3. Three-worlds models

3.1 THE NEED FOR THREE-WORLDS MODELS: SOME ALTERNATIVES

In Chapter 2 only two-worlds models have been used. The problems of disarmament and development have been treated separately, in the spirit of the opinion of the government of the United States of America concerning the meeting organized by the United Nations on disarmament and development. The United States did not participate since in their government's opinion there is no relationship between disarmament and development. To say the least, and in simple words, this is a remarkable opinion. No complicated analysis is required to understand that what is spent on armament cannot be spent on development. The economic models to be discussed in this chapter describe the relationships between the three worlds of which the global society consists and usually indicated by the terms first, second and third world. Roughly speaking, the first world is the group of non-communist developed (or industrialized) countries, the second world is the group of communist-ruled developed countries and the third world that of the underdeveloped countries. Disarmament is a subject mainly (but of course not exclusively) dealt with by negotiations between the first and the second world. Development cooperation is a subject mainly (but again not exclusively) relevant to the first and the third world. Three-worlds models automatically deal with both subjects simultaneously, and enable us to find out whether there is a relationship between the two and how it looks quantitatively.

A closer look reveals that the three worlds may be defined in somewhat different ways and that a number of alternative definitions are possible, as was stated in Section 1.7 of Chapter 1.

The main choice to be made concerns the position of the world's largest country in population, China. It is a communist-ruled country, but underdeveloped. It may be considered as part of the second or of the third world. It may also be considered in isolation.

A second choice is whether for some problems, such as discussions of security questions, the first world as a whole should be considered or the

military organized industrialized countries: the members of the North Atlantic Treaty Organisation (NATO). This problem does not exist for the second world in the restricted sense (without China). All its nations are members of the Warsaw Pact (WP). Table 3.1 lists all alternatives considered in this book.

Table 3.11 Alternative definitions of 'worlds' considered

Definition	Symbol	Variable y symbol
Non-communist developed countries	W1	y ₁
Members of NATO	W1'	y' ₁
Communist-ruled countries (incl. China)	W2	y ₂
Communist-ruled developed countries ¹	W2'	y',
Underdeveloped non-communist countries	W3	y ₃
All underdeveloped countries (incl. China)		y',
China, when considered separately	W4	\mathbf{y}_{4}

¹All East-European countries. Yugoslavia not included.

The main statistical data used for these 'worlds' are shown in Appendix II.

3.2 ALTERNATIVE SETS OF CALCULATIONS

In our calculations of optimal security assistance (v_{12}) a positive value for v_{12} was found only when we included China in the second world. For this reason we shall consider first a number of results obtained with W1 and W2, that is, the developed world and the communist world including China. Three sets of calculations have been made which all compare optimum values for the relevant variables for three cases, A, B and C. A deals with security optima negotiated by W1 and W2 only; B deals with development co-operation negotiated by W1 and W3 only, and C deals with simultaneous security and development co-operation negotiated by W1, W2 and W3. The first set of calculations is based on logarithmic utility (welfare-cum-security) functions. The second set is based on parabolic utility functions, assuming that the satiation values have been obtained by observation. The figures are arbitrary figures since no such measurements have in fact been made and have illustrative value only. The third set of

calculations are also based on parabolic utility functions, but here the satiation values are those which are optimal for the world at large. As this optimality can be interpreted in different ways, since there are three degrees of freedom, the interpretation has been chosen that W1 and W2 both reduce their armament expenditures to 50 milliards of US dollars with 1975 purchasing power. This means a reduction of military expenditures to less than half the 1975 level. Moreover, it has been assumed that 1 per cent of W1 income ($x_1 = 3880$) is made available as security assistance, hence $v_{12} = 39$ milliards of 1975 dollars.

Some of the calculations have been based on alternative assumptions, marked (i) and (ii). Thus, the negotiations between W1 and W2 for the third set of calculations (cf. Table 3.23) have been based on the assumptions that (i') armament expenditures of 50 were sufficient and that per capita non-armament expenditures in both areas should be equal (a criterion of equity); alternatively the assumptions just mentioned were made: (ii') armament expenditures restricted to 50 and security assistance of 1 per cent of W1 income $x_1 = 3880$.

Table 3.21 Optimal values of the variables when they are the result of (A) maximizing welfare of W1 and W2, (B) maximizing welfare of W1 and W3 and (C) maximizing welfare of W1, W2 and W3.

Logarithmic welfare functions. For comparison, D gives 1975 actual figures (bn 1975 US\$)

	1	A W1W2	T W1	3 W3	C W1W2W3	D
Var	iable (bn 1975 \$)		(i)	(ii)		
y_1	Non-mil. exp. of W1	2050	1458	1527	1370	3699
y ₂	Non-mil. exp. of W2	3792	•	•	2535	1866
y_3	Non-mil. exp. of W3	•	4156	4352	3905	1901
a_1	Milit. exp. of W1	40	167	0	26	167
	Milit. exp. of W2	40	•	•	26	182
-	Milit. exp. of W3	•	98	0	59	98
	Security assistance	1790	•	•	519	0
2.00	Developm. assistance	•	2255	2353	1964	14

⁽i) Military expenditures of W1 and W3 as in 1975.

Similarly, the negotiations on development assistance between W1 and

⁽ii) Full disarmament.

W3 (cf. Table 3.21) have been based on the assumptions that either (i) armament expenditure remains as it was (in 1975) or (ii) that complete disarmament had already been attained.

Tables 3.21, 3.22 and 3.23 show the results of the three sets of optimum calculations just mentioned.

Table 3.22 Optimal values of the variables when they are the result of (A) maximizing welfare of W1 and W2, (B) maximizing welfare of W1 and W3 and (C) maximizing welfare of W1, W2 and W3. Parabolic welfare functions, where satiation values are assumed to have been measured. For comparison D gives 1975 actual figures (bn 1975 US\$)

		A W1W2	E W1	3 W3	C W1W2W3	
Var	iable (bn 1975 US\$)		(i)	(ii)		
y ₁	Non-mil. exp. of W1	2015	1458	1527	1375	3699
y_2	Non-mil. exp. of W2	3727	•	•	2544	1866
y_3	Non-mil. exp. of W3		4156	4352	3918	1901
a_1	Milit. exp. of W1	46	167	0	27	167
a_2	Milit. exp. of W2	134	•	•	36	182
a_{3}	Milit. exp. of W3		98	0	27	98
v_{12}	Security assistance	1819	•	•	537	0
ν ₁₃	Developm. assistance	**	2255	2353	1946	14

By way of example the following satiation values have been taken: $y_{01} = 6000$; $y_{02} = 11100$; $y_{03} = 17100$; $a_{01} = 400$; $a_{02} = 740$; $a_{03} = 1140$; i.e., equal per capita figures for both y_0 and a_0 .

The satiation variables have been defined in Section 1.6 and the choice made for their numerical values in the present section. In Table 3.23 the values 50 chosen for a_1 and a_2 are somewhat more cautious than those found in Table 3.21.

⁽i) Military expenditures of W1 and W3 as in 1975.

⁽ii) Full disarmament.

Table 3.23 Optimal values of the variables, when they are the result of (A) maximizing welfare of W1 and W2, (B) maximizing welfare of W1 and W3 and (C) maximizing welfare of W1, W2 and W3. Parabolic welfare functions, where satiation values are chosen so as to maximize world welfare. For comparison D gives 1975 actual figures (bn 1975US\$)

		A W1	W2	B W1		C W1W2W3	D
Var	iable (bn 1975 US\$)	(i')	(ii')	(i)	(ii)		
y_1	Non-mil. exp. of W1	2043	3791	1458	1527	1355	3699
•	Non-mil. exp. of W2			•	•	2507	1866
2.	Non-mil. exp. of W3			4156	4352	3862	1901
•	Milit. exp. of W1	50	50	167	0	50	167
	Milit. exp. of W2	50	50	•	•	50	182
4.0	Milit. exp. of W3	•	•	98	0	98	98
		1787	39	•	*	515	0
1.2	Developm. assistance	•	•	2255	2353	1961	14

⁽i') Degrees of freedom choices: $a_1 = a_2 = 50$ and $y_2 = 1.85$ y_1 ('equity').

3.3 THE RELATIONSHIP BETWEEN DISARMAMENT AND DEVELOPMENT

As stated in Section 3.1, the main purpose of the comparisons made in Tables 3.21, 3.22 and 3.23 has been to show that a relationship exists between disarmament and development, contrary to the opinion expressed by the American government in 1986. In all three tables we see that the optimal amount of v_{13} , development assistance to the Third World, is lower in Case C than in Case B, that is, lower if security problems have also to be taken care of. This result is found in all three tables, each based on another welfare function – whether logarithmic and without the phenomenon of satiation, or parabolic with satiation or, in the latter case, whether based on autonomous satiation without an ethical principle, or based on an ethical principle: maximizing world welfare. (The reader will have under-

⁽ii') Degrees of freedom choices: $a_1 = a_2 = 50$ and $v_{12} = 1\%$ of x_1 (3880).

⁽i) Military expenditures of W1 and W3 as in 1975.

⁽ii) Full disarmament.

stood that the word welfare has been used in its widest sense, including the security aspect.)

The tables show some additional features worth mentioning. First, they all show the very high values characteristic for statical models, discussed at some length in Section 2.2. Next, they also show a clear reduction in armament expenditure when not fixed in advance (Table 3.23). A third feature is the extreme sensitivity of security assistance to some of the parameters of the model. This means that, at least in the model used, small changes in the relative incomes of W1 and W2 require large shifts in security assistance, whether up or down. It also means that modest improvements in W2 productivity – given so much attention by Secretary-General Gorbachev – may considerably reduce the need for any security assistance. This finding remains a subject for further study.

3.4 THREE-WORLDS MODELS WITH CHINA IN THE THIRD WORLD

As stated in Section 3.1, all calculations made so far have taken W2 to include China, because including China in W3 leads to negative security assistance, which is considered unrealistic. In this final section of Chapter 3 some results obtained with that definition of W3 (indicated by W3') will be shown. In a way it means considering China underdeveloped in the first place, rather than communist-ruled.

The evidence will be given in the same form as in Section 3.2, that is, in tables comparing the results of maximizing, respectively, welfare of W1W2', W1W3' and W1W2'W3'. Here W2' stands for the Warsaw Pact countries and W3' for the underdeveloped world including China (cf. Table 3.11). We have restricted ourselves to two welfare functions, those used in Tables 3.31 and 3.33

In both tables the value of 'security assistance' v_{12} is found to be negative, meaning literally that such assistance should be flowing from the communist countries to the western, which does not look realistic. The correct interpretation rather seems to be that the optimum position is a boundary value, in this case $v_{12} = 0$. Alternatively, v_{12} may be chosen at \$39 bn (1% of 3880).

Substituting the value 0 of v_{12} for the maximum condition $d\Omega/dv_{12} = 0$ we obtain the correct set of optimum values for all variables. Since one of the parameters—the coefficient α linking armament expenditures and non-military expenditures—must be chosen somewhat arbitrarily (< 0.10) we

Table 3.41 Optimal values of the variables, when they are the results of (A) maximizing welfare of W1 and W2', (B) maximizing welfare of W1 and W3' and (C) maximizing welfare of W1, W2' and W3'. Logarithmic welfare functions. For comparison D gives actual 1975 figures (bn 1975 US\$)

		A W1W2'	AST -	3 W3'	C W1W2'W3'	
Var	iables (bn 1975 US\$)		(i)	(ii)		
У,	Non-mil. exp. of W1	3238	1234	1295	1315	3699
y',	Non-mil. exp. of W2'	1814	*		736	1139
	Non-mil. exp. of W3'		5123	5374	5457	2644
- -	Milit. exp. of W1	40 ¹	167	0	58	167
	Milit. exp. of W2'	40¹	•	•	58	113
a_2^2	Milit. exp. of W3'	•	145	0	296	145
ν',,	Security assistance	602	•	•	-457	0
ν' ₁₃	Developm. assistance	•	2479	2585	2964	14

Chosen equal to value in Table 3.21, also based on logarithmic welfare functions.

Table 3.42 Optimal values of the variables, when they are the result of (A) maximizing welfare of W1 and W2', (B) maximizing welfare of W1 and W3' and (C) maximizing welfare of W1, W2' and W3'.

Parabolic welfare functions, where satiation values are chosen so as to maximize world welfare. For comparison D gives actual 1975 figures (bn 1975US\$)

		A W1W2'	W ₁	3 W3'	C W1W2'W3'	D
Var	iables (bn 1975 US\$)		(i)	(ii)		
7	Non-mil. exp. of W1	3226	959	997	1344	3699
	Non-mil. exp. of W2'		•	•	753	1139
י". מי	Non-mil. exp. of W3'	•	3978	4135	5579	2644
•	Milit. exp. of W1	50	167	0	50	167
2 [†]	Milit. exp. of W2'	50	•	•	50	113
2' <u>~</u>	Milit. exp. of W3'	*	145	0	145	145
,' 12	Security assistance	604	*	•	_ 449	0
+ 4	Developm. assistance	· #	2871	•	2935	14

⁽i) Military expenditures of W1 and W3' as in 1975.

⁽i) Military expenditures of W1 and W3' as in 1975.

⁽ii) Full disarmament.

⁽ii) Full disarmament.

Table 3.43 Optimum values of the variables, as shown in Table 3.4 and those obtained by substituting $v_{01} = 0$ for $\alpha = 0.9$ and $\alpha = 0.8$.

Var	iables (bn 1975 US\$)		$\alpha = 0.9$	$\alpha = 0.8$
у ₁	Non-mil. exp. of W1	1315	1231	1232
y',	Non-mil. exp. of W2'	736	1198	1204
	Non-mil. exp. of W3'	5457	5108	5112
a_1	Milit. exp. of W1	58	54	48
a'_2	Milit. exp. of W2'	58	54	48
a'_{3}	Milit. exp. of W3'	296	277	281
ν' ₁₂	Security assistance	-457	0	0
v' ₁₃	Developm. assistance	2964	2595	2600

carry out the calculation of the optimum values for two values of α , 0.9 and 0.8. Table 3.43 shows the results. Apparently the results are not very sensitive to the values of α and so are rather reliable.

The problem to which this chapter is devoted is, as announced in Section 3.1, whether a relation exists between the policies of disarmament and of development co-operation. The alternative compositions of the Second and the Third Worlds considered in the present chapter centred around the question of whether China should be considered part of the Second or of the Third World. Another approach is to consider China as a world of its own. This possibility will be studied in Chapter 4. For this reason we postpone drawing conclusions until this study has been carried out, that is until the end of Chapter 4.