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A Simple Macro-Economic Growth Model

Part III

The Model in Figures

by

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Three appended tables give the values of the macro-economic variables, Table A on the assumption of a 3% rise, Table B a 5% rise and Table C a 7% rise in net national product (NNP) for three time intervals (t) 5, 10, 15 years, three net incremental fixed capital output ratios (k) of 3, 4 and 5 and three saving ratios (s) of 5, 10 and 15 per cent. These parameters are defined in Part I. The rate of interest (n) on the import excess is assumed fixed at 7%. The number of sets of values of the macros Y, C, S, V, M (= M' + M"), X and N is accordingly 81 (= 3x3x3x3). This part of the exercise is designed to obtain the first approximation to a rate of increase (r) which might be adopted for a National Plan having regard to the realities of the Irish situation. Since many of the figures in the tables are going to appear incredible it is necessary to point out at the start that, with one exception, namely the part M" of imports, they are the results of simple arithmetic applied to the accounting identities I(2). The only element in the exercise which involves economic theory is the assumption that the import ratio m grows <u>pari passu</u> with rate of growth of the economy - percent for percent - for the reasons given in Part I. This assumption, of course, exacerbates the import excess situation, regarded as the principal criterion of feasibility of any plan. As already remarked in Part I, the one-one relation of import ratio and NNP rates of growth is a conservative one: freer trading conditions would be conducive to increasing the ratio to the further detriment of the import excess.

In the author's view most of the policies implicit in these 81 sets of figures must be dismissed out of hand as inconceivable. It will be recalled that during the period 1947-1955 of continual growth of NNP the capital-output ratio was 5 and during the two quinquennia 1952-56 and 1957-61 the net saving ratio was 9%. Wherever the country goes it has to start from where it is now, so that the actual or recent values of the parameters must be regarded as having relevance and validity and cannot be ignored. In Part I it was also shown that the high capital-output ratio was due mainly to the large, but happily diminishing, share of agriculture in Ireland's net domestic product. For long periods in the past physical growth in Irish agriculture was negligible; if during such periods there was any increase whatever in the physical capital stock then the net capital output ratio for the agricultural sector was infinity! A permanent change from 5 to 3 in a short term of years in the capital-output ratio would be revolutionary and so would an increase in the net saving ratio from 9% to the 15% contemplated in some of the exercises.

The test of feasibility of any policy must rest on the view taken with regard to exports X and import excess N. In the first place it will be noted that few of the exercises yield a negative value of N, i.e. an export excess. If Ireland, even at its present economic level, is expected to make a contribution to international social security, the country must budget for an export excess: USA now contributes 2% of its GNP (which is totally inadequate having regard to the US standard of living) but even 1% from Ireland would be equivalent to £6 million. On the other hand the hypothesis of a regular deficit is not to be regarded as improbable for that has largely been the Irish way during the past half-century except in wartime. Though the balance of payments statistics are not quite decisive, what appears to have happened is that Irish residents have more or less maintained their volume of investments abroad whereas there has been a regular inflow of extern capital into the country, perhaps principally by way of plough-back of reserves of UK branches and subsidiaries as well as direct investment. In relation to UK resources this inflow can be regarded only as a trickle - one may be surprised it was not more - but, over the whole period, it was regular.

Granted, however, that regular import excess is conceivable there remains the question of its magnitude. Clearly a <u>regular</u> import excess averaging more than say 2 or 3% of exports cannot be seriously contemplated. Comparison of the figures in the last two columns show that very few of the sets conform to this standard and realistically must be ruled out of consideration. A small external deficit brings us back to the formula between the parameters derivable from I(11):-

(1) $s \sim r(k + p)$

No set of parameters which do not satisfy this formula are feasible.

Even postulating a large deficitary economic policy an absolutely regular feature of all the exercises is the propensity of exports to increase in time proportionately more than net national product. Here are a few examples from some more feasible sets, i.e. those in which the import excess is not too great.

Year	Rate of growth 3%				Rate of growth 5%		Rate of growth 7%	
	Y	Exercise No.			Y	Ex. No.	Y	Ex. No.
		A4	A8	A9		B7		C7
1960	100	100	100	100	100	100	100	100
1965	116	131	135	128	128	153	140	168
1970	134	176	179	175	163	255	197	355
1975	156	238	239	237	208	420	276	723

Has Ireland an export growth potential anything like these figures would imply? One must doubt it, at any rate while present attitudes prevail. Perhaps two-thirds of our exports are agricultural in origin and there is not the faintest prospect of the spectacular increases required in exports or production in this sector. The only hope is in industrial exports including perhaps industrialised agricultural exports, broilers pigs, perhaps even cattle, deep-freeze vegetables etc produced on the assembly line. The main attraction which EEC membership has for Irish agriculture is increased prices and Ireland is no exception to the rule common to all primary producers that higher prices are conducive to lower quantum output.* Even if an increased demand for Irish agricultural produce made itself felt it is doubtful if there would be a commensurate response in supply. The likelihood is that agricultural output of the traditional type in quantum terms will not change much during the next quarter-century.

It is quite evident from part C of the table that a 7% rate of increase is entirely out of the question. To see this let us set $p = 0.6$ and $r = 0.07$ as before so that the fundamental identity becomes

$$(2) \qquad s = 0.07(k + 0.6)$$

when the import excess is zero. Setting s at its "practical" limit of 0.15 we find $k = 1.5$, compared with 5 in the period 1947-55. Or if k be given its "practical" limit of 3, the saving parameter $s = 0.25$ so that the net saving of the nation would have to be 25% compared with 9% in the last decade.

Finally, attention may be directed to the columns for M', interest on the import excess, or extern investment in this country. Even with the modest growth rate of 3% it increases rapidly, from zero in 1960, in all cases, in absolute value.

To conclude:-

(i) It is difficult to conceive a growth rate of more than 3% on a quasi-permanent basis. If the labour force remains at its present level, an optimistic assumption, this would imply a 3% rise in labour productivity which, on past experience, would also be regarded as optimistic.

(ii) Even a 3% rate implies a much greater rise in exports, even if an import excess is allowed to develop and persist. Since there is no growth potential in agriculture of the traditional type a severe strain will thereby

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*R. C. Geary "Variability in Agricultural Statistics on Small and Medium-sized Farms in an Irish County", Journal of the Statistical & Social Inquiry Society of Ireland, Vol. XIX, 1956-57.

be placed on non-agricultural exports (including invisibles like tourism).

(iii) The problem of syphoning away capital investment from agriculture is going to be exacerbated by the tendency towards substitution of capital for manpower in agriculture (with no growth potential) away from non-agriculture where the only hope lies.

Table A: Value of Macro-economic Variables after 5, 10 and 15 Years (t) on Different Assumptions with Regard to Annual Rate of Growth (r), Saving Rate (s) and Net Incremental Capital-Output Ratio (k)

Note: For definition of symbols see I(1). Identities I(2) are not exactly satisfied because of rounding. Figures in column heads represent values in 1960

A. Rate of Growth 3%: r = .03

£ million

No. A	Parameters s	k	t	Y 626	C 567	S 59	V 60	M' 0	M'' 256	M 256	X 255	N 1
1	.05	3	5	726	689	36	78	14	337	350	308	42
	.05	3	10	841	799	42	91	29	453	482	433	49
	.05	3	15	975	927	49	105	47	608	655	598	57
2	.05	4	5	726	689	36	100	21	337	357	293	64
	.05	4	10	841	799	42	116	44	453	497	423	74
	.05	4	15	975	927	49	135	72	608	679	594	86
3	.05	5	5	726	689	36	122	28	337	364	279	86
	.05	5	10	841	799	42	141	59	453	512	413	99
	.05	5	15	975	927	49	164	96	608	704	589	115
4	.10	3	5	726	653	73	78	2	337	339	333	6
	.10	3	10	841	757	84	91	4	453	457	450	7
	.10	3	15	975	878	98	105	7	608	614	606	8
5	.10	4	5	726	653	73	100	9	337	346	318	28
	.10	4	10	841	757	84	116	19	453	472	440	32
	.10	4	15	975	878	98	135	31	608	639	602	37
6	.10	5	5	726	653	73	122	16	337	353	303	49
	.10	5	10	841	757	84	141	34	453	487	430	57
	.10	5	15	975	878	98	164	55	608	663	597	66
7	.15	3	5	726	617	109	78	-10	337	327	357	-31
	.15	3	10	841	715	126	91	-21	453	432	467	-35
	.15	3	15	975	829	146	105	-34	608	573	614	-41
8	.15	4	5	726	617	109	100	-3	337	334	343	-9
	.15	4	10	841	715	126	116	-6	453	447	457	-10
	.15	4	15	975	829	146	135	-10	608	598	610	-12
9	.15	5	5	726	617	109	122	4	337	341	327	14
	.15	5	10	841	715	126	141	9	453	462	447	15
	.15	5	15	975	829	146	164	15	608	622	605	18

Table B: Value of Macro-economic Variables after 5, 10 and 15 Years (t) on Different Assumptions with Regard to Annual Rate of Growth (r), Saving Rate (s) and Net Incremental Capital-Output Ratio (k)

See Note at A

B. Rate of Growth 5%: r = .05

£ million

No. B	Parameters s	k	t	Y	C	S	V	M'	M''	M	X	N
				626	567	59	60	0	256	256	255	1
1	.05	3	5	799	759	40	144	32	408	440	336	104
	.05	3	10	1020	969	51	184	72	664	735	603	133
	.05	3	15	1301	1236	65	234	123	1081	1204	1035	169
2	.05	4	5	799	759	40	184	44	408	452	308	144
	.05	4	10	1020	969	51	235	99	664	763	580	184
	.05	4	15	1301	1236	65	299	170	1081	1252	1017	234
3	.05	5	5	799	759	40	224	56	408	464	280	184
	.05	5	10	1020	969	51	286	127	664	791	556	235
	.05	5	15	1301	1236	65	364	217	1081	1299	1000	299
4	.10	3	5	799	719	80	144	19	408	428	364	64
	.10	3	10	1020	918	102	184	44	664	708	626	82
	.10	3	15	1301	1171	130	234	76	1081	1157	1053	104
5	.10	4	5	799	719	80	184	32	408	440	336	104
	.10	4	10	1020	918	102	235	72	664	735	603	133
	.10	4	15	1301	1171	130	299	123	1081	1204	1035	169
6	.10	5	5	799	719	80	224	44	408	452	308	144
	.10	5	10	1020	918	102	286	99	664	763	580	184
	.10	5	15	1301	1171	130	364	170	1081	1252	1017	234
7	.15	3	5	799	679	120	144	7	408	415	391	24
	.15	3	10	1020	867	153	184	17	664	680	650	31
	.15	3	15	1301	1106	195	234	28	1081	1110	1071	39
8	.15	4	5	799	679	120	184	19	408	428	364	64
	.15	4	10	1020	867	153	234	44	664	708	626	82
	.15	4	15	1301	1106	195	299	76	1081	1157	1053	104
9	.15	5	5	799	679	120	224	32	408	440	336	104
	.15	5	10	1020	867	153	286	72	664	735	603	133
	.15	5	15	1301	1106	195	364	123	1081	1204	1035	169

Table C: Value of Macro-economic Variables after 5, 10 and 15 Years (t) on Different Assumptions with Regard to Annual Rate of Growth (r), Saving Rate (s) and Net Incremental Capital-Output Ratio (k)

See Note at A

C. Rate of Growth 7%: r = .07

£ million

No.	Parameters			Y	C	S	V	M'	M''	M	X	N
C	s	k	t	626	567	59	60	0	256	256	255	1
1	.05	3	5	878	834	44	221	51	493	544	366	177
	.05	3	10	1231	1170	62	310	122	969	1091	843	249
	.05	3	15	1727	1641	86	435	222	1907	2129	1780	349
2	.05	4	5	878	834	44	283	69	493	561	322	239
	.05	4	10	1231	1170	62	397	165	969	1134	799	335
	.05	4	15	1727	1641	86	556	300	1907	2206	1737	470
3	.05	5	5	878	834	44	344	86	493	579	279	300
	.05	5	10	1231	1170	62	483	207	969	1176	755	421
	.05	5	15	1727	1641	86	677	377	1907	2283	1693	591
4	.10	3	5	878	790	88	221	38	493	531	397	134
	.10	3	10	1231	1108	123	310	92	969	1061	874	187
	.10	3	15	1727	1555	173	435	167	1907	2074	1812	263
5	.10	4	5	878	790	88	283	56	493	549	354	195
	.10	4	10	1231	1108	123	397	134	969	1104	830	273
	.10	4	15	1727	1555	173	556	245	1907	2151	1768	383
6	.10	5	5	878	790	88	344	74	493	566	310	256
	.10	5	10	1231	1108	123	483	177	969	1146	786	360
	.10	5	15	1727	1555	173	677	322	1907	2228	1724	504
7	.15	3	5	878	746	132	221	26	493	518	429	90
	.15	3	10	1231	1047	185	310	62	969	1031	905	126
	.15	3	15	1727	1468	259	435	112	1907	2019	1843	176
8	.15	4	5	878	746	132	283	43	493	536	385	151
	.15	4	10	1231	1047	185	397	104	969	1073	861	212
	.15	4	15	1727	1468	259	556	189	1907	2096	1799	297
9	.15	5	5	878	746	132	344	61	493	554	341	213
	.15	5	10	1231	1047	185	483	147	969	1116	818	298
	.15	5	15	1727	1468	259	677	267	1907	2173	1755	418