

OUTPUT AND PRODUCTIVITY IN CUBA: COLLAPSE, RECOVERY, AND MUDDLING THROUGH TO THE CROSSROADS

Ernesto Hernández-Catá

More than a decade after the collapse of central planning in most former communist countries and the disintegration of the USSR, Cuba remains an “island of socialism” in the Caribbean sea, 90 miles from the United States. All along, and in spite of massive economic difficulties, the survival, of “socialism“ has been the authorities’ explicit objective. So far they have achieved their goal through a combination of political determination, some good and some very bad economic policies, and a steep deterioration in the living standards of the Cuban population. This paper tries to explain the behavior of output and productivity in Cuba in the period since 1989, with particular emphasis on the role of macroeconomic and structural policies, and attempts to provide some basis for evaluating the outlook for the Cuban economy under alternative policy scenarios.

MACROECONOMIC DEVELOPMENTS SINCE 1989: A BRIEF OVERVIEW

This remarkable and turbulent period of Cuban economic history can be broken down into three distinct phases.¹

- Collapse and brute force policy response, 1989-1993. This first phase begins when Gorbachov, facing serious difficulties of his own, slashed the generous subsidies that the USSR had been providing to Cuba, notably the subsidy on Soviet oil

deliveries. Beginning in 1991, a triumphant but cash constrained-Russia under Boris Yeltsin dismantled what remained of the former Soviet Union’s massive plan of assistance to Cuba. The Cuban government’s response was blunt. Price controls were tightened, with the predictable result that rationing, queues, and power shortages became more widespread. Trying to maintain social spending and granting large subsidies to loss-making enterprises, the government ran increasingly large budget deficits that were financed predominantly by monetary expansion. This resulted in a growing monetary overhang as many prices remained under administrative control, and skyrocketing inflation in black markets. Domestic output and productivity collapsed, and so did household consumption and capital formation. The value of the Cuban dollar fell sharply in the black market

- Reform and stabilization, 1994-96. In this phase, a new strategy is implemented that combines (i) macroeconomic stabilization (a sharp fall in the fiscal deficit though deep cuts in government expenditure including social spending and subsidies to enterprises, and an absolute decline in the money supply); and (ii) structural reforms (creation of basic cooperative units and free farmer’s markets in agriculture, legalization

1. This period is curiously referred to by the Cuban officials as the “special period” (*periodo especial*).

of self-employment and de-criminalization of the holding and use of U.S. dollars). Abruptly, output and labor productivity stopped falling in 1994 and recovered strongly in 1995-96. The fiscal deficit plunged, inflation vanished from both official and parallel markets, the monetary overhang shrank, and the peso appreciated in the unofficial market.

- Backtracking and muddling through, 1997-2001. The measures introduced in 1993-94 were clearly successful from an economic point of view. From the perspective of the government, however, they had created political problems. The incomes of the self-employed, some of the private farmers, and some in the tourist-related sector, including prostitutes, rose much faster than the wages of state employees, which had fallen dramatically in real terms during the early 1990s. In response, the government failed to pursue the reforms and even backtracked in some areas, for example by increasing the taxation of self-employment activities.

Can these developments be explained? There is, in fact, not much of a mystery about the first phase. First, the elimination of Soviet subsidies on sugar and nickel imports from, and fuel exports to, Cuba was a massive negative terms-of-trade shock for both households and enterprises. Second, the end of Russian loans to Cuba and the corresponding fall in Cuba's foreign saving led to a steep decline in domestic investment. Third, the collapse of trade arrangements with the CEMA disrupted Cuba's foreign trade and curtailed supplies of materials and capital goods to domestic enterprises. These events prompted a bad policy response that led to increasing distortions, rationing, and a massive increase in the budget deficit. All the ingredients for a deep economic crisis appeared to be present.

In a previous paper,² hereafter referred to as "Mirage or Reality," I considered three possible explanations

for the economic recovery in the second phase: (a) that the recovery never took place and was a mere statistical fabrication; (b) that it reflected the Keynesian effects of demand-side shocks; and (c) that it resulted from the macroeconomic and structural measures adopted in 1993-94. The paper concluded that there was little empirical support for the first two hypotheses, while the third one seemed to be consistent with the evidence. In particular, the slashing of subsidies to loss-making enterprises helped to bring down the deficit, the money supply, inflation in some sectors, and the monetary overhang in others. Private employment surged with the creation of agricultural markets and the self-employment sector, absorbing the workers released by troubled state enterprises and still allowing for a decline in unemployment. I will argue that continued growth in 1998-2001 reflected the lagged effects of reform and stabilization and could have been much higher had it not been for the lack of perseverance, and in some cases the backtracking on structural policies. Macroeconomic policy, so far, has remained appropriately cautious.

The conclusions of "Mirage or Reality" seemed consistent with the data and with theory, but the scope for empirical analysis was severely constrained by the data set used.³ The analysis relied mostly on a Dennison-style "growth accounting exercise" to show that the drop in investment in the first half the 1990s had made a significant contribution to the decline in real GDP. But it also concluded that much of that decline, and much of the subsequent rise beginning in 1994, was "accounted" for by movements in residual total factor productivity (TFP). The paper provided some evidence from panel regressions for all the transition countries including Cuba, of a correlation between these movements and the size of the non-state sector. But the paucity of data precluded a rigorous analysis of the effect of other policy variables, so that much of the swings in TFP continued to reflect the "measure of our ignorance."

2. See Hernández-Catá (2001).

3. The study relied mostly on annual aggregate GDP, saving, investment, and monetary/fiscal data from 1989 to 1998 for a total of only 10 annual observations.

This paper relies on a more extensive database provided by the sectoral national account and wage/employment data to extend the analysis of “Mirage or Reality.” The main objectives of the paper are:

1. To estimate, on the basis of time-series/cross-section regressions, a sectoral model of the Cuban economy’s supply side.
2. To use the model to analyze the contribution of exogenous shocks and shifts in policy-related variables to changes in TFP and output during the past decade or so. These variables include the rationing of energy; the discount on the peso in the parallel foreign exchange market; the subsidization of loss-making enterprises; and the share of growth of non-state employment.
3. To perform model simulations of the possible evolution of potential GDP on the basis of alternative assumptions about economic policy.

THE DATA

These objectives require a substantial increase in the number of observations in comparison with that used in the earlier paper. To that effect, this paper relies on the data for nominal and real GDP, average monthly wages and employment broken down by productive sectors. This data is provided in the *Anuario Estadístico de Cuba, 2000*⁴ for the period 1994-2000. Estimates of GDP deflators by sector can be obtained by dividing nominal GDP by the corresponding constant 1981 price series. The data can be backdated to 1985 (for GDP and price deflators) and to 1989 (for employment and wages) on the basis of the Economic Commission for Latin America’s *La economía cubana: Reformas estructurales y desempeño en los noventa* (CEPAL 2000). More complete definitions and sources of data are provided in Annex 1.

To sum up, a complete set of output, employment, and price-wage data is available from 1989 to 2000 (12 years). With seven sectors, this yields a total of 84

observations. The relatively small “financial institutions” sector and the large and heterogeneous “others” sector⁵ were excluded from the regressions for two reasons: (i) production data in those sectors is probably based on scaled up input data and not on measures of physical output; and (ii) the discontinuity beginning in 1994 between CEPAL and official Cuban statistics is particularly large for those sectors. Still, the use of sectoral, as opposed to economy-wide, data allows for a large increase in degrees of freedom.

A visual inspection of the data set reveals a number of “stylized facts”:

- As shown in Table 1, total GDP, as well as GDP in most sectors, peaks in the late 1980s (agriculture, transportation, industry and total GDP) or in 1990 (construction and electricity). Output then contracts in all these sectors and reaches a trough in 1993 (industry and electricity) or in 1994 (agriculture, construction, aggregate GDP). The commercial sector, where output had started to decline already in 1986, also bottomed out in 1994. All these sectors recovered strongly in the next few years and stabilized in the late 1990s. The pronounced u-shaped pattern of output in most sectors is illustrated in Figure 1.
- Employment is a lagged indicator of economic activity. In most key sectors (industry, construction, transportation and commerce) state employment begins to fall in 1989 and continues to decline beyond the trough in GDP (Table 2). State sector employment finally bottoms out in 1995 (in construction and transportation) or in 1996 (agriculture and commerce). Industrial employment reaches its trough later, in 1998.
- Employment in the non-state sector is very small until 1993. It surges in 1994-96 and then stabilizes at around 25% of total employment (Table 3).

4. Referred to hereafter as *AEC* (2001).

5. This sector, officially labeled “social, communal and personal services,” includes education, public health, R&D expenditure, and military and security spending.

Figure 1. Cuba: Real GDP in U-Shaped Sectors

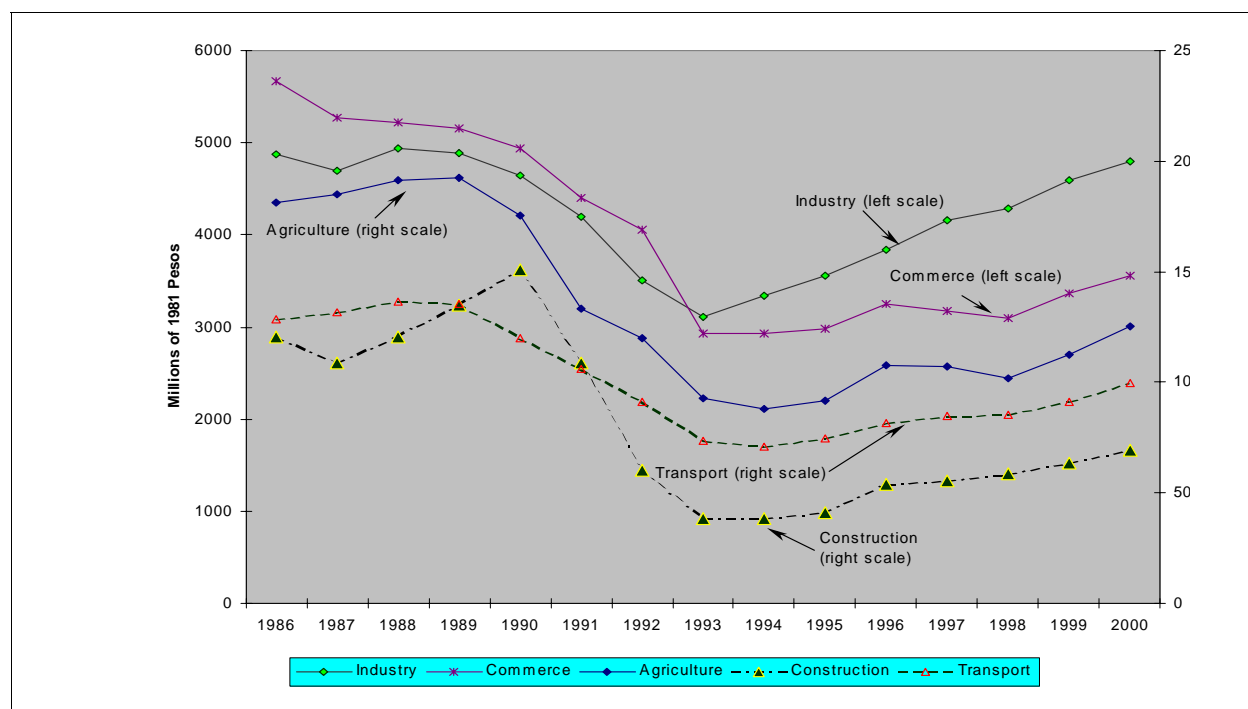


Table 1. Cuba: Real GDP by Sectors

Year	Total	Agriculture	Industry	Construction	Transport	Commerce	Electricity	Mining	Finance	Other
(millions of pesos, at 1981 prices)										
1986	20385	1813	4869	1205	1283	5661	367	114	1642	3431
1987	19934	1852	4691	1085	1319	5271	391	119	1653	3552
1988	20644	1916	4943	1207	1363	5224	414	117	1682	3778
1989	20960	1925	4887	1350	1353	5151	452	123	1729	3992
1990	20349	1756	4640	1508	1202	4936	455	92	1760	4000
1991	18415	1335	4200	1085	1059	4396	427	82	1807	4025
1992	16591	1197	3507	604	912	4050	378	106	1722	4116
1993	14332	925	3104	386	733	2936	335	96	1699	4118
1994	12868	879	3341	384	709	2935	350	98	492	3681
1995	13185	916	3555	412	748	2985	384	152	484	3548
1996	14218	1075	3835	539	813	3251	398	177	519	3611
1997	14572	1074	4155	556	845	3176	422	182	545	3619
1998	14754	1018	4291	588	855	3090	427	184	599	3703
1999	15674	1123	4595	632	912	3370	430	186	637	3790
2000	16556	1253	4794	693	995	3551	468	213	671	3918
(percent of total GDP)										
1989	100%	9%	23%	6%	6%	25%	2%	1%	8%	19%
1993	100%	6%	22%	3%	5%	20%	2%	1%	12%	29%
1994	100%	7%	26%	3%	6%	23%	3%	1%	4%	29%
1997	100%	7%	29%	4%	6%	22%	3%	1%	4%	25%
2000	100%	8%	29%	4%	6%	21%	3%	1%	4%	24%

Source: See Annex 1.

Table 2. Cuba: Employment in the State Sector

Year	Total	Agriculture ^a	Industry ^b	Construction	Transport ^c	Commerce ^d	Electricity ^e	Mining	Finance ^f	Other ^g
(Thousands of workers)										
1989	3527	736	686	319	236	435	41	34	65	976
1990	3569	785	685	310	233	431	41	39	65	981
1991	3579	831	663	305	229	420	40	40	66	985
1992	3542	838	655	288	215	416	43	43	57	989
1993	3470	846	646	232	198	413	44	40	55	995
1994	3034	815	569	180	179	333	42	32	49	836
1995	2917	675	513	179	177	314	34	22	37	966
1996	2961	683	520	180	185	318	35	24	37	979
1997	3003	752	472	192	169	351	41	43	53	932
1998	3007	733	459	179	175	355	46	47	48	965
1999	3005	714	513	167	157	375	51	21	54	952
2000	3005	714	513	168	157	375	51	21	54	952
(Percent of total state employment)										
1989	100%	23%	18%	6%	6%	11%	1%	1%	1%	33%
1993	100%	25%	16%	6%	6%	12%	1%	1%	2%	31%
1994	100%	24%	15%	6%	6%	12%	2%	2%	2%	32%
1997	100%	24%	17%	6%	5%	12%	2%	1%	2%	32%
2000	100%	24%	17%	6%	5%	12%	2%	1%	2%	32%

Source: See Annex 1.

a. Includes fisheries and hunting

b. Includes sugar refining

c. Includes warehousing and communications

d. Includes hotels and restaurants

e. Includes gas and water supply

f. Includes real estate and services to enterprises.

g. Includes public administration, defense, education, research and development, public health, culture and sports, and other services.

Table 3. Employment in the Non State Sector

Year	Total ^a	Total ^b	Agriculture	Mines	Industry	Electricity	Construction	Commerce	Transport	Finance	Other	Residual ^c
(Thousands of workers)												
1991	...	255	138	2	45	3	21	29	16	4	507	-510
1992	...	280	130	4	50	3	22	33	17	5	547	-531
1993	...	343	142	4	59	4	21	38	19	5	553	-501
1994	...	671	163	6	113	8	36	66	21	10	592	-344
1995	702	688	160	3	122	8	42	74	27	9	229	14
1996	707	686	159	0	121	8	42	74	23	9	228	21
1997	740	721	182	7	114	10	46	85	20	13	225	19
1998	789	768	189	6	118	12	46	91	24	12	248	21
1999	868	842	198	22	124	15	41	107	24	15	271	26
2000	892	865	224	30	102	2	37	99	38	1	307	27
(Share of total non-state employment)												
2000	100%	97%	25.9%	3.4%	11.8%	0.3%	4.2%	11.4%	4.3%	0.1%	35.5%	3.1%

Source: AEC (2001), CEPAL (2000), and author's calculations.

a. Includes mixed enterprises

b. Excludes mixed enterprises

c. Includes mixed enterprises and, before 1994, the discrepancy between AEC (2001) and CEPAL (2000) data.

- Average real wages⁶ in the state sector drop continuously from 1991 to 1995 (by more than one half in industry, construction and commerce) and rise slowly thereafter.
- The rate of inflation (based on the GDP deflator) increases rapidly in 1993 and 1994, falls by about half in 1995 and remains very low, or negative, thereafter. Sectoral prices rise sharply from 1992 to 1995, particularly in industry and agriculture) and stabilize thereafter. The exception is electricity and gas where prices are kept stable through rationing. Unofficial indexes of free and black market prices show a much sharper acceleration in 1993-94 and a steep decline thereafter.

THE MODEL

The model seeks to explain the supply side of the economy by combining three equations for each sector: a production function, a labor supply function, and a demand for labor function.

In each sector, the **production function** is assumed to be of the Cobb-Douglas variety:

$$Y_{it} = N_{it}^{\alpha} K_{it}^{1-\alpha} A_{it} \quad (1)$$

where Y is real GDP (1981 prices) N is effective employment, K is the capital stock and A is total factor productivity. The subscript i denotes the sector (see Table 1) and the subscript t the year (t=1989 to 2000). Using lower case letters to represent natural logarithms, equation (1) becomes

$$y_{it} = \alpha n_{it} + (1-\alpha) k_{it} + a_{it} \quad (2)$$

The **labor supply function** expresses employment in the state sector as a log-linear function of the real wage ($w-p_c$)—the nominal wage rate divided by the consumption deflator—and n^* the average worker's maximum daily work capacity times the potential labor force. The parameter θ represents the relative preference of workers for consumption over leisure.

$$n_{it} = \theta (w - p_c)_{it} + n^*_{it} \quad (3)$$

Equation (4) assumes that household income consists only of wages. The assumption is realistic in that Cuban households do not receive interest, dividends or capital gains since state enterprises are not allowed to issue equities or bonds. The assumption is restrictive, however, in that some households in Cuba do receive foreign currency transfers from their relatives or acquaintances abroad; since 1994, these transfers can be used to purchase goods in “dollar stores.”

The **demand for labor** reflects maximization of enterprise profits subject to the constraint imposed by the production function (1), which implies the equality of the marginal productivity of labor and the real wage rate (w_i-p_i) where p_i is the GDP deflator for sector i.

$$y_{it} - n_{it} = \ln(\alpha) + w_{it} - p_{it} \quad (4)$$

Combining equations (3) and (4) and substituting into the production function (2) gives the **aggregate supply function** for each productive sector.

$$y_{it} = v_i + (1-\alpha) k_{it} + \beta n^*_{it} + \beta (p-p_c)_{it} + \alpha/(1-\alpha) n_{it} + a_{it} \quad (5)$$

where $\alpha\theta = \beta/(1+\beta)$, and v_i is a sector-specific constant. Equation (5) provides the general form of the estimated equations presented in Table 4.

STATISTICAL ISSUES AND REGRESSION RESULTS

Before moving to the measurement of factor inputs and TFP, there are a number of data issues that must be confronted. First, there is a significant discontinuity in the employment and national accounts data derived from CEPAL (for 1989-1993) and those taken from the AEC (for 1994-2000). To deal with this problem, the regressions include a dummy variable (d) equal to one from 1994 to 2000 and to zero otherwise. It is used in the equations reported in Table 4, both in additive form, and multiplied by the state employment and relative price variable. This is not an ideal solution, however, because the dummies could be picking up effects other than the statistical discontinuity. In particular, since 1994 was the first

6. Based on the GDP deflator.

Table 4. Panel Regression Results for Sectoral Supply Functions^a

Variable:	State employment n^s	Relative price $p - p_c$	Non-state sector proxy $\sigma(n^{ns}-n^s)$	Exchange rate premium x	Real subsidies s	Power consumption c_E	1994 dummy d	dummy X state employment $d n^s$	dummy X relative prices $d (p-p_c)$	Adjusted R-squared
(Equation)										
(a)	0.289 (1.49)						0.886 (3.41)	-0.179 (3.78)		0.954
(b)	0.247 (1.42)	-0.925 (5.80)					1.176 (4.29)	-0.16 (3.97)	1.012 (4.66)	0.957
(c)	0.247 (1.42)	-0.925 (5.80)					1.18 (4.29)	-0.165 (3.99)	1.011 (4.66)	0.969
(d)	0.385 (2.30)	-0.823 (5.45)	1.407 (3.48)				1.001 (3.88)	-0.07 (1.61)	0.771 (3.61)	0.973
(e)	0.452 (3.36)	-0.542 (4.21)	1.171 (3.60)	-0.430 (6.38)			1.115 (5.34)	-0.154 (4.87)	0.656 (3.82)	0.983
(f)	0.444 (3.39)	-0.59 (4.64)	0.964 (2.91)	-0.280 (2.96)	-0.159 (2.15)		0.987 (4.65)	-0.159 (5.12)	0.737 (4.29)	0.984
(g)	0.152 (1.49)	-0.412 (4.33)	0.681 (2.81)	-0.086 (1.16)	-0.064 (1.66)	0.609 (7.97)	0.78 (4.98)	-0.11 (4.68)	0.72 (5.77)	0.991

a. The dependent variable in all equations is the natural logarithm of real GDP. Figures in parenthesis below the coefficients are t statistics. Each equation includes a constant term and a set of 6 sectoral dummies. The sample includes 84 observations.

full year of reform, the dummy variables could be capturing the effects on TFP and GDP growth of omitted structural change variables, including the emphasis on state enterprise profitability after 1994.

Labor and Capital Inputs

Measurement of the non-state sector. It would have been desirable to explain separately output in the state and non-state (private and cooperative) sectors. Unfortunately, real GDP data by type of ownership are available only for the overall economy. It is possible, however, to obtain employment data disaggregated both by type of production and by ownership (see Annex 1). On this basis, a variable was constructed⁷ and used in the regressions to take some account of the rapid rise in the non-state sector after the measure taken in 1993-94. The coefficient of this variable is positive as expected (total output increases

when the share of the more productive non-state employment rises) and consistently significant.

Employment in state enterprises. Ideally, the variable n should represent the effective labor input defined as the number of employed adjusted for the average number of hours worked and the effort supplied by the average worker. This is important in Cuba, as it was in other communist countries in the past. Because of the government's reluctance to create open unemployment, state enterprises tend to react to a fall in demand not by firing workers but by cutting real wages, to which workers react by lowering the number of hours worked (through absenteeism, goofing off, or giving up second jobs). Unfortunately, data for hours worked, overtime, and shifts, is not available in Cuba, and data for work effort does not exist. Thus, a key aspect of the cyclical behavior of labor markets cannot be analyzed.

7. This variable is the difference between the logarithms of non-state and state employment ($n^{ns}-n^s$) multiplied by the share of non-state employment into total employment ($\sigma = N^{ns}/N$).

In table 4 the coefficient of the state employment variable (β) implies values of $\alpha\theta$ between 0.13 and 0.33 for 1989-93 and between 0.08 and 0.24 for 1994-2000 (the second range is obtained by using the coefficient of the multiplicative dummy). The coefficient α cannot be identified from the estimated supply function. But even assuming a fairly high income elasticity of labor supply (say, $\theta = 1$) the estimates of α would average about 0.20. This is unusually low by the standards of econometric studies in other countries, and particularly given the tendency of estimated production functions in the United States to reveal the opposite problem: a high labor coefficient of 1 or more.⁸

Relative prices. The most disturbing result stemming from Table 4 is the negative (and strangely significant) value of the coefficients for the relative price variable in 1989-93. For 1994-2000, the coefficient is positive and ranges from 0.08 to 0.23, not way out of line with the coefficients of the state employment variable. But there is no reason why the estimate for the previous period should have a negative sign. It could be that the labor market equations are misspecified, for reasons suggested earlier, that the dummy variables are messing up the results, and/or that the true underlying production function is not Cobb-Douglas.

Capital stock. While *aggregate* investment data is available for the whole economy from 1989 on, investment *by sector* is available only from 1994. These data were used to build sectoral capital stock variables that in turn were used to estimate supply functions for the seven sectors for the shortened period 1994-2000. However, the estimated coefficients of the capital stock variables were statistically insignificant. This is probably because the data are not good (among other things, data for individual sectors do

not differentiate between business fixed investment, residential construction, and inventory accumulation.

Total Factor Productivity (TFP)

TFP is defined as the set of economic, technological administrative and political variables that affect the organization of economic activity for given values of labor and capital. In particular, TFP includes the effect of policy variables, and is therefore the central part of the present study. In addition to the non-state sector labor differential (which is included as a statistical adjustment given the unavailability of non-state GDP data), four key variables were used:

Exchange rate premium on the U.S. dollar (x_t).

This variable is the log-difference between the parallel market exchange rate and the official market rate between the peso and the U.S. dollar. Variables of this sort are frequently used in empirical studies of growth in developing countries as proxies for the intensity of distortions.⁹ In the Cuban case it may capture, among other things, the effects of price controls. In Table 4, the coefficient of the variable x is negative and significant, except in equation (f) where its t-value is lowered by the high correlation between x and the energy consumption variable.¹⁰

Real government subsidies (s_t). The specific variable used here is the real value of government subsidies provided to loss-making enterprises. The role of this variable is not to capture the *direct* effects of these subsidies on state enterprise production (subsidies for losses, just as taxes on profits, do not affect the firm's profit maximization plan) but rather to capture the general effects of soft-budget constraints on overall enterprise productivity. In effect, these subsidies keep unprofitable enterprises alive, thus absorbing scarce resources that could otherwise be used

8. In reviewing possible explanations for this high value of the estimated labor coefficient, Bernake and Parkinson (1991) suggest three possibilities: a bias due to technological shocks, a bias due to labor hoarding, and the effect of increasing returns. The first two explanations are relevant to the Cuban case (the Soviet oil shock of the late 1980s /early 1990s, and the tendency for labor hoarding by state enterprises). Yet the estimated values of α derived from Table 4 seems very low.

9. The subscript t indicates that the exchange premium changes over time but is the same for all productive sectors.

10. Every sector of the economy confronts the same exchange rate premium, so that the sectoral index i can be omitted. The same holds for government subsidies, in this case because data by sector is not available.

Table 5. Cuba: Growth Accounting and Medium-Term Scenarios

Period	(a) 1990-93	(b) 1994-96	(c) 1998-01	Medium term scenarios	
				(d) Reform	(e) Current policy
(Average annual rates)					
Actual real GDP growth	-10	3	5	10	-2
(Contributions to the growth of real GDP, in percentage points at annual rates)					
Input growth	0	-3	-2	1	1
Capital formation	0	-2	-2	2	0
State employment growth	0	-1	0	-1	1
Total factor productivity growth	-8	10	5	9	-3
Changes in exchange rate premium	-2	2	0	1	-2
Non-state sector growth	0	2	0	7	0
Changes in power consumption	-5	3	3	0	0
Subsidies to loss making enterprises	-1	3	2	1	-1
Other variables, including unexplained residual	-2	-4	2	0	0

Source: Regression coefficients from Table 4; and author's estimates.

more efficiently by other (state or non-state) enterprises. They also convey to firms in general the message that enterprise managers need not work hard to cut losses by increasing productivity, because in any event they will be bailed out at the expense of the budget. The estimated coefficient of subsidies is thus expected to be negative, and this is confirmed by the results in Table 4, even though significance drops in equation (f), probably because of multicollinearity.

Electricity consumption in real terms (c^E_t). In the late 1980s the Soviet Union suspended shipments of heavily subsidized oil to Cuba in exchange for sugar¹¹ Forced to satisfy its oil requirements (which accounted for the bulk of its energy use) by buying in the world market at market prices, and given the critical shortage of foreign exchange it was experiencing, the Cuban government decided to ration energy supplies to both households and enterprises. For the latter, the result was a massive adverse technological shock that resulted in generalized output cuts. As expected, the coefficient of the variable c^E_t in Table 4 is positive, meaning that a decrease in the oil quota assigned

to a particular sector or enterprise results in a contraction of output.

CAN WE EXPLAIN THE 1990s?

The coefficients reported in Table 4 were used to perform a backward looking growth exercise for the three sub-periods within the so-called "special period":

- The period of contraction (1989-93) associated with the end of Soviet aid and characterized by a steep fall in output.
- The period of recovery (1994-96), following the stabilization and liberalization measures adopted in 1993-94.
- The period of "muddling through" (1997-2000) characterized by the cessation of further structural reforms (and even the backtracking in some areas), but with continued emphasis on macro-economic stability.

The results are summarized in Table 5. For every year in the sample, the contribution of each explanatory variable was calculated by multiplying the per-

11. As well as the additional supplies of oil that Cuba could sell in the open market to obtain foreign exchange.

centage change in that variable by the corresponding estimated coefficient. For example,

$$C(X_t) = \gamma \Delta \ln(X_t) = \gamma \Delta x_t$$

Where $C(X)$ is the contribution of variable X to the growth of real GDP in year t , and γ is the estimated coefficient of x from Table 4. Since no estimated coefficient was available for the capital stock, the contribution of capital was taken from the growth accounting exercise reported in “Mirage or Reality.”

In the **period of contraction**, the fall in domestic production averaged 10 % a year and reflected a steep decline in total factor productivity. More than half of this decline was accounted for by the rationing of power supply following the end of Soviet subsidies. The other part resulted from a bad policy response that increased distortions (as evidenced by the widening of the exchange rate premium) and weakened incentives for enterprise reform (as reflected in a rise in subsidies). Capital and labor made no contribution to the change in GDP during that period.

In the **period of recovery (1994-96)** positive growth was restored in spite of a decline in net capital formation. TFP surged at an annual rate of 10 percentage points following a broad improvement in policies. First, much of the sharp decline in the government deficit during that period resulted from a *cutback in subsidies* to cover enterprise losses, which tightened budget constraints and improved incentives in the state sector. Second, *the exchange rate premium narrowed* substantially following the legalization of the U.S. dollar, some price decontrol, and the reduction in monetary financing due to a sharply reduced government deficit. This contributed 2 percentage points to the growth of output in 1994-96. Third, *the rise in the non-state sector* following the measures taken in 1993-94 also contributed 2 percentage points to the average growth rate of real GDP during

the recovery. Altogether, these three policy variables contributed seven percentage points to annual GDP growth, with most of the increase concentrated in 1994. Finally, the *supply of electric power* rose owing to an increase in both imports and domestic production of oil.¹² It should be noted that the model overpredicts real GDP growth in 1994-96, as the identified policy variables are more than sufficient to account for growth in that period. The post reform recovery was a reality, not a mirage.

From **1998 to 2001** real GDP expanded at an average annual rate of 5 %.¹³ This is not bad by the standards of developing countries in general (4.6% during that period) and much better than the average for Latin American countries (1.8%). The expansion was more than accounted for by continued growth in TFP and reflected a further increase in the supply of energy and additional reductions in government subsidies. However, the contribution of capital formation was negative, as it had been since 1992. The key question in these circumstances is: can the expansion of potential GDP be sustained? Of course, there is plenty of scope for TFP to grow at a fast pace. But this would require price and exchange system liberalization and, most critically, privatization. There is still some scope for reducing subsidies—not those to cover enterprises losses, but those to finance differentials between free market and regulated prices. However, a further increase in the supply of energy will depend on the vagaries of the world oil price (and of subsidized Venezuelan shipments), as domestic oil production appears to have tapered off.

WHERE IS CUBA GOING?

The recovery that started in 1994 is running out of space. The structural reforms that fueled the recovery in its early years have been essentially interrupted, capital formation continues to shrink, and the benefits from macroeconomic stabilization have been

12. From 1989 to 1993 imports of petroleum and products fell by more than 60% from 13.1 million metric tons (mt) to 5.5 million mt while the rise in domestic oil production was small. As a result, total supply of petroleum and products fell from 13.8 to 6.6 million mt. By contrast, from 1993 to 2001 total supply increased by 35% (to 8.9 million mt) as both imports and domestic production rose.

13. This period includes an out-of-sample year (2001) in which the model over-estimated growth by just under one percentage point. Perhaps this is because the economy was affected by two exogenous shocks in that year: hurricane Michelle, and the effects on Cuba's tourism of the events of September 11.

largely absorbed. Therefore, barring new structural change, further positive growth of actual GDP, stemming for example from a rise in tourist receipts or a policy-induced expansion of domestic demand, would soon bump against the constraint of a falling *potential* output. The result could be a resumption of inflation in free and black markets and the temptation to tighten price controls. More likely, as has already happened since 2001, it will take the form of a rise in the demand for imports. Given the lack of official international reserves and the authorities' insistence on maintaining the fixed official exchange rate at par with the dollar, this would manifest itself in two ways: the further tightening of import controls; and the depreciation of the peso in the parallel market.

The simulation results shown in columns (d) and (e) in Table 5 suggest what might happen over the medium-term (around three years) under two very different policy assumptions. Column (e) illustrates the case of **unchanged policies**: real GDP would decline at an annual rate of 2% even though the negative contribution of investment would stop, as the exchange rate premium on the dollar would likely widen with the tightening of import and price controls. The energy situation is assumed to remain unchanged although, of course, this would remain an area of vulnerability. Furthermore, any decline in remittances from Cubans abroad would compromise the authorities' already difficult task of repaying its foreign obligations. More generally, the bleak prospects for national income raises questions about the government's ability to fund its domestic and foreign liabilities, including the payment of pensions to an ageing population.

The consequences of a **shift in policy towards reform** are illustrated in column (d) of Table 5. In this scenario, real GDP would grow at an average annual

rate of 10 percent.¹⁴ TFP would surge and the contribution of capital formation would turn positive. The non-state sector would expand from 25% to 40% (measured in terms of the sector's share in total employment), still well below the shares already achieved by many transition countries from China and Vietnam to Hungary and Poland. Exchange rate unification and the elimination of government subsidies would make a further contribution to the growth of TFP and output.

In spite of significant problems with the availability and consistency of data, the empirical results presented in this paper seem strong enough to support some important conclusions.

- Economic policies matter a great deal.
- The cessation of Soviet aid coupled with a terrible policy response sent the economy into a tailspin in the first half of the 1990s.
- The liberalization and stabilization plan of 1993-94 brought about the resumption of positive growth. The recovery was real—not a statistical trick.
- The Cuban economy is approaching the crossroads. Without new supply-side measures, continued recovery is likely to be thwarted as the gap between potential and actual GDP continues to narrow. Never has the policy choice been so clear: continued policies mean, at best, stagnation and debt services difficulties. Further backtracking on structural reforms would be a recipe for disaster, particularly if macroeconomic stability is given up. By contrast, a decisive reform plan would reinvigorate the Cuban economy and set the stage for a lasting improvement in the living standards of the population, after so many years of economic deprivation.

14. A formidable performance by revolutionary Cuban standards, but not greatly out of line with recent growth in developing Asia (around 6% at annual rate) and among the transition countries of the former Soviet Union (an average of more than 7% in 2000-2001).

REFERENCES

- Anuario Estadístico de Cuba 2000* (2001). La Habana, Cuba.
- Bénassy, Jean-Pascal (1993). "Nonclearing Markets: Microeconomic Concepts and Macroeconomic Applications," *Journal of Economic Literature*, Volume XXXI (June)
- Bernake, Ben S., and Parkinson, Martin L. (1991). "Procyclical Labor Productivity and Competing Theories of the Business Cycle," *Journal of Political Economy*, Vol. 99, Number 3 (June).
- Comisión Económica para América Latina (CEPAL) (2000). *La economía cubana: Reformas estructurales y desempeño en los noventa*. Fondo de Cultura Económica, Mexico.
- Comisión Económica para América Latina (CEPAL) (2002). "Cuba: Evolución económica durante 2001." United Nations. LC/MEX/L.525
- Hernández-Catá, Ernesto (2001). "The Fall and Recovery of the Cuban Economy in the 1990s: Mirage or Reality?" International Monetary Fund *Working Paper* 01/48.
- Nordhaus, William D. (2002). "Productivity Growth and the New Economy," *Brookings Papers on Economic Activity*, No. 2.

ANNEX 1 DEFINITIONS AND SOURCES OF VARIABLES

A_{it} = **Total factor productivity (TFP)**. A vector of variables including changes in the exchange rate premium, in electrical power consumption, in subsidies to loss making enterprises and in the non-state sector.

C_E = **Consumption of electricity**, in gi ga-watt hour. *AEC*, Cuadro VII.15 for industry, construction, agriculture, transportation, and aggregate consumption. For the commercial sector, electricity consumption was estimated by subtracting household consumption (Cuadro VII.10) from "other" sectors in cuadro VII.15..

N = **Total employment** in thousands of workers. *AEC*, Cuadro V.2. for 1994-2000; and *CEPAL* (2000) for 1989-1993.

N^s = **Employment in state entities**, in thousands of workers. *AEC*, Cuadro V.3. for 1994-2000; and *CEPAL* (2000) for 1989-1993.

N^{ns} = **Employment in the non-state sector**, in thousands of workers. Includes self-employed, agricultural private sector, cooperatives, and mixed enterprises. Sectoral data obtained by subtracting, for each sector, state employment (N_s) from total employment (N).

P = **Implicit GDP deflator**. Sectoral data calculated by dividing, for each sector, nominal GDP by real GDP. *AEC (2001)* for 1994-2000; and *CEPAL* (2000) for 1989-1993.

P_e = **Personal consumption deflator**. Data calculated by dividing, for each sector, nominal private by real private consumption. *AEC (2001)* for 1994-2000; and *CEPAL* (2000) for 1989-1993.

S = **Government subsidies** for state enterprise losses. *AEC (2001)* cuadro IV.4. for 1994-2000; and *CEPAL* (2000) for 1989-1993. Deflated by the aggregate GDP deflator.

T = **Government revenue**, in millions of pesos. *AEC (2001)* Cuadro IV.4. for 1994-2000; and *CEPAL* (2000) for 1989-1993. Deflated by the aggregate GDP deflator.

W^s = **Average monthly wage in state entities**, in pesos. *AEC*, Cuadro V.5. for 1994-2000; and *CEPAL* (2000) for 1989-1993.

X = **Exchange rate premium** on the U.S. dollar. *CEPAL* (2002), Cuadro 21.

Y = **Gross domestic product (GDP)** in constant 1981 prices. *AEC*, Cuadro III.1. for 1994-2000; and *CEPAL* (2000) for 1989-1993.