, credit obtained in the free market (i.e., nondirected credit) in NIS, and nondirected credit in foreign currency. Ex post real interest rates were obtained by subtracting the rate of change in the wholesale price of industrial outputs (WPI) from these calculated effective nominal interest rates. The cost of labor in the industrial sector was measured by the cost of labor per work hour in industry. This measure includes wages, salaries, and other labor expenses in industry. The real effective exchange rate is used as an indicator of the relative prices of industry in Israel vis-à-vis those of Israel's main trade partners and as a partial measure of profitability in the industrial sector. The real exchange rate was computed by deflating the exchange rate of the NIS against the currency basket by the WPI in Israel and the countries represented in the currency basket. The foreign WPI is a weighted average of the WPIs in the United States, France, Germany, the United Kingdom, and Japan. In order to get the real effective exchange rate relevant to the industrial sector, export subsidies were taken into account. The ratio of subsidies to industrial exports compared to the value of industrial goods exported was computed and applied to the real exchange rate.

In order to focus on real fluctuations, the dollar value of the industrial exports (excluding diamonds) was deflated using the correspondence export price index as shown in Israel's trade statistics. The export function that was estimated is:

$$(8)\quad DEXPORT_t = \beta_0 + \beta_1 DWORLD_t + \beta_2 DRER_{t-1} + \beta_3 DWAGE_t + \beta_4 DINT_t,$$

where $DEXPORT_t$ = [(industrial exports)$_t$]/[(industrial exports)$_{t-4}$] − 1; $DWORLD_t$ = [(world imports)$_t$]/[(world imports)$_{t-4}$] − 1; $DRER_{t-1}$ = [(real exchange rate)$_t$]/[(real exchange rate)$_{t-4}$] − 1; $DWAGE_t$ = [(labor costs per hour in industry)$_t$]/[(labor costs per hour in industry)$_{t-4}$ − 1; and $DINT_t$ = [(real interest rate (industry))$_t$] − [(real interest rate (industry))$_{t-4}$] − 1. All variables are expressed in real terms. Equation (8) was estimated using quarterly data from first quarter 1979 to fourth quarter 1990.

In order to insure the heteroskedasticity and autocorrelation consistency of the covariance matrix during the estimation of equation (8), we used Parzen's lag window approach (this technique and similar ones such as Newey and West [1987] are discussed in Andrews [1991]). The interpretation of the coefficients is as follows: β_1 is the reduced-form elasticity of export growth with respect to world import, β_2 is the elasticity with respect to the real exchange rate, β_3 is the elasticity with respect to wages in industry, and β_4 is the reduced-form elasticity with respect to the real interest rate in industry. Notice that the real exchange rate was entered with a lag. The use of four differences is motivated by the notion that the impact of world demand or real exchange rate on exports is effected with lags, and by the attempt to remove seasonality from our calculations. The results are shown in table 6.15.

Our results indicate that the rate of growth of world imports has a significant positive coefficient, as does the rate of change of the real exchange rate. The elasticity of exports with respect to world demand is estimated at 1.861, and its 95%-confidence interval is (0.629, 3.093). The estimated elasticity for the real exchange rate is 0.857 and its confidence interval is (0.216, 1.499). These elasticities fall in the range of previous export function estimates for Israel. The coefficients on the remaining variables (i.e., real wage and real interest rate) are not precisely estimated.

Table 6.15 **Estimation Results of Israeli Export Equation (8) (industrial exports, excluding diamonds)**

	Parameter Estimate	Standard Error
β_0	−0.0232	0.0532
β_1	1.8610	0.6164
β_2	0.8575	0.3206
β_3	0.0607	0.2925
β_4	−0.0345	0.1651
R^2	0.77	
N	43	
σ	0.1507	

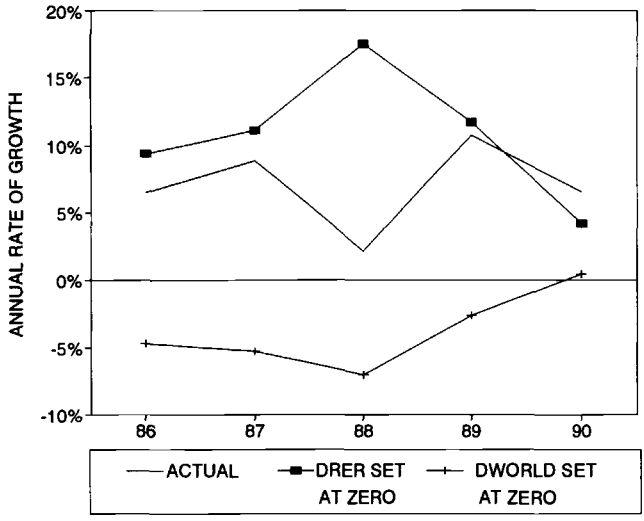

Fig. 6.15 Industrial exports: actual and simulated values
Note: The simulated values are based on the estimation results of equation (8) while alternately holding the real exchange rate and world imports at their values at the start of the stabilization program. Quarterly simulated values are accrued to create the annual projections shown.

To assess the relative importance of world demand and real exchange rate in the performance of exports over the sample period, we used the coefficients of equation (8) to simulate the behavior of the rate of growth of exports under various scenarios. The simulation is given in figure 6.15, which includes three elements: (1) the actual rate of growth of exports expressed in annual terms; (2) the predicted rate of growth of exports under the restriction that the real exchange rate is fixed at its value at the start of the program—which isolates the impact of world demand on Israeli exports over the sample; and (3) the predicted rate of growth of exports under the assumption that there is no change in the level of world demand—thus capturing the separate effect of real exchange rate fluctuations. Due to the existence of a regression residual, the simulated paths do not exactly sum up to the actual path. From the figure, two types of patterns are evident. First, from 1986 to 1987 and from 1989 to 1990, the rate of growth of exports moved in the same direction as that of world demand. In the former period, exports expanded (along with expansion of world demand), and in the latter period, the rate of growth of exports decreased along with world recession. Second, from 1987 to 1989, the rate of growth of exports moved in the same direction as the real exchange rate. That is, it decreased along with a more pronounced real exchange rate appreciation.

Although the estimated relations allow for one-year lags, it is well to examine whether longer lags and more complicated dynamics show up in the data as well. To deal with this issue, we estimated bivariate vector autoregressions

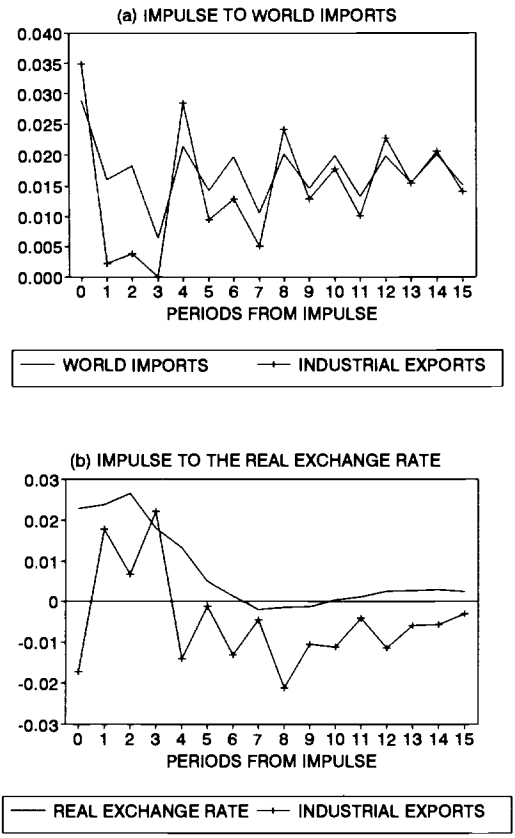

Fig. 6.16 Response of industrial exports to a one-standard-deviation shock of (a) world imports and (b) the real exchange rate

Notes: The vector autoregressive system estimated is a bivariate log-log system with four lags:

$$\ln(EXP_t) = \text{const} + \sum_{i=1}^{4} \{[\beta_i \ln(EXP_{t-i})] + [\gamma_i \ln(x_{t-i})]\}.$$

In panel *a*, x is world imports, and in panel *b*, x is the real exchange rate. The system was estimated using quarterly data of the Israeli economy from first quarter 1979 to first quarter 1990.

for the rate of growth of exports and the rates of growth of world demand and the real exchange rate using four lags for each variable. Figures 6.16 and 6.17 depict the dynamic effects of real exchange rate and world demand shocks on exports, in the form of impulse response functions. The evidence indicates that the most important effects operate with a one-period lag, and that indeed real exchange rate depreciation and increased world demand are associated with higher rate of growth of exports.

Overall, the foregoing findings indicate that the behavior of exports after the

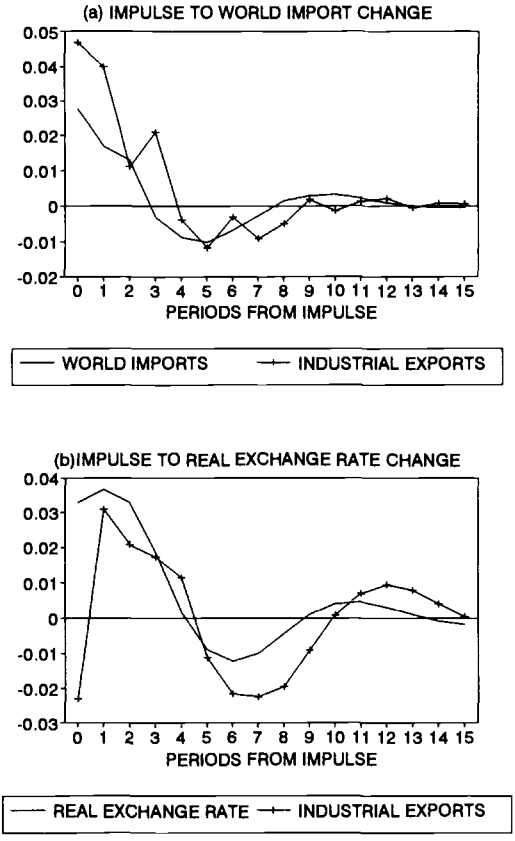

Fig. 6.17 Response of industrial export *growth* rate to a one-standard-deviation shock of (a) the rate of world import growth and (b) the rate of real exchange rate change

Notes: The vector autoregressive system estimated is a bivariate system with four lags, applied to annual rates of growth:

$$\left(\frac{EXP_t}{EXP_{t-4}} - 1\right) = \text{const} + \sum_{i=1}^{4} \left\{\beta_i \left(\frac{EXP_{t-i}}{EXP_{t-4-i}} - 1\right) + \gamma_i \left(\frac{x_{t-i}}{x_{t-4-i}} - 1\right)\right\}.$$

In panel *a*, x is world imports, and in panel *b*, x is the real exchange rate. The system was estimated using quarterly data of the Israel economy from first quarter 1979 to first quarter 1990.

1985 stabilization program cannot be attributed solely to fluctuations in the real exchange rate; changes in world demand played an important role as well. However, the partial impact of the real exchange rate on exports was negtive for most of the sample period, thus capturing the effect of the marked real appreciation observed during the sample period. Whether such real appreciation was avoidable, and whether it was the result of nominal exchange rate

policy per se or of underlying fundamentals, are important issues whose resolution must await further research.

6.5 Conclusions

In assessing the main lessons from Israel's disinflation, and the applicability of similar stabilization programs to other economies, this paper draws two main conclusions. First, in countries where the initial conditions in terms of investment and growth are not strong, the adoption of policy measures aimed at increasing the stock of public sector capital, especially infrastructures, right at the time of stabilization may well contribute to acceleration of transition from stabilization to growth. In this context, Israel's program embodied no specific direct policy measures aimed at reversing this state of affairs, and we argued that this may have played an important role in the lack of fast transition to growth after disinflation.

Second, any exchange rate–based stabilization faces the issue of how and when to relax exchange rate targets and to adapt them to changing economic conditions without losing their value as key nominal anchors. We found that Israel's adoption of an exchange rate band in 1989 was an important step in making exchange rate policy more flexible. Yet as domestic inflation continued to exceed foreign inflation, the fixity of the central parity rate in each band was not considered credible by market participants. Under these circumstances, it may be most appropriate to shift to a band regime with a preannounced crawling central parity rate, like the one adopted in December 1991.

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Comment on Chapters 5 and 6

José De Gregorio

The two papers presented in this session are very interesting and cover a wide range of issues. In my discussion I want to focus on three issues raised by the authors: the relationship between inflation and income distribution, the evolution of consumption after the Israeli stabilization, and exchange rate management.

Inflation and Income Distribution

The paper by Cardoso, Paes de Barros, and Urani (CPU henceforth) presents time series evidence on the role of macroeconomic conditions on income distribution in Brazil. After a detailed review of the evidence for the six largest metropolitan areas of Brazil, they conclude that inflation and unemployment have had a negative impact on income distribution. In addition, they argue that, although an unequal education distribution may be an important cause for inequality, it is not important in explaining the evolution of inequality during the 1980s.

The data used by CPU correspond to the distribution of labor earnings; hence, the authors conclude that the data capture only the effects of inflation on income distribution stemming from imperfect wage indexation. That is, wages of high-income people appear to be more protected from inflation (through indexation) than those of the poor.

Given that indexation and other forms of protection of labor earnings from inflation usually appear in countries that have experienced at least two-digit inflation, one may wonder whether CPU's finding applies to other countries.[1]

To examine this issue, I present some empirical evidence on the relationship between income distribution and inflation in a cross section of countries. The sample consists of forty-six countries, where data on income distribution are available for the 1960s and 1980s.

The first specification reported below has as dependent variable an index of inequality (*INEQ80*). This index is constructed as the ratio between the share of income earned by the richest 20% of the population and the share of income earned by the poorest 20% of the population. The year for each data point is different, but the data are centered on 1980. The secondary school enrollment ratio in 1960 (*SEC60*) was used to capture the effects of the distribution of education. Although this index does not compare enrollment ratios at different education levels, it is a good proxy for education distribution because it represents an intermediate stage in the educational process. Inflation is another explanatory variable and is measured as the logarithm of the average inflation

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1. Blejer and Guerrero (1990) find similar results for the Philippines.

rate from 1960 to 1985 (*LINF*). Finally, dummy variables for Latin America and Africa (*LAMER* and *AFRICA*) were included to control for cultural, institutional, and other factors that were excluded in the regressions and that could account for the fact that income distribution in these regions is worse than in the rest of the world. This regression can be interpreted as the effect that education, inflation, and continental characteristics have on the long-run level of equality. The result for the sample of forty-six countries is (t-statistics in parentheses).[2]

$$\begin{aligned}(1)\qquad \text{INEQ80} = {} & 9.966 + 0.123\ \text{LINF} - 6.535\ \text{SEC60} \\ & \quad (3.32) \qquad (0.12) \qquad\quad (-1.70) \\ & + 10.73\ \text{AFRICA}, + 10.66\ \text{LAMER}, \\ & \quad\ (3.71) \qquad\quad (5.21)\end{aligned}$$

$R^2 = 0.61$, $N = 46$. The result for the sample excluding Latin American countries is

$$\begin{aligned}(2)\qquad \text{INEQ80} = {} & 10.30 - 0.108\ \text{LINF} - 6.133\ \text{SEC60} \\ & \quad (4.73) \qquad (-0.14) \qquad\quad (-2.78) \\ & + 10.84\ \text{AFRICA}, \\ & \quad\ (6.71)\end{aligned}$$

$R^2 = 0.74$, $N = 36$.

The overall fit of the regressions is good. They explain over 60% of the variability of income distribution across countries. Three main conclusions emerge from these results. First, education distribution, measured by *SEC60*, is an important determinant of income distribution in the long run. Second, after controlling for education, the level of inequality in Latin America and Africa is greater than in the rest of the countries of the sample. Third, inflation performance has no effect on the level of inequality.[3]

The finding that inflation is not important to whether a certain country has relatively better or worse income distribution does not necessarily imply that inflation has no effects on inequality. In fact, what CPU's results suggest is that the improvement or deterioration of income distribution depends on the rate of inflation. That is, *changes in income distribution are correlated with inflation.* The following two regressions look at this correlation by regressing the change in inequality between 1980 and 1960 ($\Delta INEQ = INEQ80/INEQ60$) on the logarithm of the rate of inflation, the change is secondary school enrollment

2. The data sources are as follow: *INEQ80*, Larraín and Vergara (1992): *INEQ60* (same variable as *INEQ80* but centered on 1960), Alesina and Perotti (1992); *LINF*, International Financial Statistics (to eliminate outliers in inflation, which distort the average rate of inflation for the whole period 1960–85, the observations for Argentina and Bolivia in 1985 and Chile in 1974 were eliminated); *SEC60* and *SEC85;* Barro and Wolf (1989).

3. The results are robust to the use of secondary school enrollment ratio in 1970 and inflation between 1970 and 1985. In addition, when Gini coefficients were used as proxies for inequality, the significance of *SEC60* increased, and inflation remained not significantly different from zero.

ratios during a similar period ($\Delta SEC = SEC85/SEC60$), and the continental dummies, for the full sample and the sample that excludes Latin American countries:[4]

$$\begin{aligned}(3)\qquad \Delta INEQ = {} & 0.573 + 0.186\,LINF - 0.041\,\Delta SEC \\ & \quad (2.02) \quad (1.60) \qquad (-0.71) \\ & + 1.692\,AFRICA + 0.499\,LAMER, \\ & \quad (2.40) \quad (2.17)\end{aligned}$$

$R^2 = 0.42$, $N = 40$; and

$$\begin{aligned}(4)\qquad \Delta INEQ = {} & -0.094 + 0.489\,LINF - 0.028\,\Delta SEC \\ & \quad (-0.27) \quad (3.19) \qquad (-0.53) \\ & + 1.589\,AFRICA, \\ & \quad (2.50)\end{aligned}$$

$R^2 = 0.42$, $N = 31$.

The results show that inflation leads to increased inequality and that changes in education do not explain the changes in inequality. The result excluding Latin America is even stronger,[5] suggesting that this correlation is not caused by the presence of high-inflation countries. Thus, the evidence reported here suggests that the negative effects of inflation on the change in income distribution is not particular to Brazil or high-inflation countries. However, this evidence should be considered preliminary for at least two reasons. Since data on income distribution have serious problems that make comparisons difficult across countries and over time, this evidence, although suggestive, has to be considered preliminary. More work will have to be done to establish the robustness of the results presented above.

Stabilization and Consumption Boom

Bufman's and Leiderman's paper provides a nice description of the stabilization program in Israel, and draws some important policy lessons. One interesting fact that they report is the existence of a consumption boom at the onset of the program and a posterior recession. This evolution of consumption is not particular to Israel, and as reported by Kiguel and Liviatan (1992) is a common phenomenon in some other episodes, in particular in exchange rate–based stabilizations. Moreover, the consumption boom appears to be followed almost inevitably by a recession. This consumption cycle, however, is not observed in money-based stabilizations. The hypothesis that has received most attention is so-called temporariness. This hypothesis, advanced by Calvo (1986), suggests that the lack of credibility on the sustainability of the low inflation rate will,

4. Another rationale for using the change of inequality rather than the level as dependent variable is that inequality indices are not comparable across countries, since they come from different sources and are constructed using different methodologies.

5. In regression (3), *LINF* is only significant at 12%. The results were the same when the change in the Gini coefficients were used instead of the ratio between the extreme quintiles. However, in that case, *LINF* was significant at 5% and 10% in all of those regressions.

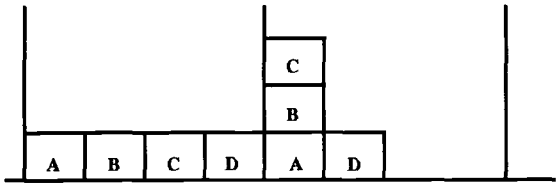

Fig. 6C.1 Consumption of durables

through intertemporal substitution, lead individuals to anticipate consumption. The mechanism is the temporary reduction of the effective price of consumption goods (through a decline in the nominal interest rate). Bufman and Leiderman find this explanation unsatisfactory because it requires a decline in the real interest rate, which was not the case in Israel. Furthermore, one can argue that in the case of Israel there were no expectations that the plan would be unsuccessful (Bruno, 1993). Indeed, the expectations that Israel's stabilization would fail would have turned out to be wrong, since the reduction of inflation has lasted for more than seven years.

I want to present another explanation for the consumption cycle associated with exchange rate–based stabilizations. It is based on the observation that most of the rise in consumption occurs in the category of durables (Dornbusch 1986; Drazen 1990).[6]

An important characteristic of durable goods is that they are indivisible and, therefore, bought infrequently. In addition, the purchase of durable goods involves transaction costs. Now, consider an economy consisting of four consumers (fig. 6C.1), each of them buying a unit of durable goods every four periods, but at different times. Thus, discrete purchases at the individual level appear as smooth behavior of consumption of durables at the aggregate level.

Now assume that an exchange rate–based stabilization is implemented. Contrary to money-based stabilizations, exchange rate–based stabilizations generally induce positive wealth effects, at least in the short run. This wealth effect may be caused by several mechanisms, for example, the expectation of higher income as the result of the return to stability; the relaxation of liquidity constraints as a consequence of the increase in real wages, disposable income, and the supply of banks' credit; and the reduction of interest payments stemming from the reduction of the nominal interest rate. The wealth effect will cause an expansion of both durable and nondurable consumption goods, but what drives the consumption cycle (a boom followed by a recession) is the change in the timing of consumption of durables. In contrast, in money-based stabilizations, the slow adjustment of prices and the consequent contraction of real balances leads to an immediate reduction of output.

6. This explanation is developed formally in De Gregorio, Guidotti, and Végh (1992), from which the following discussion is based. That paper also presents additional evidence on the consumption cycle in exchange rate–based stabilizations.

Individuals' reaction to a wealth shock will be to anticipate the purchase of the next durable good, and to buy a more expensive one. For simplicity, consider the case illustrated in figure 6C.1, where individuals A, B, and C decide to buy a new durable at the onset of the stabilization, while D will wait for one period, since she bought a new durable good just before the stabilization. The behavior of the economy will be quite different after the stabilization. There will be a consumption boom followed by a recession. This explanation appears to be consistent with the evolution of consumption of durables in Israel as well as in other stabilization programs.[7]

Understanding the evolution of consumption is important not only at the theoretical level, but also in terms of policy implications. If the consumption cycle were the result of lack of credibility, the slowdown of consumption would be an indication that, at least from the public's point of view, the program is close to the end. In contrast, if the consumption cycle were the result of a dynamic in consumption of durables as described above, the consumption slowdown would not imply that the stabilization is at risk.

Using the Exchange Rate to Stop Inflation

Perhaps the most important lesson we learned from the stabilization in Israel is the need for flexibility in the exchange rate policy. Although the exchange rate was chosen as the nominal anchor, the authorities kept the option of adjusting the exchange rate whenever necessary. This is an important element, since a real appreciation is an inevitable consequence of exchange rate–based stabilizations. By not basing the success of the stabilization on having an irrevocable fixed exchange rate, the Israeli authorities were able to adjust the nominal exchange rate to protect competitiveness and to defend the program against the main threat to an exchange rate–based stabilization: the unsustainability of the current account.

It seems there is broad agreement that the first stage in a stabilization should reduce the rate of inflation from three digits to, say, 20%. Attempts to achieve one-digit inflation in a short period of time may be unsustainable in the medium term. Once a moderate rate of inflation has been achieved, on a permanent basis, the focus should be on the recovery of competitiveness, and then the more ambitious objective of bringing inflation down to one digit should be pursued. The adoption of an exchange rate band with the central parity following a crawling peg is a good solution during moderate inflation.

Although I agree that it is better to have crawling rather than jumping central parity (such as the case of Israel during the period 1989–91), the evidence provided by Bufman and Leiderman to support this conclusion is not convincing. The main piece of evidence presented in the paper is the estimation of devaluation expectations in the period of fixed central parities. They argue that

7. Allowing for idiosyncratic shocks, the economy will converge to a steady state where the consumption cycle vanishes (see Caballero and Engel 1992).

the central parities were not credible and that lack of credibility resulted in increased interest rate volatility.

The problem with Bufman's and Leiderman's interpretation is that the authorities did not announce that the central parity would remain unchanged; hence, there is no issue of credibility involved (in contrast, for example, with the functioning of the European Monetary System). They estimate expectations of realignment, but not credibility of a certain policy. Moreover, it could be argued that the public quite accurately predicted the realignments because it knew the implicit policy followed by the authorities. In this case, however, the conclusion that the operation of the band introduced excessive (in the sense of undesirable) volatility is not warranted.

Finally, another puzzling result of the estimations is that during some weeks there were *expectations of revaluation* of the central parity (most notably right after the fourth realignment!), which seems to be inconsistent with the perception that the real exchange rate was appreciating from some equilibrium level. Perhaps analyzing more carefully some of the assumptions used to derive the estimated regression, such as the assumption of uncovered interest parity, or the approximation used to estimate expectations, may help better understanding of the operation of exchange rate bands.

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