

THE TYRANNY OF NUMBERS: CONFRONTING THE STATISTICAL REALITIES OF THE EAST ASIAN GROWTH EXPERIENCE*

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This paper documents the fundamental role played by factor accumulation in explaining the extraordinary postwar growth of Hong Kong, Singapore, South Korea, and Taiwan. Participation rates, educational levels, and (excepting Hong Kong) investment rates have risen rapidly in all four economies. In addition, in most cases there has been a large intersectoral transfer of labor into manufacturing, which has helped fuel growth in that sector. Once one accounts for the dramatic rise in factor inputs, one arrives at estimated total factor productivity growth rates that are closely approximated by the historical performance of many of the OECD and Latin American economies. While the growth of output and manufacturing exports in the newly industrializing countries of East Asia is virtually unprecedented, the growth of total factor productivity in these economies is not.

TABLE I
GROWTH RATES (PERCENT)

	Hong Kong (1966-1991)			Singapore (1966-1990)		
	N	D	N - D	N	D	N - D
GDP per capita	7.3	1.6	5.7	8.7	1.9	6.8
GDP per worker	7.3	2.6	4.7	8.7	4.5	4.2
Excluding agriculture	NA	2.8	NA	8.8	4.6	4.2
Manufacturing	NA	1.3	NA	10.2	6.2	4.0
Δ Participation rate	0.38 → 0.49			0.27 → 0.51		
	South Korea (1966-1990)			Taiwan (1966-1990)		
	N	D	N - D	N	D	N - D
GDP per capita	8.5	1.7	6.8	8.5	1.8	6.7
GDP per worker	8.5	2.8	5.6	8.5	3.1	5.4
Excluding agriculture	10.3	5.4	4.9	9.4	4.6	4.8
Manufacturing	14.1	6.3	7.8	10.8	5.9	4.9
Δ Participation rate	0.27 → 0.36			0.28 → 0.37		

N = Numerator, D = Denominator. NA = Not Available, the Hong Kong government has yet to develop constant price estimates of GDP by sector. GDP measures are at market prices, excluding import duties, however. Columns may not add up due to rounding.

TABLE II
EDUCATIONAL ATTAINMENT OF THE WORKING POPULATION (PERCENT)

	Hong Kong		Singapore		South Korea		Taiwan	
	1966	1991	1966	1990	1966	1990	1966	1990
None	19.2	5.6	55.1	↓	31.1	6.4	17.0	4.5
Primary	53.6	22.9	28.2	33.7	42.4	18.5	57.2	28.0
Secondary+	27.2	71.4	15.8	66.3	26.5	75.0	25.8	67.6

Self-taught are included under primary. Hong Kong, Korean, and Taiwanese data refer to highest level of education "attended" rather than completed. All percentages are calculated net of those reported as "unknown."

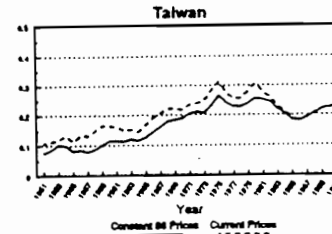
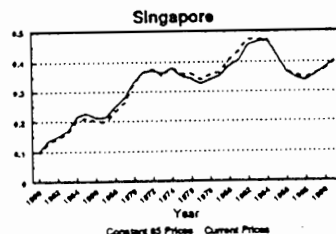
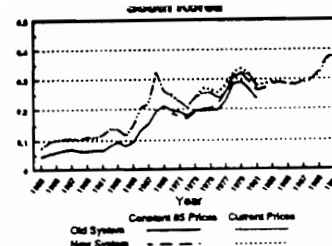
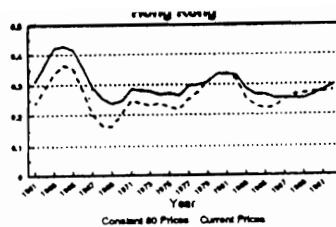


FIGURE I
I/GDP Ratios

TABLE V
TOTAL FACTOR PRODUCTIVITY GROWTH: HONG KONG

Time period	Annual growth of:						
	Output	Raw capital	Weighted capital	Raw labor	Weighted labor	TFP	Labor share
61-66	0.109	0.169	0.162	0.032	0.025	0.035	0.643
66-71	0.065	0.075	0.078	0.025	0.024	0.023	0.660
71-76	0.081	0.075	0.080	0.033	0.024	0.039	0.662
76-81	0.099	0.093	0.098	0.051	0.064	0.022	0.617
81-86	0.058	0.078	0.079	0.019	0.027	0.009	0.593
86-91	0.063	0.062	0.066	0.005	0.022	0.024	0.609
66-91	0.073	0.077	0.080	0.026	0.032	0.023	0.628

Raw inputs are the arithmetic sum of subcomponents, with no adjustment for hours of work. Weighted inputs are translog indices of factor input growth, with labor services measured by hours of work.

TABLE VI
TOTAL FACTOR PRODUCTIVITY GROWTH: SINGAPORE

Time period	Annual growth of:						
	Output	Raw capital	Weighted capital	Raw labor	Weighted labor	TFP	Labor share
Economy:							
66-70	0.130	0.119	0.134	0.054	0.033	0.046	0.503
70-80	0.088	0.122	0.140	0.050	0.058	-0.009	0.517
80-90	0.069	0.091	0.084	0.036	0.066	-0.005	0.506
66-90	0.087	0.108	0.115	0.045	0.067	0.002	0.509
Manufacturing*:							
70-80	0.103	0.123	0.130	0.086	0.089	-0.009	0.423
80-90	0.067	0.090	0.094	0.021	0.061	-0.011	0.385
70-90	0.085	0.107	0.112	0.064	0.070	-0.010	0.404

*Only covering firms recorded in the Census of Industrial Production.

TABLE VII
TOTAL FACTOR PRODUCTIVITY GROWTH: SOUTH KOREA

Time period	Annual growth of:						
	Output	Raw capital	Weighted capital	Raw labor	Weighted labor	TFP	Labor share
Economy—excluding agriculture:							
60-66	0.077	0.069	0.070	0.062	0.072	0.005	0.690
66-70	0.144	0.167	0.194	0.095	0.103	0.013	0.690
70-75	0.095	0.121	0.118	0.052	0.055	0.019	0.661
75-80	0.093	0.158	0.178	0.040	0.052	0.002	0.694
80-85	0.085	0.102	0.099	0.031	0.047	0.024	0.729
85-90	0.107	0.105	0.108	0.061	0.072	0.026	0.739
66-90	0.103	0.129	0.137	0.054	0.064	0.017	0.703
Manufacturing:							
60-66	0.123	0.105	NA	0.115	0.115	0.013	0.504
66-70	0.204	0.205	NA	0.104	0.108	0.048	0.504
70-75	0.165	0.133	NA	0.084	0.088	0.053	0.477
75-80	0.127	0.207	NA	0.047	0.062	-0.007	0.503
80-85	0.106	0.075	NA	0.019	0.039	0.051	0.547
85-90	0.118	0.147	NA	0.069	0.082	0.008	0.572
66-90	0.141	0.151	NA	0.063	0.074	0.030	0.521

TABLE VIII
TOTAL FACTOR PRODUCTIVITY GROWTH: TAIWAN

Time period	Annual growth of:						
	Output	Aggregate capital	Weighted capital	Aggregate labor	Weighted labor	TFP	Labor share
Economy—excluding agriculture:							
66-70	0.111	0.152	0.171	0.043	0.044	0.034	0.739
70-80	0.103	0.137	0.144	0.068	0.068	0.015	0.739
80-90	0.078	0.085	0.083	0.024	0.032	0.033	0.749
66-90	0.094	0.118	0.123	0.046	0.049	0.028	0.743
Manufacturing:							
66-70	0.168	0.207	0.214	0.078	0.075	0.031	0.558
70-80	0.121	0.145	0.146	0.100	0.101	0.001	0.566
80-90	0.072	0.078	0.079	0.012	0.021	0.028	0.613
66-90	0.108	0.128	0.130	0.069	0.063	0.017	0.579
Other industry:							
66-70	0.104	0.177	0.190	0.100	0.096	-0.020	0.702
70-80	0.112	0.165	0.169	0.063	0.066	0.013	0.691
80-90	0.059	0.068	0.060	0.012	0.018	0.027	0.692
66-90	0.088	0.122	0.127	0.048	0.051	0.014	0.696
Services:							
66-70	0.087	0.145	0.162	0.018	0.023	0.040	0.828
70-80	0.094	0.134	0.139	0.049	0.050	0.029	0.827
80-90	0.090	0.094	0.092	0.036	0.038	0.039	0.777
66-90	0.091	0.119	0.123	0.038	0.040	0.035	0.811

Other industry combines mining, electricity, gas & water, and construction. Services combines wholesale & retail trade, restaurants & hotels, transport, storage & communications, finance insurance, real estate & business services, and community & social services.

TABLE XIII
AVERAGE TOTAL FACTOR PRODUCTIVITY GROWTH
(PERCENT PER ANNUM)

	Hong Kong (1966-1991)	Singapore (1966-1990)	South Korea (1966-1990)	Taiwan (1966-1990)
Economy*	2.3	0.2	1.7	2.1
Manufacturing#	NA	-1.0	3.0	1.7
Other industry	NA	NA	1.9	1.4
Services	NA	NA	1.7	2.6
Private sector	NA	NA	NA	2.3

NA—not available. *In the case of Korea and Taiwan, agriculture is excluded. #In the case of Singapore, the years are 1970-1990.

TABLE XIV
COMPARATIVE TOTAL FACTOR PRODUCTIVITY GROWTH
(PERCENT PER ANNUM)

Country	Period	Growth	Country	Period	Growth
Canada	1960-1989	0.5	Brazil	1950-1985	1.6
France	1960-1989	1.6	Chile	1940-1985	0.8
Germany	1960-1989	1.6	Mexico	1940-1985	1.2
Italy	1960-1989	2.0	Brazil (M)	1960-1980	1.0
Japan	1960-1989	2.0	Chile (M)	1960-1980	0.7
United Kingdom	1960-1989	1.3	Mexico (M)	1940-1970	1.3
United States	1960-1989	0.4	Venezuela (M)	1950-1970	2.6

M: manufacturing alone; developed economies are from Dougherty (1991); less developed economies from Elias (1990).

Table 5.1
Growth Accounting in OECD Countries, 1980-2000

Country	Growth Rate	TFP Growth	Capital Deepening	TFP Share	Capital Share
Australia	1.67	1.26	0.41	0.75	0.25
Austria	2.99	2.03	0.96	0.68	0.32
Belgium	2.58	1.74	0.84	0.67	0.33
Canada	1.57	0.95	0.63	0.60	0.40
Denmark	1.87	1.52	0.55	0.70	0.30
Finland	2.72	2.05	0.69	0.75	0.25
France	2.50	1.54	0.95	0.62	0.38
Germany	3.09	1.96	1.12	0.64	0.36
Greece	1.93	1.66	0.27	0.86	0.14
Iceland	4.02	2.53	1.69	0.58	0.42
Ireland	2.93	2.26	0.67	0.77	0.23
Italy	4.04	2.10	1.94	0.52	0.48
Japan	3.28	2.73	0.56	0.83	0.17
Netherlands	1.74	1.25	0.49	0.72	0.28
New Zealand	0.61	0.45	0.16	0.74	0.26
Norway	2.36	1.70	0.66	0.72	0.28
Portugal	3.42	2.06	1.56	0.60	0.40
Spain	3.22	1.79	1.44	0.55	0.45
Sweden	1.68	1.24	0.44	0.74	0.26
Switzerland	0.98	0.69	0.29	0.70	0.30
United Kingdom	1.90	1.31	0.58	0.69	0.31
United States	1.89	1.09	0.80	0.58	0.42
Average	2.41	1.61	0.80	0.68	0.32

AGHION-HOWITT

$$\hat{y}, \hat{B}, \alpha \hat{h}, \hat{\beta}, \frac{\alpha \hat{h}}{\hat{y}}$$