Capital Mobility:
Evidence from Sri Lanka

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The paper examines the degree to which financial deregulation has contributed to increased international capital mobility in Sri Lanka. In fulfilling this objective the empirical validity of three tests are examined: the Feldstein-Horioka (1980) model; the Sachs (1981, 1982) approach to the savings–investment relation; and the Shibata-Shintani (1998) model. The Shibata-Shintani model is further investigated by relaxing the assumption of a constant real rate of return. Overall evidence points to an increase in capital mobility in the postderegulation period suggesting an enhanced role of the exchange rate in the monetary transmission process.

I. INTRODUCTION

Sri Lanka deregulated its financial system in 1977 through reforms aimed at increasing the role of the market mechanism. The dismantling of restrictions with respect to external trade and payments constituted a key element of the reform process.[1] Given that Sri Lanka was the first among the South Asian economies to liberalize its economy, it provides a particularly interesting case for an investigation of capital mobility.

In satisfying this objective, the empirical validity of three tests is examined. The first is the test advanced by Feldstein and Horioka (1980), which examines the correlation between domestic savings and investment. The second is the approach to the savings–investment relationship advanced by Sachs (1981, 1982). The third is a measure of international capital mobility, suggested by Shibata and Shintani (1998), based on the correlation between a country's consumption and net output. This model is also tested by relaxing the assumption of a constant real rate of interest.

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[1]Among other policy measures introduced were the unification of the exchange rate, adoption of a managed float, upward revision of interest rates, reduction of directed credit, introduction of prudential regulations of banks and finance companies, and strengthening of debt recovery legislation.

Contrary to expectations, empirical tests on capital mobility have consistently failed to validate theoretical predictions.[2] Feldstein and Horioka found a high correlation between domestic savings and investment for a sample of 16 OECD countries, which implied that there were significant imperfections in the international capital market. This subsequently gave rise to two further questions: the persistence of a strong positive correlation between savings and investment for developed countries (see Feldstein 1983, and Penati and Dooley 1984), and a higher savings investment correlation for developed rather than developing countries (see Fieleke 1982; Dooley, Frankel, and Mathieson 1987; Wong 1990). For this reason, the Sachs approach and the Shibata Shintani model are also tested for Sri Lanka.

The rest of this paper is organized as follows. Section II presents the Feldstein-Horioka, Sachs, and Shibata-Shintani tests of capital mobility. Section III outlines the empirical models. Section IV provides an overview of capital account liberalization in Sri Lanka. Section V presents the data. Section VI evaluates the empirical results relating to the tests of capital mobility. Section VII summarizes the conclusions.

II. TESTS OF CAPITAL MOBILITY

A.   The Feldstein Horioka Model

Feldstein and Horioka (1980) put forward a test of capital mobility based on the correlation between a country's level of domestic savings and investment. They argue that, with greater capital mobility, the level of investment in a country need not be constrained by the level of domestic savings, as any discrepancy can be financed by foreign savings. It follows from this that the correlation between domestic savings and investment is zero with perfect capital mobility, and that savings equals investment in the case of capital immobility.

Using data from 1960-1970, Feldstein and Horioka ran a regression of the investment ratio on the savings ratio for a cross section of 16 OECD countries. The regression was also run with the sample period divided into three subsamples. The coefficient on savings was in the range of 0.94 and 0.83 for the four sample periods examined, pointing to the conclusive rejection of perfect capital mobility. Contrary to theoretical predictions, data revealed almost a one-to-one increase in the domestic savings ratio in response to an increase in the domestic investment ratio. Feldstein (1983), extending the sample period to cover the 1974-1979 period, found support for the previous findings of Feldstein and Hori-

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[2]Feldstein and Horioka (1980); Feldstein (1983); Dooley, Frankel, and Mathieson (1987); Bayoumi (1990); and Golub(1990) among others, found a significant positive correlation between savings and investment.

oka, with the coefficients on the savings ratio ranging from 0.78 to 0.99 for all the sample periods studied. Their findings were subsequently confirmed by many others—Dooley, Frankel, and Mathieson (1987); Penati and Dooley (1984); Frankel (1986); Bayoumi (1990); Golub (1990); and Kim (1993).[3] Vredin and Warne (1991) and Krol (1996), however, found some support for the theory.

The savings investment relationship was examined from a different perspective by Sachs (1981), who defined the difference between savings (S) and investment (I) as the current account balance. According to him, investment had a negative impact on the current account balance under conditions of capital mobility because higher domestic investment would lead to greater international borrowing and hence a higher current account deficit. Regressing the current account balance (CA) on the investment ratio, Sachs found a significant negative relationship between the current account and investment ratios for a cross-section of 14 OECD countries for the 1960-1979 period. In regressions of $\Delta(CA/GNP)$ on $\Delta (I/GNP)$ and $\Delta (S/GNP)$, respectively, for the period 1968-1979, the regression coefficient on the change in investment rate was –0.61, while the estimated coefficient on the change in the savings rate was –0.34, establishing a significant negative correlation between investment and the current account balance (see Sachs 1981, 250, Table 14). These findings were in contrast to those of Feldstein and Horioka.

More recently, Shibata and Shintani (1998) put forward a measure of capital mobility based on the correlation between a country's consumption and net output. They employ the permanent income model of Campbell and Mankiw (1989, 1990, 1991). The intuition underlying this model is that under conditions of perfect capital mobility, changes in consumption should be uncorrelated with predictable changes in net output. Estimating the model for a sample of 11 OECD countries, they concluded that capital mobility appeared to be greater in countries that had previously maintained capital controls than in those that had not.

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[3]This puzzle has been explained by way of institutional and legal restrictions (Feldstein and Horioka 1980); population growth, income growth, terms of trade shocks (Obstfeld 1986 and Summers 1988); nontraded consumption goods, immobile factors of production (Frankel 1986, Murphy 1986, Wong 1990); and government policy (Summers 1988 and Bayoumi 1990).

III. EMPIRICAL MODELS

The three models are summarized below.

Feldstein-Horioka (1980) Model	$(I/Y)_t = \alpha + \beta\,(S/Y)_t$ $\beta = 0$: perfect capital mobility $\beta = 1$: zero capital mobility
Sachs (1981) Model	$(CA/Y)_t = a + b\,(I/Y)_t$ $b = -1$: perfect capital mobility
Shibata-Shintani (1998) Model	$\Delta C_t = \quad \Delta C_t = (1 - \lambda)\,e_t + \lambda\,\Delta X_t$ $\lambda = 0$: perfect capital mobility $\lambda = 1$: zero capital mobility

where Y = gross domestic product, I = gross domestic investment, S = gross domestic savings,
C = private consumption, CA= the current account and X = Y – I – G = the country's net output.

Shibata and Shintani assume that the real rate of interest is constant. Michener (1984), however, points out that consumption could appear sensitive to income due to variation in real interest rates through time, despite the intertemporal optimization by agents in the absence of borrowing constraints. The study, therefore, also investigates the model permitting for changes in the real rate of interest. Relaxing the assumption of a constant real interest rate the model can now be written as (see Campbell and Mankiw 1990, 1991):

$$\Delta C_t = (1 - \lambda)\,[\,e_t + \delta r_t\,] + \lambda\,\Delta X t$$

The existence of a statistically significant real interest rate could imply that the ex ante real interest rate is associated with the growth rate of consumption.

IV. CAPITAL ACCOUNT LIBERALIZATION IN SRI LANKA

Prior to 1977, Sri Lanka's financial system was characterized by administered interest rates, ceilings on the level of credit, lending to priority sectors and public sector ownership, and control of financial institutions. Barriers to trade and international capital movements restricted competition in the local financial market by discouraging the entry of foreign investment. In 1977 the financial system was deregulated and the entire interest rate structure was revised upward in an attempt to ensure positive interest rates that reflected market conditions. A number of measures were taken to encourage foreign direct investment into the country. An investment promotion zone was set up to attract foreign investment on projects producing for export, and a statutory authority, the Greater Colombo Economic Commission (GCEC), now named the Board of Investment (BOI), was

set up to develop the infrastructure and manage the zone. The projects located in the zone were entitled to a number of fiscal incentives, including 100 percent foreign ownership in investment projects, tax holidays, and preferential tax rates of 15 percent for 15-20 years, duty-free import of machinery and raw material, and unrestricted repatriation of profits. As at the end of 1996, the total potential capital investment in these projects stood at Rs.631,588 million, of which 83 percent was foreign investment, while realized investment in BOI industries was Rs.91,622 million, of which foreign investment accounted for 67 percent. Commercial banks were permitted to set up Foreign Currency Banking Units (FCBUs) in 1979, with the aim of developing an offshore market in Sri Lanka. In 1980, commercial banks were permitted to open nonresident foreign currency (NRFC) accounts. Sri Lankans employed abroad and non-nationals could maintain NRFC accounts in designated foreign currencies. From 1991, residents were permitted to operate resident foreign currency (RFC) accounts with a minimum balance equivalent to $US500 in designated currencies. The attempts at reform slowed down significantly after 1982, due to fiscal imbalances. In 1990, liberalization measures were accelerated once again, focusing on the removal of restrictions on trade and payments to create an environment conducive to private sector investment. By March 1994, the current account was fully liberalized.

After 1990, capital controls were relaxed to some degree with respect to equity investment. By 1992, foreign equity participation of 100 percent was permitted. Despite the fact that capital controls still remain, a process of sequential liberalization is being undertaken with respect to the capital account. In 1995, commercial banks were permitted to obtain foreign loans of up to 5 per cent of their capital and reserves. This was increased to 15 percent in 1997 with the approval to grant foreign currency loans to non-Board of Investment exporters. In 1999 all banks licensed under the Banking Act could lend to Sri Lanka companies with a majority nonresident share holding. In 2000, further measures were taken by the Exchange Control Department to continue the process of liberalization of the capital account. Among them, banks were permitted to lend to nonresident controlled companies approved under Section 17 of the Board of Investment Act. The limits imposed on nonresident investment in banking, insurance, and stock brokering were relaxed with 60, 90, and 100 percent foreign participation permitted in each industry, respectively. Permission was also granted to the National Development Bank and Development Finance Credit Corporation to grant foreign currency loans to exporters provided they had resources from foreign currency credit lines.

In 1977 the exchange rate was unified; the rupee was allowed to float at an initial depreciated rate of Rs.16=US $1.00 and a managed float was adopted with the aim of making the exchange rate an active instrument of policy. The Central Bank commenced quoting rates for six major currencies—the US dollar, deutsche mark, franc, yen, UK pound, and Indian rupee—and only intervened to end out

undue fluctuations. In 1982, the Central Bank limited its quotations of rates to the intervention currency, the US dollar, and permitted commercial banks to determined the cross-rates for other currencies based on market conditions. This practice was abandoned in 1990 and the Central Bank commenced announcing daily buying and selling rates for the US dollar against the Sri Lankan rupee for transactions with commercial banks within margins of 2 percent. In 1991 money changers were also authorized to engage in foreign currency transactions besides the Central Bank and commercial banks. This was done with the intention of minimizing the black market premium. As of 23 January 2001 the Sri Lanka Rupee has been allowed to float freely representing a radical departure from the controlled regime of the past.

Despite the progress made since 1977 in liberalizing capital account transactions, restrictions continue to apply over capital movements. The authorities have adopted a gradual approach to dismantling restrictions with respect to capital account transactions for fear of undermining macroeconomic stability. Needless to say, capital controls are frequently cited as causing deviations from interest parity. Nonetheless, as the elimination of capital controls continues, the impact of these developments on the degree of efficiency of the foreign exchange market has become an important consideration (See Table 1 for the magnitude of capital inflows and exchange rate movements in Sri Lanka).

Table 1: Capital Flows and Exchange Rate Movements
(US dollars million)

| Year | Capital Account | | | | | Overall Balance | Exchange Rate |
| | Long-term Capital | | | Short Term (net) | Capital Account Balance | | SL Rupees per US Dollar |
	Direct Investment	Other Private	Government				
1970	-0.3	0.0	57.6	-0.7	56.6	-7.0	5.96
1971	0.3	0.0	74.0	-3.9	70.4	32.9	5.96
1972	0.3	-0.2	48.6	-6.4	42.4	69.5	6.70
1973	0.5	-0.3	68.9	-1.7	67.3	45.9	6.75
1974	1.4	-0.2	84.6	-2.3	83.6	-57.0	6.69
1975	-0.1	0.0	62.7	-4.3	58.2	10.4	7.71
1976	0.0	-5.7	83.1	-7.1	70.3	118.3	8.83
1977	-1.0	-3.3	51.1	-10.0	36.7	360.9	15.56
1978	1.5	0.5	157.2	7.3	166.5	120.1	15.51
1979	47.0	9.1	156.2	0.1	212.3	51.9	15.45
1980	42.9	40.3	157.5	157.5	398.3	-191.9	18.00
1981	50.2	52.9	266.0	31.4	400.6	19.9	20.55
1982	63.6	194.5	261.2	7.1	526.4	-48.0	21.32
1983	37.5	94.9	281.0	37.6	451.0	18.0	25.00
1984	32.6	-4.7	341.7	-25.5	344.1	269.3	26.28

Table 1 *(continued)*

| Year | Capital Account | | | | | Overall Balance | Exchange Rate |
| | Long-term Capital | | | Short Term (net) Balance | Capital Account Dollar | | SL Rupees per US |
	Direct Investment	Other Private	Government				
1985	24.4	31.2	273.0	4.4	333.0	-49.3	27.41
1986	28.2	18.3	291.7	-13.5	324.8	-70.3	28.52
1987	58.2	-13.0	198.0	39.0	282.2	-67.3	30.76
1988	43.0	-43.0	245.0	16.0	261.0	-90.7	33.03
1989	17.9	-50.0	217.0	92.0	276.9	-88.0	40.00
1990	43.0	-45.0	406.0	65.0	469.0	188.9	40.24
1991	94.0	-24.0	501.4	79.4	650.8	217.6	42.58
1992	148.0	25.0	266.0	97.0	536.0	171.6	46.00
1993	254.0	188.0	265.0	147.0	854.0	515.5	49.56
1994	186.0	310.0	246.0	260.0	1,002.0	309.9	49.98
1995	51.0	75.0	453.0	27.0	606.0	-64.2	54.05
1996	127.0	3.0	227.0	37.0	394.0	-134.4	56.71
1997	429.8	47.0	239.0	-2.01.7	602.2	162.9	58.99
1998	193.0	2.0	203.1	-64.0	413.4	36.8	64.59
1999	176.9	196.0	62.1	-142.4	372.9	-263.2	70.39
2000	176.0	82.0	170.6	-88.5	568.0	-516.3	75.78

Source: Central Bank of Sri Lanka Annual Reports.

V. DATA

All data are taken from the Central Bank Reports of Sri Lanka. The sample period runs from 1959 to 1998. The sample is divided into two subperiods, with the 1959-1976 period representing the era of fixed exchange rates, and 1978-1998 the period of floating exchange rates. It should be noted that while Feldstein and Horioka (1980) use cross sectional data, this study uses time series data.[4] However, the data is tested for unit roots and regressions are also carried out on the first differences of the series to make the data stationary, see Bayoumi (1990).

All the time series employed are tested for unit roots. The trend term is omitted from the first differences of the series as it is shown to be insignificant on the basis of an F test. The test results are reported in Tables 2 and 3.

While the savings and investment ratios appear to be nonstationary in levels in the absence of a trend term, the current account ratio is stationary in levels. Therefore, ADF tests are carried out on the first differences of the data series that display a unit root. Table 3 reports the results.

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[4]The use of time series data can be found in Frankel (1986), Bayoumi (1990), and Monadjemi (1990).

Table 2. **Dickey-Fuller Test for Unit Roots for the Levels of the Series**

Variable	No Trend		Trend	
	ADF	LM	ADF	LM
I/Y	-1.43	3.74	-2.29	5.99
S/Y	-1.86	6.98	-3.62**	4.48
CA/Y	-3.16**	4.60	-3.30*	5.16
C	-1.60	10.56	-1.16	9.54
X	-0.84	2.13	-2.39	3.92

*, **, *** significant at the 10, 5, and 1 percent levels respectively.

Note: The lag length for the ADF regressions has been selected to ensure white noise residuals. A sixth order autoregressive model is used. The χ^2 statistic for 6th order serial correlation in the residuals with 6 degrees of freedom is 12.59.

Significance levels with trend: 1%, −4.07: 5%, −3.46 : 10% −3.16; without trend: 1%, −3.51 : 5%, −2.90, 10% −2.58 (Davidson and MacKinnon 1993).

Table 3. **Dickey-Fuller Test for Unit Roots for First Differences of the Series**

Variable	ADF	LM
I/Y	-6.08***	4.74
S/Y	-6.87***	10.46
CA/Y	-3.57***	11.20
C	-3.26**	10.89
X	-5.17***	5.69

*, **, *** significant at the 10, 5, and 1 percent levels respectively.

Note: The lag length for the ADF regressions has been selected to ensure white noise residuals. A sixth order autoregressive model is used. The χ^2 statistic for 6th order serial correlation in the residuals with 6 degrees of freedom is 12.59.

Significance levels without trend: 1%, −3.51; 5%, −2.90; 10%, −2.58 (Davidson and MacKinnon 1993).

All data appear to be stationary in first differences. As the savings and investment ratios display an unit root, in addition to the conventional inference procedures cointegration tests are carried out on the Feldstein-Horioka model. As ΔX, ΔC and CA/Y are stationary, the Sachs and Shibata-Shintani models are estimated on the basis of the assumption that both the current account and the change in net output and change in consumption are stationary.

VI. EMPIRICAL RESULTS

A.   Savings−Investment Correlations

The cointegration tests for the full sample, the prederegulation and postderegulation periods are reported in Table 4.

Table 4. **Cointegration Results for the Feldstein-Horioka Model**

Sample Period	Regression Equation	ADF
1959-1998	$(I/Y)_t = \alpha + \beta(S/Y)_t + \varepsilon_t$	-2.75
1959-1976	$(I/Y)_t = \alpha + \beta(S/Y)_t + \varepsilon_t$	-3.10
1977-1998	$(I/Y)_t = \alpha + \beta(S/Y)_t + \varepsilon_t$	-2.31

Significance Levels: 1%, –4.29; 5%, –3.74; 10%, –3.45 (Davidson and MacKinnon 1993)

The results point to the rejection of a long-run relationship between the savings and investment ratios for Sri Lanka. The test statistic for the full sample, the prederegulation and postderegulation periods are all below the 10 percent critical value. The rejection of the cointegration tests does not necessarily imply foreign exchange market efficiency as the failure of the tests could stem from un-satisfied assumptions. Therefore hypothesis tests employing the conventional inference procedures are carried out to verify the evidence implied by the cointe-gration tests.

Table 5 presents OLS estimation results for the Feldstein-Horioka model.

Table 5. **The Feldstein-Horioka Model: OLS Estimates**

Sample Period	Regression Equation	R^2	DW
1959-1998	$(I/Y) = 0.07 + 0.90\ (S/Y)$		
	(2.51) (4.65)	0.36	0.68
1959-1976	$(I/Y) = 0.12 + 0.32\ (S/Y)$		
	(5.53) (1.85)	0.18	1.3
1977-1998	$(I/Y) = 0.25 - 0.04\ (S/Y)$		
	(5.03) (-0.14)	0.00	0.65
1959-1998	$\Delta(I/Y) = 0.002\ - 0.05\ \Delta(S/Y)$		
	(0.51) (-0.29)	0.002	2.0
1960-1976	$\Delta(I/Y) = -0.00 + 0.17\ \Delta(S/Y)$		
	(-0.15) (0.97)	0.06	2.3
1977-1998	$\Delta(I/Y) = 0.00 - 0.19\ \Delta(S/Y)$		
	(0.75) (-0.80)	0.03	1.9
With a Structural Break			
1959-1998	$I/Y = 0.15 + 0.07\ (S/Y) + 0.09\ D$		
	(6.17) (0.39) (6.19)	0.69	1.0

t statistics are reported in the parenthesis below the coefficients.

The null hypothesis that the savings retention coefficient (the coefficient on S/Y) is zero is rejected for the full sample covering the 1959-1998 period, with the estimated coefficient taking on a value of 0.90. The results for the full sample appear to suggest that 90 percent of the increase in the domestic invest-

ment ratio is financed by domestic savings. While the null hypothesis that the coefficient on S/Y is zero is rejected at the 10 percent level for the preregulation period, it is not rejected for the postderegulation period. The coefficient drops from 0.32 during the period 1959-1976 to −0.04 for the period 1978-1998. Although negative, the coefficient is not significantly different from zero suggesting a significant increase in capital mobility between the two periods. This is further confirmed by the sharp fall in the R^2 of the regressions. The levels of the series display some evidence of serial correlation in the residuals on the basis of the DW statistics.[5] The savings retention coefficient (S/Y) on the first differenced data is marginally higher and negative in the post-deregulation period in comparison with the coefficient for the prederegulation period.

In order to investigate if the financial deregulation has led to a weakening of the link between savings and investment, the regression of I/Y on S/Y is carried out with the inclusion of a dummy variable (see Table 5). This variable takes on a value of zero until 1977 and one thereafter. While the coefficient on the dummy variable is statistically significant, confirming a structural break, the restriction that the coefficient on the savings ratio is zero is not rejected, consistent with the evidence obtained for the levels regressions. Overall evidence therefore points to an increase in capital mobility.

A test of capital mobility put forward by Sachs (1981), based on a regression of the current account ratio to investment ratio, is also used to confirm the above results. Sachs hypothesized that if capital was internationally mobile, investment should have a negative impact on the current account. The results are reported in Table 6.

As pointed out by Penati and Dooley (1984), the inverse correlation between the current account balance and I/Y should increase over time with increasing capital mobility. The results appear to suggest increasing capital mobility, with the estimated slope coefficients rising from −0.47 to −0.86 for the levels, and from −0.59 to −1.02 for the first differences of the series between the pre- deregulation and post-deregulation periods. The results confirm increased capital mobility between the periods.

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[5]Correction for serial correlation does not lead to a significant change in the savings retention coefficient.

1959–1998   (I/Y) = 0.07 + 0.95 (S/Y) - 0.37 Δ(S/Y)$_{t-1}$ + 0.47 Δ(I/Y)$_{t-1}$
              (2.11) (4.66)*** (-1.24)   (1.83)   DW=1.2
1959–1976   (I/Y) = 0.12 + 0.28 (S/Y)) - 0.03 Δ(S/Y)$_{t-1}$ + 0.24 Δ(I/Y)$_{t-1}$
              (4.42) (1.26)   (-0.11)   (0.96)   DW=1.6
1977–1998   (I/Y) = 0.23 + 0.10 (S/Y) - 0.35 Δ(S/Y)$_{t-1}$ + 0.33 Δ(I/Y)$_{t-1}$
              (4.61) (0.33)   (-1.25)   (1.20)   DW =1.2

Table 6. **The Sachs Model: OLS Estimates**

$CA/Y = a + b(I/Y)$

Sample Period	Regression Equation	R^2	DW
1959–1998	$(CA/Y) = 0.06 - 0.52 (I/Y)$		
	(4.43) (-7.70)	0.60	1.3
1959–1976	$(CA/Y) = 0.05 - 0.47 (I/Y)$		
	(1.44) (-2.16)	0.23	1.7
1977–1998	$(CA/Y) = 0.15 - 0.86 (I/Y)$		
	(4.77) (-6.65)	0.69	1.30
1959–1998	$\Delta(CA/Y) = 0.002 - 0.93 \Delta(I/Y)$		
	(0.59) (-6.30)	0.52	2.5
1960–1976	$\Delta(CA/Y) = 0.001 - 0.59 \Delta(I/Y)$		
	(0.28) (-2.05)	0.22	2.4
1977–1998	$\Delta(CA/Y) = 0.003 - 1.02 \Delta(I/Y)$		
	(0.62) (-5.62)	0.61	2.6

t statistics are reported in parenthesis.

Figure 1 illustrates the behavior of the average rates of investment, savings, and current account for the period under study. The graph clearly indicates a significant rise in the investment ratio over the 1977–1980 period, leading to a widening gap between the savings and investment ratios. A question arises, therefore, as to whether the absence of a correlation between savings and investment for this period was due to these few outlying observations. Hence, the regression for the post-deregulation period is re-estimated by omitting these observations.

Figure 1: **Investment Ratio, Savings Ratio and Current Account Ratio 1959-1998**
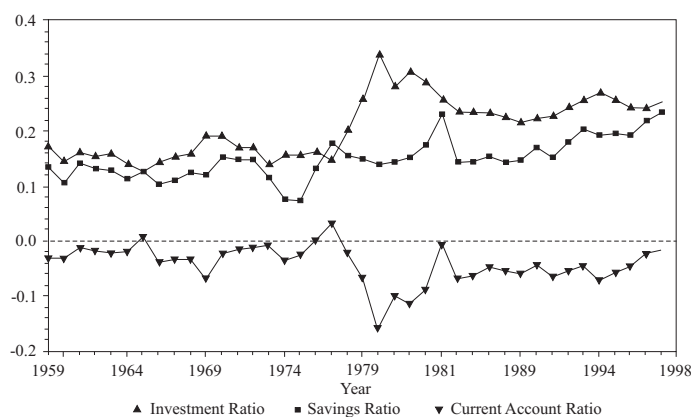
Source: Central Bank of Sri Lanka Annual Reports.

Table 7. **Estimates for the Feldstein-Horioka and Sachs Current Account-Investment Models Eliminating Observations from 1977 to 1980**

Sample Period	Regression Equation	R2	DW
1981-1998	(I/Y) = 0.23 + 0.13 (S/Y)		
	(6.69) (0.68)	0.03	0.41[6]
1981-1998	(CA/Y) = 0.09 - 0.60 (I/Y)		
	(1.51) (-2.51)	0.28	1.4

t statistics are reported in parenthesis.

The elimination of observations does not lead to a significant change in the estimated coefficients in the regressions of S/Y on I/Y or CA/Y on I/Y. It is possible to conclude, therefore, that financial deregulation has led to an increase in capital mobility.

However, it should be kept in mind that a number of factors could bias the results in favor of the Feldstein-Horioka model. Studies by Dooley, Frankel, and Mathieson (1987) and Frankel and MacArthur (1988) find a strong association between domestic savings and investment for economies with relatively open capital accounts and a weak correlation between savings and investment for developing economies that rely heavily on foreign aid to finance their current accounts. Fry (1993) shows that a rise in the debt ratio in developing countries leads to a widening of the current account ratio, increasing the gap between the savings ratio and investment ratio monotonically. Sri Lanka's external debt, which was relatively low in the prederegulation period at 16.4 percent of GDP in 1976 had increased to 46.8 percent of GDP by 1996. Per capita government external debt indicates a rise from Rs.394 to Rs.19,648 over the 1976 to 1996 period. This perhaps explains the results in support of the Sachs model. The results obtained above while could be attributed to increased capital mobility, it is also possible that the increase in foreign debt and the widening current account imbalance in the postderegulation period have biased the results in favor of increased capital mobility. Hence the Shiabta-Shintani model of international capital mobility is used to verify the results obtained above.

B.   Consumption–Income Correlations

The Shibata-Shintani model is estimated by using OLS and IV techniques. The results are reported in Table 8. The second and third rows report the ad-

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[6]With correction for serial correlation:
1981-1998   (I/Y) = 0.23 + 0.12 (S/Y) + 0.11Δ (I/Y)$_{t-1}$ +0.06 Δ(S/Y)$_{t-1}$
                 (6.23)   (0.56)   (0.50)   (0.28)
                  R2 = 0.05   DW = 0.56

justed R^2 for the OLS regressions of ΔC and ΔX on the instruments. As pointed out by Campbell and Mankiw (1990), e_t in this model is an innovation and is hence orthogonal to any variable that is in the agents' information set at time t-1. Therefore, IV estimation is also employed to eliminate the potential inconsistencies of the OLS estimates.

Table 8. **Consumption-Income Correlations**

$\Delta C = \upsilon + \lambda \Delta X$

Sample Period		OLS Estimates	IV Estimates		
			1	2	3
1960-1998	λ	0.81	0.43	0.67	0.58
		(2.3)	(1.12)	(1.36)	(1.95)
R^2 for ΔC			-0.03	-0.03	-0.09
R^2 for ΔX			0.04	-0.02	-0.04
1960-1976	λ	1.09	1.20	0.83	1.03
		(8.82)	(3.02)	(1.51)	(5.29)
R^2 for ΔC			-0.03	-0.16	0.07
R^2 for ΔX			-0.11	-0.20	0.23
1977-1998	λ	0.49	0.29	0.04	0.57
		(3.13)	(0.77)	(-0.02)	(1.99)
R^2 for ΔC			0.004	-0.12	0.06
R^2 for ΔX			0.05	-0.15	-0.05

Instruments used are   1: Constant, $\Delta C_{t\text{-}2},\ldots\Delta C_{t\text{-}4}$
                      2: Constant, $\Delta X_{t\text{-}2}\ldots\Delta X_{t\text{-}4}$
                      3: Constant, $\Delta C_{t\text{-}2}\ldots\Delta C_{t\text{-}4},\Delta X_{t\text{-}2}\ldots\Delta X_{t\text{-}4},CA_{t\text{-}2}$
Scaling has been carried out by dividing ΔC, ΔX and CA by $X_{t\text{-}1}$ [7]
The R^2 values are the adjusted R^2 from OLS regression of ΔC and ΔX on the instruments. t statistics are reported in parenthesis.

      The results appear to be robust to the measures of estimation. While the coefficient on ΔX records a decline from 1.09, capital immobility, in the period 1959–1976 to approximately 0.49 in the postderegulation period under OLS, the IV estimates record a similar trend. There is significant evidence of an increase in capital mobility between the two periods consistent with the results obtained with

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[7]See Campbell and Deaton (1989). This method is employed by Campbell and Mankiw (1990) and Shibata and Shintani (1998).

respect to the savings–investment correlations. The fact that consumption appears sensitive to income given a constant real interest rate violates Michener's (1984) proposition of a fluctuating real interest rate as the factor giving rise to the close association between the two variables. It would, however, be interesting to examine if the relaxation of the assumption of a constant real interest rate would yield similar results.

Table 9. **Consumption-Income Correlations Relaxing the Assumption of a Constant Real Rate of Interest**

$\Delta C = \upsilon + \delta r + \lambda \Delta X$

Sample Period		OLS Estimates	IV Estimates			
			1	2	3	4
1960-1998	λ	0.70	-0.004	0.22	0.59	0.37
		(6.57)	(-0.003)	(0.20)	(1.95)	(0.74)
	δ	-0.006	0.01	0.01	-0.00	0.004
		(-2.86)	(0.50)	(0.66)	(-0.09)	(0.40)
R^2 for ΔC			-0.03	-0.03	-0.07	-0.07
R^2 for ΔX			0.04	-0.02	-0.04	-0.06
1960-1976	λ	0.78	0.43	0.63	0.68	0.66
		(5.72)	(1.01)	(1.87)	(4.04)	(3.98)
	δ	-0.01	-0.02	-0.02	-0.12	-0.02
		(-3.17)	(-2.42)	(-3.12)	(-3.33)	(-3.32)
R^2 for ΔC			-0.03	-0.16	-0.12	-0.15
R^2 for ΔX			-0.11	-0.20	-0.18	-0.06
1977-1998	λ	0.29	-0.10	-2.81	0.31	0.02
		(2.42)	(-0.23)	(-0.23)	(1.32)	(0.93)
	δ	-0.008	-0.02	-0.02	-0.010	-0.008
		(-4.46)	(-1.72)	(-0.24)	(-2.44)	(-1.95)
R^2 for ΔC			0.004	-0.12	-0.18	-0.12
R^2 for ΔX			0.05	-0.15	-0.18	-0.21

Real Rate calculated as $i-\pi$ (nominal rate less the rate of inflation).
Instruments used are   1: Constant, $\Delta C_{t-2}\ldots\Delta C_{t-4}$
        2: Constant, $\Delta X_{t-2}\ldots\Delta X_{t-4}$
        3: Constant, $\Delta C_{t-2}\ldots\Delta C_{t-4}, \Delta X_{t-2}\ldots\Delta X_{t-4}, CA_{t-2}$
        4: Constant, $\Delta C_{t-2}\ldots\Delta C_{t-4}, \Delta X_{t-2}\ldots\Delta X_{t-4}, r_{t-2}$
Scaling has been carried out by dividing ΔC, ΔX and CA by X_{t-1}
The R^2 values are the adjusted R^2 from OLS regression of ΔC and ΔX on the instruments. t statistics are reported in parenthesis.

The coefficients on the real rate of interest are statistically significant and of the correct sign for most of the regressions. Despite the fluctuations in the real

interest rate, the results are not significantly different from those of Table 8, confirming increased capital mobility between the preregulation and postderegulation periods.

VII. CONCLUSION

The models of Feldstein-Horioka (1980); Sachs (1981, 1983); and Shibata-Shintani (1998) appear to suggest an increase in capital mobility in Sri Lanka between the preregulation and postderegulation periods. However, as pointed out by Tesar (1991) and Shibata and Shintani (1998) among others, the observed correlation between savings and investment, and consumption and income need not necessarily arise from an increase /decrease in capital mobility but changes in a number of other factors including technological progress, population growth and government policy.

Despite the progress made since 1977 in liberalizing capital account transactions, restrictions continue to apply over capital movements in Sri Lanka. Restrictions relate in particular to transactions in government securities and debt instruments. Foreign investment in government Treasury bills, bonds, and securities is prohibited, while foreign participation is not permitted in the government debt market. Private foreign capital has access only to certain specified types of investment.[8] There also remain restrictions on access to foreign funds by Sri Lankan nationals. Local enterprises other than those in free trade zones do not have unlimited access to foreign capital. Controls also remain on long-term capital movement in Sri Lanka, particularly with respect to foreign ownership of real estate.

Therefore, capital controls still remain a pervasive feature of Sri Lanka's financial system. The authorities have adopted a gradual approach to dismantling restrictions with respect to capital account transactions for fear of undermining macroeconomic stability. Needless to say, capital controls are frequently cited as causing deviations from interest parity. Nonetheless, as the elimination of capital controls continues, the impact of these developments on the degree of efficiency of the foreign exchange market has become an important consideration. Hence the evidence of an increase in capital mobility has important policy implications for Sri Lanka in that it suggests an enhanced role for the market mechanism in the monetary transmission process. It is possible to conclude, therefore, that Sri Lanka is on its way to achieving greater efficiency in the foreign exchange market.

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[8]These include banking, finance, and plantations. Foreign investment is not permitted in sectors such as money lending, pawn broking, and fishing.

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