BOTSWANA INSTITUTE FOR DEVELOPMENT POLICY ANALYSIS

Exchange rate, inflation and competitive power

An analysis of the relationship between Botswana's exchange and inflation rates, and its implication for the competitive strength of her producers

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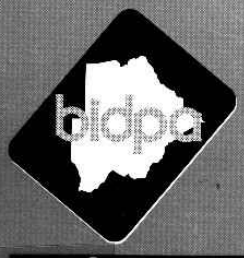

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Abstract

The present paper has grown out of two separate issues. These are, on the one hand, the specific preparations for a forthcoming reconstruction of the Macro Economic Model for Botswana (MEMBOT), and on the other, the general debate about Botswana's exchange rate regime. Responding to these issues, a simple exchange rate model was constructed, and used to analyse a number of alternative exchange rate scenarios.

In the first instance these efforts were undertaken in order to examine the feasibility of including a separate exchange rate sub-model in the MEMBOT project. Additional to the specific modelling considerations, however, it was felt that the exchange rate question warranted considerable attention in its own right. A project dealing more directly with this issue ought therefore to be initiated.

Although such a project would eventually have to be separate from the MEMBOT project, the two could initially be combined. Thus, given that the prototype model had to be tested out, and that this implied the analysis of alternative exchange rate scenarios, these efforts were undertaken with the double aim of testing the model structure, and of serving as an initial input into a future exchange rate project.

Keywords

Exchange rates
Economic models
Botswana

Preface

The present paper has grown out of two separate issues:

i) The preparations for the forthcoming reconstruction of the Macro Economic Model for Botswana (MEMBOT), which is used by the Ministry of Finance and Development Planning for forecasting and planning purposes.

ii) The extensively debated issue of Botswana's exchange rate regime, especially the wisdom of allowing the Pula to follow the Rand in its recent slide against major foreign currencies.

Responding to these issues, BIDPA decided that an effort should be made to construct a simple prototype exchange rate model. In the first instance this would be done for the purpose of examining the feasibility of extending the MEMBOT effort by the construction of a separate sub-model dealing more specifically with the exchange rate issue. Thus, the fundamental format of the prototype model was a priori restricted to that of the MEMBOT model itself, i.e. essentially to an input/output type of model.

Additional to the specific modelling considerations, however, it was felt that the exchange rate question warranted attention in its own right. A project dealing more directly with this issue ought therefore to be considered. Although this effort would be separate from and additional to the MEMBOT effort, the two could initially be combined. Thus, given that the prototype model would have to be tested out, and that this would take the form of analysing a number of exchange rate scenarios, it seemed natural to extend and focus these efforts in such a way that they might serve as the initial stage for a future exchange rate project.

The present paper reports on the outcome of these efforts. In presenting these results and conclusions, it should be emphasised that they are those of a *pilot* effort, limited both in time and scope. Thus, this report touches on a number of subjects, but it does not necessarily deal with them conclusively, the ambition at this stage having been to inspect the problems and possibilities involved, rather than to deal with them at any great length, depth or detail.

It should also be re-emphasised that the presented results are derived from what has essentially been intended as a modelling exercise, rather than from a more direct onslaught on the exchange rate issue *per se*. As such it has its clear limitations in terms of scope and coverage. Thus, relatively much attention is paid to the prototype model's structure and interpretation, its strength and weakness, while little or no attention is paid to the literature dealing with the exchange rate issues in general or in the spesific Botswana context. These, of course, should be taken on board later, should these initial efforts develop into a fully fledged project.

This paper have benefited from comments made by various colleagues. Thanks are due to all of them, and especially to Dr. J. S. Salkin, whose comments were particularly extensive. None of these are however responsible for the views and conclusions presented in the paper; these are the sole responsibility of its author.

Table of contents

I. Executive summary

II. Main Report

III. Annexes

I. Executive summary

Introduction

1. Recent years have seen a rapid depreciation of the Rand against most major currencies, closely followed by the Pula. The latter development may seem paradoxical because the underlying economic factors would appear to imply a strong Pula. The Pula's fall against major currencies has not, however, been brought about by market forces, but by the Botswana authorities themselves, who have adhered to a policy of keeping the value of the Pula largely in line with the value of the Rand. The wisdom of pursuing such a policy has been questioned in some quarters.

2. A desire for a strong and stable Pula seems to have underpinned these concerns. This, however, begs the question: strong and stable for whom, and against which currency? For some economic actors the Pula's rate against the South African Rand may be a main concern, while other actors may be more concerned with the rate against the US Dollar (US$), the Zimbabwe Dollar etc.

3. Unless the underlying Rand/US$ rate remains unchanged, the Pula can not be simultaneously stable against both the Rand and the US$. The same applies for other currency combinations. The Botswana authorities can therefore not in general hope to satisfy *all* economic actors. Given that these actors have different preferences with respect to the value of the Pula, some, or all, of them are likely to feel disadvantaged no matter what the authorities do.

4. Objections to the prevailing exchange rate policy are therefore not in themselves sufficient proof that anything is seriously wrong with it. Nevertheless, given the existence of concerted objections to this policy, the exchange rate question may warrant some consideration. The present paper seeks to make a modest initial contribution towards addressing this question, in the expectation that a more comprehensive effort may in due course follow.

General policy conclusions

5. A simple economic model combining inflation and exchange rate movements has been constructed for the purpose of analysing the potential outcome of alternative exchange rate policies. The model has been used to examine a number of hypothetical scenarios, illustrating the typical changes that may occur in the fortunes of local producers as a result of alternative Botswana exchange rate responses to developments abroad, primarily in South Africa.

6. The general policy conclusions drawn from these model simulations are in line with standard textbook results. Thus, as further discussed below, a devaluation of the Pula will tend to bring the Botswana producers of tradable products immediate advantages, while a revaluation will tend to hurt them. But a devaluation will also tend to accelerate inflationary impulses from abroad, while a revaluation will tend to dampen these impulses. The inflationary reactions arising within the Botswana economy will serve to modify the immediate advantages and disadvantages, and may eventually completely erase them.

7. The Botswana authorities are of course not compelled to adopt either of the above options; they may equally chose to keep the exchange rate stable. This option should not be ignored, especially since it is the option largely adopted during later years in respect of the Pula/Rand rate. As may be expected, this option is neutral with respect to the competitive situation; it implies nil competitive gains or losses. It is also neutral with respect to inflation; it does allow inflation impulses from abroad to enter the local economy, but it does not accelerate or dampen them.

8. The exchange rate effects will be different for different groups of producers, depending on their relationship to particular markets and currencies. The present analysis focuses upon two distinct groups of producers: producers of traditional exports and producers of non-traditional tradables. The former group includes Botswana's producers of beef and mineral products, while the latter includes the local producers of all other products that are either exported or facing competition from imports in the local market.

a. The producers of traditional exports

9. The producers of traditional exports typically sell their products in the world market; sales to the RSA and regional markets are relatively small. The prices obtained for these exports are typically determined in the international market, not in the local or regional markets. As such, these incomes relate directly to prices given in US Dollar, UK Pound etc., not to prices fixed in Pula, Rand or similar. A devaluation of the Pula against the former currencies, increasing the amount of Pula paid for each US Dollar etc., will therefore increase the nominal Pula value of these export incomes, while a revaluation will reduce it.

10. A devaluation of the Pula against *major foreign currencies* will consequently *ceteris paribus* benefit Botswana's traditional exporters, and a revaluation hurt them. A change in the Pula's rate against the *Rand*, on the other hand, will not have the same effect, unless it implies a corresponding de/revaluation of the Pula also against the major foreign currencies. This follows from the simple fact that the majority of the export prices in question are fixed in US Dollar etc., not in Rand.

11. The above conclusions refer to the nominal sales incomes of the traditional exporters. The corresponding *real* value of their overall *net* incomes will depend upon the inflation factors associated with the exchange rate changes in question. These inflation factors relate, on the one hand, to production costs, and on the other, to the actual "purchasing power" of the net incomes themselves.

12. Unlike their sales incomes, the production costs of the traditional exporters will be affected by changes in the Pula/Rand rate. On the whole, however, these costs are a relatively minor determinant of the real net incomes in question. This reflects the well known fact that these exports are, on average, extremely profitable. This average does however hide a pronounced disparity between the individual firms of the group. Thus, it is equally well known that some of the producers concerned tend to operate near the brink of collapse; even relatively minor setbacks in their fortunes, in the form of increased costs or reduced sales incomes, may jeopardise their very existence.

13. The "purchasing power" of the net incomes earned by the traditional exporters will depend upon the specific nature of the "purchases" made, i.e. upon the specific purposes for

which these incomes are used. The nature of these is not altogether obvious, since these incomes are distributed in the form of dividends, tax revenues etc. to various local and foreign recipients. Given this uncertainty, one can not be absolutely sure about the strength and direction of the real term de/revaluation effect. Even a reversal of the nominal income effects can not be entirely ruled out. In most cases, however, it seems realistic to anticipate that they will merely be modified in strength, not altered in direction.

b. The producers of non-traditional tradable products

14. The producers of non-traditional tradable products face import competition in their home market, chiefly from the RSA. The RSA also receives the lion's share of their exports. These producers are therefore mainly facing competition from the RSA. The obvious implication of this fact is that developments in the Pula's rate of exchange against the Rand will, on average, tend to affect them a lot, while the Pula's rate of exchange against other currencies will affect them only a little.

15. A devaluation of the Pula against the Rand, making the Pula cheaper in Rand terms, will *ceteris paribus* allow local products to be sold at a lower price both in the Botswana and RSA market. In so doing, it will improve the competitive standing of local producers vis-à-vis their RSA competitors. A revaluation of the Pula against the Rand, on the other hand, will *ceteris paribus* increase the price of local products, and thus weaken the competitive strength of their producers.

16. A simple numerical example may serve to clarify the nature of these conclusions. In table ES,1 we have assumed that trade between Botswana and RSA may be represented in terms of a single commodity, which is produced, sold and traded in and between both countries. The price of the Botswana product is 100 Pula, and the price of the RSA product 133 Rand. These prices refer to the price charged by the relevant producers. Assuming no price discrimination, transport costs etc., they also refer to the local price paid in the relevant home markets, as well as to the local equivalent of the foreign price paid in the relevant export markets. Assuming the Pula/Rand exchange rate to be 0.75, the latter prices are: 133 Rand (100/0.75 = 133) for the Botswana product sold in the RSA market, and 100 Pula (133*0.75 = 100) for the RSA product sold in Botswana. Both prices are therefore the same within each market, 100 Pula in the Botswana market and 133 Rand in the RSA market, implying that no-one enjoys an initial price advantage.

Table ES,1 : Simple numerical example of de/revaluation effects

	Pula/Rand	Prices in the Bot. market		Prices in the RSA market	
	exchange rate	Bot. prod.1)	RSA prod.2)	RSA prod.3)	Bot. prod.4)
Initial situation	0.75	P 100	P 100	R 133	R 133
Pula devalued	0.80	P 100	P 107	R 133	R 125
Pula revalued	0.70	P 100	P 93	R 133	R 143

Notes:

1) The local (Pula) price of the Botswana product, when sold in the Botswana home market.
2) The Pula price of the RSA product, when sold in the Botswana market; calculated as the corresponding Rand price multiplied by the Pula/Rand exchange rate (i.e. Pula price = Rand price * (Pula/Rand)).
3) The local (Rand) price of the RSA product, when sold in the RSA home market.
4) The Rand price of the Botswana product, when sold in the RSA market; calculated as the corresponding Pula price divided by the Pula/Rand exchange rate (i.e. Rand price = Pula price / (Pula/Rand)).

17. Assume next that the Pula is devalued against the Rand. In table ES,1 this is represented by an increase in the Pula/Rand rate from 0.75 to 0.80. Each Rand consequently buys more Pula, and each Pula less Rand. This has the immediate effect of altering the above export prices. The price of the Botswana product sold in the RSA market is reduced from 133 to 125 Rand (100/0.8 = 125), while the price of the RSA product sold in the Botswana market is increased from 100 to 107 Pula (133*0.8 = 107). The corresponding home market prices are assumed unaffected by the devaluation, because we are here focusing on the immediate price changes, before any induced inflation effects etc. materialise. The local price of the Botswana product therefore remains at 100 Pula, and the price of the RSA product sold in the RSA market at 133 Rand.

18. The devaluation of the Pula has consequently made the Botswana product cheaper than the RSA product; i.e. it has earned the Botswana product a significant price advantage over the RSA product irrespective of market. Thus, the price of the Botswana product is 100 Pula in the local market, compared to 107 Pula for RSA product. The corresponding prices in the RSA market are 125 Rand for the Botswana product and 133 Rand for the RSA product. In other words: the devaluation of the Pula has brought a significant immediate improvement in the competitive situation of the Botswana producers.

19. Alternatively, assume that the Pula is revalued against the Rand. In table ES,1 this is represented by a decrease in the Pula/Rand rate from 0.75 to 0.70. Each Rand consequently buys less Pula, and each Pula more Rand, compared to the initial situation. This again has the immediate effect of altering the export prices, while the home market prices remain unaffected. Thus, as indicated in table ES,1 the price of the Botswana product sold in the RSA market is increased to 143 Rand (100/0.7 = 143), while the price of the RSA product sold in the Botswana market is reduced to 93 Pula (133*0.7 = 93). The revaluation has consequently worsened the competitive situation of the Botswana producers, by making their product relatively more expensive than the RSA product, irrespective of market.

20. A devaluation of the Pula against the Rand will consequently tend *(ceteris paribus)* to result in ***immediate*** competitive benefits, while the opposite is true for a revaluation. A change in the Pula/Rand exchange rate will however also have implications for local inflation, and these will ***over time*** serve to modify the initial, immediate effects. This follows from the fact that Botswana is heavily dependent upon imports, mostly from the RSA. It seems reasonably safe to assume that the foreign nominated price of these imports is decided by their foreign suppliers, not by their Botswana buyers.

21. The Rand nominated import price will consequently not react to changes in the Pula/Rand exchange rate, but the corresponding Pula price will do so, the latter being a function of the Rand price and the Pula/ Rand rate. Thus, as illustrated in table ES,1, a devaluation of the Pula against the Rand will increase the local price of imports, while a revaluation will decrease it. In other words, a devaluation will (*ceteris paribus*) increase, and a revaluation decrease, local inflation in Botswana.

22. Exchange rate changes consequently give rise to local price changes. Although these are in the first instance limited to imports only, they will increase local production and consumption costs, and this will give rise to subsequent price and wage adjustments throughout the local economy. The price advantage (or disadvantage) resulting from the devaluation (or revaluation) will thereby be gradually reduced. If the process is allowed to run its full course,

local inflation factors will eventually re-establish the original price relationship between local and imported products, (as will be demonstrated below). The inevitable result of such a process is that the competitive gain (or loss) initially accrued to the non-traditional producers is completely erased.

23. The situation with respect to the non-traditional producers may consequently be summarised as follows:

i) A devaluation of the Pula against the Rand will tend to bring immediate competitive gains to these producers, but it will also tend to leave the country wide open to inflationary impulses emanating from the RSA. Unless efficiently curbed, local inflation factors will respond by driving up domestic prices. The result is a gradual reduction of the initial competitive gains, eventually even their complete erosion.

ii) A revaluation of the Pula against the Rand, on the other hand, will tend to bring immediate competitive losses to these producers, but it will also serve to defuse inflationary pressure from the RSA. Unless obstructed by other inflation factors, this will induce a comparatively low rate of local inflation, holding back domestic prices. If so, the result is a gradual reduction of the initial competitive losses, possibly even their complete erosion.

iii) The typical difference between a devaluation and a revaluation of the Pula against the Rand, is therefore the direction of the short term changes in their competitive situation, and the level of induced local inflation. Roughly speaking, the short term competitive gain brought by a devaluation has to be paid for by an increase in the long term inflation rate, while the short term competitive loss resulting from a revaluation is the price paid for a reduced inflation rate.

c. *The inflation spiral*

24. In the above we have argued that exchange rate changes give rise to local price changes, and that these may in due course completely erase the price advantage (or disadvantage) initially resulting from the de/revaluation. A simple numerical example may serve to clarify these postulates. In table ES,2 we have assumed that import prices (as measured in Pula) increase by 10%. This has immediate cost implications for local producers and consumers, both of which rely heavily on imports.

25. If the local producers respond to the increase in their operating costs by carrying it forward to their own customers, local prices will on average rise by 2.6%. If they, in addition, increase their prices sufficiently to safeguard their own profit margins, the average local price effect will rise to 3.6%.

26. The combined effect of this price increase, and the direct price increase on consumer imports, is a 5.4% increase in the cost of living. If local wage earners are fully compensated for this loss of purchasing power, further cost and price increases result. Thus, as seen from table ES,2, a 5.4% increase in wage rates will induce an additional 3.4% increase in local prices, if local producers continue to safeguard their profit margin.

27. This will in its turn induce a further 2.5% increase in the cost of living. If local wage earners are again fully compensated in terms of wage increases, the inflationary spiral continues. Each additional turn of the spiral will however produce smaller incremental price and

cost effects. The process will therefore eventually grind to a halt, but not until the induced local price increase in aggregate matches the initial import price increase.

Table ES,2 : Local price reactions to a 10% increase in import prices

Wage increase round no:	*0*	*1*	*2*	*3*	*4*	.....	*Final*
			Partial, incremental increases				
Import price increase	10.0%	0.0%	0.0%	0.0%	0.0%	.....	0.0%
Wage rate increase	0.0%	5.4%	2.5%	1.1%	0.6%	.....	0.0%
Local price increase 1)	3.6%	3.4%	1.6%	0.8%	0.3%	.....	0.0%
Cost of Living increase	5.4%	2.5%	1.1%	0.6%	0.2%	.....	0.0%
			Total, aggregate increases				
Import price increase	10.0%	10.0%	10.0%	10.0%	10.0%	.....	10.0%
Wage rate increase	0.0%	5.4%	7.9%	9.0%	9.6%	.....	10.0%
Local price increase 1)	3.6%	7.0%	8.6%	9.4%	9.7%	.....	10.0%
Cost of Living increase	5.4%	7.9%	9.0%	9.6%	9.8%	.....	10.0%

Note: 1) The local price refers to the average price of all local products, excluding traditional exports (the price of which is decided internationally, not locally).

28. The above conclusion refers to the initial import price increase affecting the local economy, i.e. for import prices as measured in Pula. It holds equally true whether this increase results from a price increase at source (i.e. as expressed in the corresponding forex nominated price), from a change in the Pula exchange rate, or from both. As concerns these changes, the following rule of thumb applies: the rate of local (Pula nominated) price increase on imports is roughly equal to the rate of price increase at source, plus the rate of Pula *de*valuation.

29. Combining this rule with the above given conclusion in respect of local price effects, it becomes evident that a devaluation of the Pula will increase local inflation, not only because it increases the price of imports as such, but also because it accelerates the locally induced price effects (unless the latter are effectively checked). The reverse is true for a revaluation.

Main statistical conclusions

30. A crude attempt has been made to analyse actual events during the period 1980-96, and to compare them to the general conclusions drawn from the model. In doing so, however, a fundamental problem arises. The statistical data refer to time-specific observations made within a dynamic and multi-faceted environment, while the model conclusions refer to time-*un*-specific effects derived for a hypothetical situation taking into account a selected few factors only. The two are therefore neither directly nor completely comparable. Even so, they may allow a rough and approximate comparison of the overall long term trends affecting the competitive fortunes of the non-traditional producers.

31. As concerns the long term model trends, it is recalled from above that although an exchange rate change may bring these producers a competitive gain or loss, this may prove of a temporary nature only. The associated inflation effect will in general modify the immediate competitive effect, and unless the inflationary impulse is effectively contained, it will eventually erase it.

32. On the whole, the statistical evidence does not suggest that the inflationary impulses have been particularly well contained over the years. Drawing on the above model conclusion, we may therefore deduce that past devaluations of the Pula will not on the whole have significantly improved, and past revaluations not significantly depressed, the long term competitive strength of the Botswana non-traditional producers.

33. The analysis of the available statistical evidence seems to lend some support to this conclusion. Thus, calculating estimates of competitive price gains (and losses) from the exchange and inflation rate data at hand, it appears that the competitive strength of the Botswana producers did on the whole remain fairly stable throughout the 1980s. It deteriorated sharply in the early 1990s, but again returned to relative stability during the period 1993-96, although at an unprecedented low level.

34. The long term competitive situation therefore seems to have changed relatively little over time, except in the early 1990s, when it received a considerable, and seemingly permanently, setback. The reasons for this particular development is not clear, but it was probably due to factors not included in the present analysis. Thus, it is recalled that the early 1990s saw the climax and collapse of an economic boom in Botswana. Drought and considerable increases in government imposed user charges also occurred during the period.

35. The relatively stability in the competitive situation during the years before and after the early 1990s is noteworthy. The Pula was on the whole gradually revalued against the Rand during the 1980s, while the opposite was true during the years 1993-96. Directly opposite exchange rate policies were consequently followed during these periods, yet the overall result in terms of competitive strength was the same. In other words, the revaluations of the 1980s did not cause a long term loss of such strength, while the devaluations of the 1990s did not secure a long term gain. This result is in keeping with our general model conclusions.

36. As may be expected, these developments essentially reflect the fact that during the 1980s, when the Pula was gradually revalued against the Rand, the local inflation rate was on the whole lower than the RSA inflation rate, while the reverse was the case in the 1990s.

37. The above described developments in the competitive fortunes of the Botswana non-traditional producers are to some extent reflected in Botswana's foreign trade data, and in crude estimates of the local production of tradable goods. But the developments depicted by these data equally suggest that the exchange rate has not been the only, or even the major, factor at play in promoting local production and export. It does on the whole seem rather unlikely that the exchange rate may have played the major role in this process. The crucial factor is more likely to have been the special industrial policies etc. put in place over the years.

38. This is not, however, to argue that the exchange rate is irrelevant to the fate of domestic producers, only to suggest that a host of other factors are equally, or more, important. The role of the exchange rate vis-à-vis these factors is essentially a supporting one. Little can be achieved through exchange rate policy alone, if other factors are not conducive to economic growth.

39. Finally, it should be emphasised that what has been demonstrated by these statistics is only that the long term competitive effects of fairly *moderate* Pula re- and devaluations have tended to be rather marginal in the 1980s and mid-1990s. It should not be inferred that the same would necessarily apply in the case of *substantial* re- and devaluations. Neither should

it be inferred that competitive effects of a short term nature have not occurred during these periods, or that these effects may not have been of importance to the industries concerned.

Evaluation of recent events

40. The typical effects of potential Pula de- and revaluations have been analysed in earlier chapters. It should be understood that the conclusions drawn from this exercise refer to an analysis of potential policy options. Hence, although we have analysed the effects of changes in the Rand/Pula exchange rate, this does not suggest that significant changes have in reality occurred in this all-important rate during the last few years.

41. Recalling the concrete events of these years, it is in fact evident that Botswana has, on the whole, experienced only marginal changes in the Pula/Rand rate. The really significant change in the Pula's rate of exchange during later years has been against the US Dollar, the UK Pound etc., not against the Rand. When the current exchange rate policy is sometimes labelled a devaluation policy, reference is consequently made mainly to the latter, not the former, exchange rate.

42. Focusing on the Pula/Rand exchange rate, the last few years have consequently been a period of relative stability. Except for occasional short time exchange rate corrections, these years have seen no revaluation of the Pula against the Rand. A degree of devaluation *has* occurred, but only a relatively marginal one. On the whole, therefore, the basic aim of the adopted policy appears to have been to maintain approximate stability in the Pula/Rand rate, even in the face of considerable variations in the Pula's rate against other currencies. This is noteworthy, given that the officially professed policy is one of pegging the Pula to a basket of currencies, including the Rand, the US Dollar etc., rather than to the Rand alone.

43. Interpreting this policy in terms of the competitive fortunes of local (non-traditional) producers, it therefore appears that the aim has been largely defensive, focused on the protection of local industry against competitive setbacks, rather than offensive, trying to secure them any significant competitive gains. In other words, the basic aim seems to have been to maintain an unchanged competitive situation vis-à-vis the RSA, by refusing to let the Pula appreciate against the Rand.

44. Given the fact that the Pula has not been significantly devalued against the Rand, one may perhaps be tempted to conclude that the associated problem of import inflation has not been too serious. However, even a stable Pula/Rand rate will induce considerable inflation into the local economy if the RSA inflation rate runs high, which it has been doing during the period in question. True, the RSA inflation rate has not been accelerated too much by the adopted exchange rate policy, something which would have been the case if the Pula had been significantly devalued against the Rand, but neither has it been deflated, which it would have been if the Pula had been revalued against the Rand. Instead, the substantial RSA inflation rate has largely been allowed to enter the local economy unchecked.

45. It is recalled from the introduction to this summary that considerable doubts have been expressed about the wisdom of tying the Pula to the Rand during recent years, which have seen a rapid depreciation of the Rand against major foreign currencies, and a high RSA inflation rate. Are these doubts justified according to our analysis?

46. To the extent that they refer to the inflationary effect *as such*, they do indeed seem to be justified. As explained above, the policy does appear to have left the country wide open to inflationary pressure from abroad. The *direct* inflationary impact alone must have been considerable, with the full force of the high South African inflation rate being allowed to enter unchecked into the local economy, and the *full* impact even more so, as internal economic actors have fuelled further inflation in their efforts to catch up with the initial import driven price increase.

47. Whether this has created serious problems for the average local producer is more uncertain. It is generally accepted that a high inflation rate gives rise to a host of problems, both macro economic and otherwise, and it is undeniably true that inflation (*ceteris paribus*) affects producers negatively by increasing their costs. However, unless their sales prices are in some way frozen, the inflationary process may equally make room for price increases of their own, thus allowing them to keep abreast of events. If so, the adopted exchange rate policy may even have brought them some marginal benefits, for instance by temporarily reducing their real term wage costs.

48. The policy of tying the Pula to the Rand does, on the whole, appear to have been beneficial to the Botswana producers, at least as long as negative inflation effects *additional* to those included in the present analysis are ignored. Thus, Botswana's traditional exporters appear to have benefited significantly from the policy. Also the producers of non-traditional tradables appear to have benefited, at least marginally and temporarily, and especially when compared to their probable situation under an alternative regime.

49. The group of traditional exporters of beef and mineral products appears to have benefited significantly from the policy. Their export incomes reflect prices fixed in US Dollar, British Pound etc. In consequence, the nominal Pula value of these exports has been inflated in direct proportion to the significant devaluations of the Pula against these currencies.

50. Their operating costs have of course also increased, due to local inflation effects associated with these events, but for the group as a whole these costs are relatively small compared to the sales incomes. They have therefore had a fairly limited effect upon the operating surplus of these producers. This, however, reflects the overall situation of the group of traditional exporters as a whole. The situation is known to be very different for *some* of the firms concerned. But even these firms will have benefited, due to the substantial increase in the Pula value of their sales incomes resulting from the depreciation against major foreign currencies.

51. The above conclusion refers to net incomes as measured in current prices. The general inflationary effect upon the purchasing power of these nominal incomes may well have been substantial, significantly modifying the value of these benefits, but this will essentially depend on the purposes for which these incomes have been used.

52. The Government of Botswana has shared in the nominal income increases of the traditional exporters. A substantial share of the total profits earned by Botswana's largest traditional exporter (Debswana) accrues to Government in the form of dividends, royalties and tax revenues. Again, the actual purchasing power of these nominal revenues will depend on the purposes for which they have been used.

53. However, according to the advocates of the current exchange rate policy, its chief concern is not the fate of the above sectors of the economy. Rather, it is concerned with the fate of the non-traditional producers facing RSA competition both at home and abroad. Also these producers appear to have benefited from the policy, especially when compared to what might have happened if an alternative (de-linking) policy had been adopted.

54. As already noted above, the present exchange policy, although largely one of keeping the Pula in line with the Rand, has not been absolute. Thus, the period 1993-96 saw a minor devaluation of the Pula against the Rand, implying that the non-traditional producers did benefit from a certain improvements in their competitive strength. Given, however, the marginal nature of the devaluation in question, the benefits thus secured can not have been very substantial.

55. What has probably been of greater importance to these producers is the fact that the Pula has not been allowed to appreciate against the Rand. The latter alternative would in many ways seem to be the natural alternative to the present policy. Thus, as already noted earlier, this policy has cost Botswana dearly in terms of inflation. An obvious alternative would therefore be to pursue a policy inducing less inflation into the local economy, i.e. essentially a policy of allowing the Pula to appreciate against the Rand. This would appear all the more reasonable, given that the Pula would seem an inherently strong currency, backed as it is by extensive foreign exchange reserves etc.

56. Such a policy would however have implied competitive disadvantages for the non-traditional producers. It is especially in this perspective that the present policy may be said to have benefited local producers; the benefits concerned have not primarily been in the nature of competitive advances, but in the protection against competitive reverses.

57. But these benefits may have been of a temporary nature only. Local cost pressure, ignited by the initial inflationary impact, is likely to have partly or wholly erased the competitive benefits actually earned by the Pula devaluation against the Rand. Similarly, reduced inflationary pressure would probably have reduced or erased the potential competitive disadvantages derived from an alternative revaluation policy. Botswana may therefore have paid a high price in terms of inflation, for granting producer support that may have been both limited and temporary in nature.

58. However, even a high price is not necessarily *too* high if paid for something sufficiently important. Depending on circumstances, the benefits of even limited producer support may outweigh the associated costs in terms of inflation. Allowing one's industrial base to collapse in order to promote overall price stability is not generally regarded a viable policy option.

59. The crucial question is therefore how important these relative benefits have been for the fortunes of the recipient industries. The present paper can offer no general or conclusive answer to this question. Thus, it may well be true that much of Botswana's present industry is of an infant nature, and therefore too weak to face *significant* reverses in their operating conditions. Even so, however, it does not seem altogether obvious that the industries concerned are in such a perilous position that they could not possibly have weathered the relatively *limited* setbacks that might have resulted for instance from a gradual revaluation policy.

60. The question of whether or not the price paid for these benefits has been fully justified is therefore left open, as is the related question of whether or not the same benefits could, or should, have been secured by alternative means, for instance by tax concessions, direct subsidies or similar.

61. This is not, however, to suggest that the adopted exchange rate policy has been totally, or even largely, unjustified. The difference between being fully justified and largely unjustified is considerable, and not many policies may be truly said to be either.

62. To illustrate that the present policy is not without merits, we need only consider the likely implications of following a significantly different policy. Assume, for instance, that the Pula had been completely de-linked from the Rand, remaining instead close to the US Dollar or similar. Intuitively, this may seem no more than a logical extension of the notion advanced earlier about an inflation-restraining revaluation policy being the obvious alternative to the present inflation-driving pegging policy.

63. Looking at the likely implications of doing so, however, it does *not* appear a viable option, given the particular circumstances of the last few years. Thus, it does on the whole seem highly probable that local producers would have faced severe problems, had the Pula been allowed trail major foreign currencies rather than the Rand. Given that the Rand's fall against these currencies has not been an isolated incidence of limited magnitude, this would have caused the Pula to appreciate *significantly and persistently* against the Rand during recent years. Such a development might have placed local producers, who are mainly competing against the RSA, at a seemingly permanent disadvantage.

64. This conclusion may seem to be contrary to our earlier policy conclusions. Thus, it is recalled that although a Pula revaluation against the Rand will give rise to a competitive loss, this loss might eventually be erased by accompanying inflation gains. This, however, does not necessarily imply that the loss in question is too small to be of any real consequence to the industries concerned. In the present case we are considering a considerable revaluation, which will result in a considerable competitive loss.

65. It is also recalled that the erasure of the initial competitive loss represents the ultimate outcome of a rather drawn-out process, when local wages and profits are assumed to respond to price signals, and a host of other inflation driving factors are ignored. In the present case, in contrast, we would not be dealing with the result of a single revaluation launched under such favourable circumstances, but with the aggregate result of a very long series of substantial revaluations, and a number of other inflation factors simultaneously hard at work.

66. In this situation, the exchange rate effects would tend to create a long term loss situation for local producers, with the ever increasing appreciation of the Pula bringing them a steady flood of fresh competitive losses before time had allowed prior ones to die down. The existence of other inflation factors would serve to reverse the competitive situation further, these factors seeming on the whole to have fuelled local inflation during the 1990s. Unless the Botswana producers were able to respond to such a combined challenge by operating more efficiently, they could have found themselves in a serious predicament.

67. The pertinent question is therefore not so much if the Pula should have been completely de-linked from the Rand, but if it should have been allowed a different degree of flexibility towards it. Given the circumstances of the last few years, a policy of, say, allowing

the Pula's value to be decided solely by its own inherent strength, could easily have resulted in a significant and persistent appreciation of the Pula against the Rand. Such a development would probably have brought Botswana a dose of the Dutch decease, "crowding out" local industry, rather than promoting or protecting it. On the whole, therefore, the essence of the present policy seems justified. Even so, however, the possibility that it could be improved upon, at least marginally, should not be discarded out of hand.

68. Virulent opposition to the present exchange rate policy consequently seems unjustified. This is all the more so, given that there is also an operative side to the exchange rate question. Developments in the international value of the Rand are not influenced by the Botswana authorities, yet they have direct implications for the Rand/Pula rate, which is of main concern to them. The Botswana authorities *have* to react to these developments in one way or another, and they may typically have to do so under conditions of considerable time pressure and uncertainty about the precise outcome of their actions.

69. Therefore, if the authorities suspect that local industries may be ill equipped to suffer a competitive setback, and especially if employment creation is an over-riding objective, their best course of action will be to choose the lesser peril. In the present case this would seem to imply that they should risk inflation rather than industrial failure. When judged in this perspective, there seems considerable justification for the adopted exchange rate policy.

Looking towards the future

70. Our aim in evaluating the events of the past is not so much to pass judgement upon matters that cannot be undone, as to draw out the possible implications for the future. Looking towards this future, it is evident that Botswana will have to expand both its industrial base and its export base significantly, if the goal of creating employment and prosperity for a growing population is to be achieved. Much of the industrial base required to lead the economy on its envisaged export oriented growth path into the future has not yet come into existence.

71. This base can not be created by "government decree"; the task will largely have to be left to the private sector. The authorities must nevertheless play an important part in enabling and promoting such private sector involvement. They will have to make considerable efforts to attract new enterprises, and to avoid subjecting existing industries to undue reverses in their operating conditions. These efforts will have to involve the implementation of appropriate policies and measures in a variety of areas, not only in the area of exchange rate policy.

72. In doing so, however, the authorities should keep in mind the ever inherent danger of fostering an overprotected and inefficient industrial sector, unable and unwilling to face prevailing market conditions, calling for everlasting government assistance in one form or another. It can not be in the long term interest of the nation to create a local industry dependent on open-ended government support, draining the public coffer, and tying the authorities' hands.

73. The costs and benefits to the nation of providing various types of support to local industry should therefore be closely monitored; otherwise they could over time turn out misconstrued, or even counterproductive to the nation's long term interests.

74. As part of these efforts, the question of adjusting the present exchange rate policy should be considered. An important aim of such an adjustment could be to reduce inflationary pressure emanating from RSA, should the RSA inflation rate continue to run high. This may be achieved by appropriate movements in the Pula/Rand exchange rate, i.e. essentially by trading such limited competitive gains as may be associated with the present exchange rate policy off against a reduction in the inflation pressure emanating from the RSA.

75. In implementing such a policy, however, it should not be overlooked that the inflationary process is a dynamic phenomenon, with present inflation rates typically feeding upon past inflation impulses. Local inflation may therefore run strong for quite some time, even after the total or partial sterilisation of new inflation impulses from abroad.

76. Thus, it is recalled from above that local producers may be faced with serious problems if the Pula is allowed to appreciate significantly and persistently against the Rand. As long as these producers are mainly competing against the RSA, such a development might placed them at a considerable disadvantage.

77. The average Botswana producer may be ill equipped to weather such setbacks in their competitive fortunes. It may therefore be wise to implement any de-linking policy only gradually and cautiously, for instance by relying on a succession of small revaluations against the Rand, even if the latter should continue its substantial decline against major foreign currencies.

78. The introduction of such a policy would institute no revolutionary change of Botswana's foreign exchange regime. It implies little more than an adjustment of the present policy, and it is no stranger to the Botswana authorities, who relied on this very policy for the better part of the 1980s. It is recalled that the experience of doing so were largely positive, suggesting that such a succession of gradual and small revaluations may work reasonably well in dampening local inflation, without significantly harming local industry.

79. Admittedly, there may have been particular circumstances favouring this positive outcome in the 1980s; a subsequent attempt at repeating the success, made around 1990, appears to have failed. But, if so, these circumstances ought to be investigated, in order to identify the conditions under which a gradual revaluation policy may be expected to work reasonably well in reducing inflation without unduly harming the Botswana producers.

80. Such an investigation may possibly indicate that the success of the 1980s was less due to especially *favourable* circumstances, than the failure of 1990 to especially *unfavourable* ones. Thus, it is recalled that definite boom conditions prevailed around 1990, with significant demand and price pressures affecting the local economy. Therefore, in the absence of any evidence to the contrary, a policy of gradually revaluing the Pula against the Rand, would seem to remain a tenable option, should the RSA inflation rate continue to run high.

Concluding remarks

81. The results and conclusions presented in this paper are derived from a simple and static model, taking into account only a selected few variables, based on a simplified trade pattern etc. These results do to a certain extent seem to be supported by an analysis of

available inflation and exchange rate statistics, but the relevance and reliability of some of these data may be questioned, as may the analysis built upon them.

82. For instance, we have allowed ourselves to draw general conclusions about long term causality from these data, even though a crude statistical investigation of their short term relationship failed to show any clear link between them. Our conclusions are therefore far from gospel truth; they are to a certain degree both simplistic and inaccurate, and as such they may well be challenged.

83. Finally, it should be emphasised that the present paper refers to a *pilot* study, undertaken in the expectation that a more comprehensive project may in due course follow. As such it has concentrated upon the analysis of a relatively few scenarios, suggestive of past and present events. Also, in analysing the concrete experiences of the 1980s and 1990s, it has no more than "scratched the surface" of the events in question.

84. In formulating a more comprehensive exchange rate project, these developments ought to be studied in further depth and detail. Attention should however not be focused solely upon past and present events; conditions that *may* arise in the future should also be considered. It should not be taken for granted that current trends will continue indefinitely, or that Botswana's response should be the same irrespective of circumstances.

II. Main Report

Exchange rate, inflation and competitive power

An analysis of the relationship between Botswana's exchange and inflation rates, and its implication for the competitive strength of her producers

1 : Introduction

85. The last few years have seen a rapid depreciation of the Pula against major international currencies. A development of this nature is normally seen as both a reflection of, and a reaction to, a severe underlying weakness in the country's foreign trade position, as disclosed for instance by a significant Balance of Payment deficit. In Botswana's case, however, this explanation can hardly apply. Botswana's Balance of Trade has given no grounds for alarm, its overall Balance of Payment has been sound, and its foreign reserves have remained at a very high level throughout the period.

86. The underlying cause of the Botswana devaluations instead appears to have been a rapid weakening of the South African Rand against most major currencies, combined with a Botswana decision to keep the value of the Pula largely in line with the value of the Rand. The rationale of pursuing such an apparently paradoxical policy of tying an inherently strong Pula to an ever weakening Rand has been questioned in some quarters.

87. A general desire for a strong and stable Pula, seems to have underpinned these concerns. This, however, begs the question: strong and stabile for whom, and against which currency? For some economic actors, such as those trading with or competing against South Africa (RSA), the developments in the Pula/Rand rate will be a main concern. For other actors, such as the diamond mining industry, the Pula/US$ rate will be more important. For yet others, trading or competing with other countries, or having obligations in their currencies, the Pula's exchange rate against these currencies will matter most.

88. Unless the underlying Rand/US$ rate remains unchanged, the Pula can not be simultaneously stable against both the Rand and the US$, and similar for other currency combinations. Neither can the Pula in general be re- or devalued by any common percentage against these currencies individually. The Botswana authorities can therefore not in general hope to satisfy all economic actors. Given that these actors have different preferences with respect to the value of the Pula, some, or all, of them are likely to feel disadvantaged no matter what the authorities do.

89. Objections to the prevailing exchange rate policy are therefore not in themselves sufficient proof that anything is seriously wrong with it. Nevertheless, given the existence of concerted objections to this policy, the exchange rate question may warrant some consideration. The present paper attempts to provide a modest contribution towards this end.

90. In doing so, we shall first look at Botswana's pattern of foreign trade. Next we investigate, via a few simple models, the implications of this pattern for the options faced by the nation with respect to such factors as the overall inflation rate, the exchange rates and the "terms of trade" of various producer groups vis-à-vis their foreign competitors.

91. For the sake of simplicity and clarity, the Botswana trade pattern relied upon will be a simplified one, ignoring minor trade flows. Also the models used will be kept simple, concentrating largely on inflation and exchange rate variables. Any numerical results presented will consequently tend to be less than 100% correct. Even so, these results may be of some indicative value, if it is accepted that Botswana's trade pattern and inflation mechanism are *largely* as depicted.

2 : Trade patterns

92. The trade structures depicted below illustrate Botswana's and South Africa's trade flows vis-à-vis each other and the rest of the world. The trade flows, which represent total exports and imports, are seen from each country's own perspective. The trade patterns represent the existing situation, but in a slightly simplified form, all minor trade flows having been ignored.[1]

a. Botswana's trade pattern

93. In overall terms, Botswana's imports are overwhelmingly bought from the RSA, while its exports are largely sold to the rest of the world. Thus, according to table 2,1 of Annex J, RSA's share of Botswana's total imports of goods has been in the region of 75-85% over the last few years, while its share of Botswana's total exports of goods has been in the region of 5-20%.[2] Similar country-specific data are not available for Botswana's imports and exports of services. However, the inclusion of services would not have altered the above picture very significantly, given that Botswana's total foreign trade in services accounts for little more than a tenth of its total foreign trade in goods.

94. Botswana's total exports are customarily subdivided into two sub-groups: traditional and non-traditional. From a trade analysis point of view these groups have different characteristics. Thus:

i) Traditional exports consist of mineral and beef products. These constitute by far the lion's share of Botswana's total exports. Some 80-90% of all goods exported during the last few years were of this type (see table 2,3 of Annex J), corresponding to 70-80% of all goods and service exports. The traditional exports are typically sold to the rest of the world, the RSA's share being approx. 2% (see table 2,4 of Annex J), and at prices decided by the Central Selling Organisation (CSO, for diamonds), the world market (for other copper/nickel), the European Economic Community (EEC, for beef) etc.

ii) Non-traditional exports consist of all exports other than minerals and beef. Their total value is comparatively small. Some 10-20% of all goods exported during recent years were of this type. Adding service exports, the corresponding share of all exports is around 20-30%. Even though this is a minor share of total exports, it is too large to ignore in our trade analysis. This is all the more true, because these exports command the special attention of the Botswana authorities, who see them as crucial for future economic diversification and growth. Recent years have seen fairly high growth rates for these exports, largely to the RSA market, which absorbs nearly 80% of all non-traditional goods exported from Botswana.

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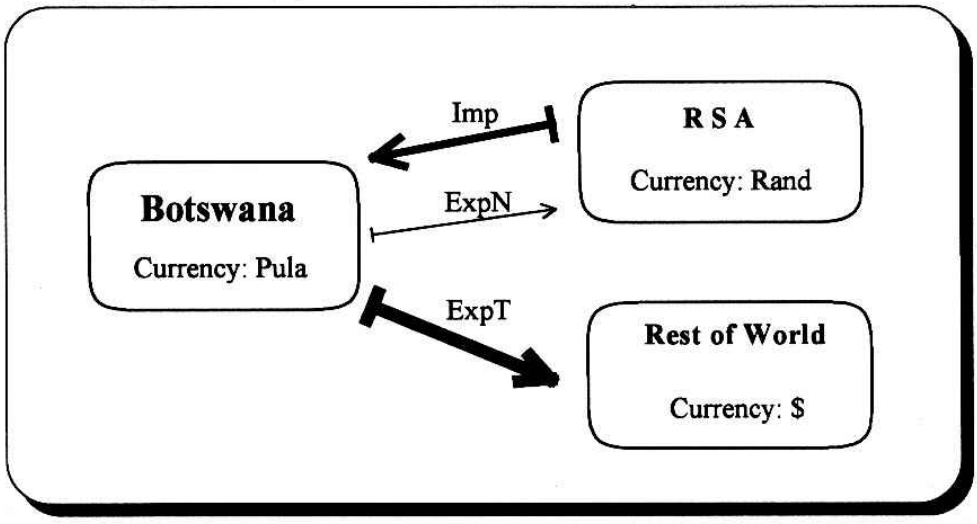
[1] The model, in its extended form, is capable of handling the full trade flows pattern. The simplification of this pattern is introduced merely as a convenience, making the derived estimates and conclusions more transparent.

[2] These shares are slightly exaggerated. They represent the totals for the Common Customs Area (CCA) rather than for RSA alone. Botswana imports from and exports to the CCA other than RSA are however minimal.

95. Ignoring minor trade flows, the "map" of Botswana's international trade relations, as seen from Botswana's own perspective, consequently looks as indicated in the simplified illustration of Botswana's foreign trade pattern given in Figure Cpt2,1.

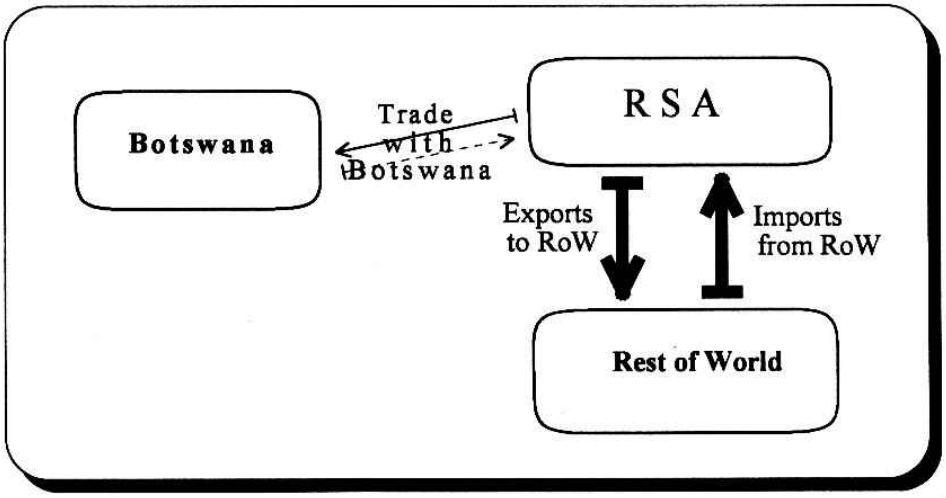
Figure Cpt2,1 : Simplified illustration of Botswana's foreign trade pattern



The trade flows depicted above are:
: Imp = Imports, i.e. Botswana's total imports of goods and services.
: ExpT = Traditional exports, i.e. Botswana's total exports of mineral and beef products.
: ExpN = Non-traditional exports, i.e. Botswana's total exports of goods and services *other than* mineral and beef products.

b. South Africa's trade pattern

Figure Cpt2,2 : Simplified illustration of South Africa's foreign trade pattern



96. South Africa's foreign trade relations are mostly directed towards the rest of the world; in comparison, trade with Botswana is relatively limited. Thus, Botswana is a comparatively modest market for exports, and a rather insignificant source of imports. As seen from table

2,2 of Annex J, Botswana's shares of RSA's total imports of goods have been in the region of 1-5% during the last few years, and its share of RSA's total exports of goods 12-14%.[3]

97. Ignoring minor trade flows, the "map" of South Africa's international trade relations, as seen from the country's own perspective, consequently looks as indicated in the simplified illustration of South Africa's foreign trade pattern given in Figure Cpt2,2.

c. Overall relationship and its likely implication for inflation

98. Comparing the two trade "maps", a rather lopsided trade relationship emerges. For Botswana, RSA is *the* major trading partner both with respect to imports and (non-traditional) exports. For RSA, Botswana is a significant, but nevertheless comparatively minor, customer for its exports, and a rather insignificant supplier of imports.

99. In general: if a given country (A) is largely dependent upon another country (B) for its imports, and these imports represent only a minor part of country B's total exports, the implied imbalance is likely to effect the two countries' bargaining position vis-à-vis each other. Other things being equal, country B will be in a strategically superior position to country A, enabling it to decide the prices etc. of country A's imports.

100. The above description applies, within limits, to Botswana's trade relationship with RSA. This is not to imply that Botswana is dependent upon the RSA for its imports in an absolute sense. Botswana is not obliged to buy its imports from RSA "no matter what". If it wants, it may obtain them from other sources. In practice, however, this is not an attractive option, as long as the RSA suppliers are reasonably efficient. Due to Botswana's geographical position close to RSA but far from other major suppliers, due to established trade relationships and transport routes, due to the external tariffs of the Southern African Customs Union etc., RSA has definite advantages as a supplier to Botswana. It is from these advantages that RSA derives its relative strength vis-à-vis the Botswana import market.

101. The trade relationship between Botswana and RSA may consequently be assumed to imply that the RSA has considerable influence over the Botswana import market in terms of price trends. If the RSA price situation is one of general inflation, this will not only affect the RSA home market, but equally the Botswana import market. The imported inflation impetus will give rise to direct and indirect inflation effects within the Botswana economy, and these will, in their turn, give rise to price increases on local production. The latter will affect also the price of products subsequently exported to RSA. Botswana's share of the total RSA market is however too small to have any significant effect upon the RSA price level. Inflationary effects exported (or re-exported) from Botswana to RSA may consequently be ignored (for practical purposes, and in terms of its effect on the overall RSA price level). All told, the inflationary process may be seen as a "one way" phenomenon; inflationary impulses flow from RSA into Botswana, but not in the opposite direction.

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[3] This aggregate figure ignores the composition of the RSA exports. Botswana typically buys finished products from the RSA, while the rest of the world largely buys raw materials etc. The Botswana market is therefore somewhat more important for certain RSA industries than indicated above.

3 : Some concepts and classifications

102. In this paper we will study the relationship between inflation and exchange rate changes in Botswana and RSA under various hypothetical scenarios. To do so we must analyse some underlying factors regarding trade and price factors, exchange rates etc. For this purpose, we will refer to certain basic concepts and classifications. These are briefly described below.

3,1 : Exchange rate concepts

a. Exchange rates

103. As earlier explained, different economic actors may have different preferences with respect to the value of the Pula. Some actors may for instance be particularly concerned about the Pula/US$ rate, while others may be more concerned about the Pula/Rand rate.[4] Unless the underlying Rand/US$ rate is stable, the Pula can not be simultaneously stable against both the Rand and the US$, and neither can it be re- or devalued by a common percentage against them.

104. Botswana's exchange rate regime takes this fact into account by pegging the Pula to a weighted average of currencies, rather than to a single currency. The exact specification of this weighted average, commonly referred to as "the basket", is not made public knowledge, but it may be presumed that it is largely intended to reflect the pattern of Botswana's foreign trade.[5] If so, exchange rate stability towards the basket will translate into overall exchange rate stability vis-à-vis Botswana's *average* trading partner, but not necessarily into stability vis-à-vis any *individual* trading partner. As seen in this context, the exchange rate of the Pula may therefore be stable, even though it appears to fluctuating significantly, as judged by the value of the Pula against individual currencies.

105. In this paper we simplify matters by ignoring the existence of the basket. It is not central to our analysis, and it would be problematic to treat it correctly given that its specification is unknown. Instead we direct our attention directly to a few selected bilateral exchange rates, and allow ourselves to interpret any variations in these rates as resulting from direct re- or devaluations, even though we know this to be a simplification of the actual facts.

b. Re- and devaluations

106. In this paper we restrict the number of foreign currencies to two: Rand and $, the latter essentially representing a basket of major foreign currencies relevant to Botswana's traditional exports. We will describe *any* change in the Pula exchange rate against either of these

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[4] Many, perhaps even most persons may tend to express the Pula's rate of exchange against the US$, the Rand etc. in the same way as illustrated above, i.e. as Pula per US$ (Pula/US$), Pula per Rand (Pula/Rand) etc. It may be noted that this paper will deviate from this practise in so far as the Rand/Pula rate will be used in preference to the Pula/Rand rate. This is a mere convenience, reflecting the format of the Bank of Botswana exchange rate data entered into our exchange rate model. (The same do *not* apply for the US$ rate.)

[5] The Bank of Botswana has recently (mid-1997) released the information that the general formula applicable to the basket is as follows: (US$/Pula) = a*(US$/SDR) + b*(US$/Rand). Information about the past and present value of the formula's coefficients (a and b) has however not been released.

as a devaluation or a revaluation, depending on the direction of change in question. This implies a deviation from standard terminology. Thus:

i) Given that the Pula is pegged to a basket of currencies, a de- or revaluation is in principle declared against the total basket, not against any single currency within it. In the present paper, however, we will for the sake of simplicity describe changes in individual exchange rates as de- and revaluations. We will also analyse selected exchange rate movements as if the Pula could be changed directly against the individual currency in question. Thus, we will refer for instance to "an X% revaluation of the Pula against the Rand", rather than to "a Y% devaluation of the Pula against the basket, resulting in an X% increase in the Rand/Pula exchange rate".

ii) Furthermore, it will be evident from what has already been said that variations in individual exchange rates will occur even when the Botswana authorities have *not* de- or revalued the Pula against the basic basket, or altered its specification. These variations may be described as implicit, as opposed to explicit, exchange rate changes. Also such implicit changes are described as re/devaluations. Thus, our re/devaluation concept cover *all* exchange rate movements. Given that the Botswana authorities are assumed to have full authority over the Pula exchange rate, even non-action on their part, allowing given exchange rate variations to materialise, may in principle be regarded as an expression of a deliberate choice. In our discussion we do therefore not attempt to make any distinction between explicit and implicit exchange rate movements.[6]

3,2 : Classification of products

a. Tradable and non-tradable products

107. The distinction between tradable and non-tradable products is defined in Annex A. Shortly described this distinction reflects whether or not the products in question lend themselves to be internationally traded, i.e. whether or not they are, or can be, exported and/or imported. Thus:

- The tradable products are products that *do* lend themselves to be internationally traded, i.e. to be exported and imported, such as for instance manufactured goods.
- The non-tradable products are products that *do not* lend themselves to be internationally traded, such as for instance retail, personal and government services.

108. The distinction between tradable and non-tradable products consequently gives indication of whether or not the products in question are effectively protected against competing imports in their home market, but also whether or not they may have any export potential.

109. It may be noted that this classification concerns *products* rather than *producers*. It is unavoidable that some production sectors will comprise both tradable and non-tradable products, given the highly aggregated representation of the Botswana economy used for the present study. The degree to which this is assumed to be the case is indicated in Annex C.

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[6] Another reason for not attempting such a distinction is our lack of relevant data.

b. Traditional and non-traditional exports

110. The distinction between Botswana's traditional and non-traditional exports has already been introduced in chapter 2, from where it is recalled that:

- Traditional exports consist of mineral and beef products.
- Non-traditional exports consist of all products other than minerals and beef.

3,3 : Classification of price behaviour

a. Price-receivers and price-setters

111. The price formation mechanism underlying the present analysis reflects the assumed behaviour of broad groups of economic actors. Basically, these actors are assumed to either set or accept the going market price of given goods and services. The distinction between price-receivers and price-setters reflects this difference. Both customers and producers, importers and exporters, may in principle be classified as price-receivers or price-setters. The important factor is not whether they are buyers or sellers in a given market, but who have the more important role in deciding the price of the transaction.

112. The distinction between price-receivers and price-setters, as adopted for present paper, is given in Annex A. Shortly described it is as follows:

- The price-receivers, which in the present case may be either buyers or sellers, have to accept market prices decided by their trading partners.
- The price-setters, which in the present case are all sellers, i.e. producers of goods or services, may set their own sales prices, reflecting their assessment of the prevailing market conditions.

113. As explained in Annex A, Botswana is assumed to be a price-receiver with respect to its imports and traditional exports, but a price-setter with respect to its non-traditional exports and its own home market sales. Hence:

- Botswana's importers are assumed to be price-receivers; i.e. the source price[7] of Botswana imports is assumed to be set by the foreign suppliers, not by the local buyers.
- Botswana's traditional exporters are assumed to be price-receivers; i.e. the price of Botswana's mineral and beef exports is assumed to be given by the world market or similar, not by the Botswana producers.
- Botswana's non-traditional exporters are assumed to be price-setters; i.e. the price of Botswana's non-traditional export products is assumed to be set by the local producers, not by the foreign customers.
- Botswana's home market suppliers, both of tradable and non-tradable products, are assumed to be price-setters; i.e. the price of local products sold in the Botswana market is assumed to be set by the local producers, not by the local buyers.

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[7] The source price is the "price at source", i.e. the Rand nominated export price of Botswana's imports from the RSA, or the Pula nominated export price of RSA's imports from Botswana.

114. It may be noted that although the price-setters are assumed to set the price of their products, this does not necessarily amount to a particular strong position vis-à-vis the market. Only a few of them may be price-*makers* in the traditional sense, enjoying a monopoly situation or similar, and capable of "dictating" a price to the market. Most price-setters may in fact have to follow general inflation and market trends fairly closely. As such they may in many respects resemble the price-receivers. The latter, however, as here defined, are assumed to have no influence whatsoever over their sales price. They have to accept a price clearly specified by the word market (or similar), as for instance for diamonds or copper. The price-setters, in contrast, are faced with no such easily recognisable prices. They are selling their products in a market of considerably diversity, where slightly different product alternatives, brand names etc. compete against each other in terms of price, quality, design and similar.

b. Alternative treatment of non-traditional producers

115. The price-setter assumption applied to Botswana's producers of non-traditional tradable products represents a fairly standard input/output assumption. As such it corresponds for instance to the price formation functions of the MEMBOT model. The essential rational of the assumption is to allow producer prices to be calculated on the assumption that the producers will typically push any cost increases on to their own customers in the form of higher product prices.[8] It is admittedly a fairly rough and "mechanical" assumption, paying more attention to mathematical convenience than to any proper "theory of producer behaviour" reflecting for instance profit maximisation under conditions of given demand functions.

116. The price-setter assumption may be challenged. Thus, a counter argument holds that all producers of Botswana tradable products, both traditional and non-traditional, and both exports and local sales, ought to be treated as price-receivers. If so, one have to accept that the Botswana producers of tradable products adopt the price of the corresponding RSA products as their own price, without any attempt at deviating from it, in the same way as the non-traditional exporters are restricted to accept the "world market" price in the present analysis. Also this amounts to a fairly rough and "mechanical" assumption. It nevertheless has considerable merits. The effect of substituting the price-setter assumption by the price-accepter assumption is briefly analysed in Annex E.

4 : Model I : A simple framework for exchange rate analysis

117. A very simple framework for analysing the relationship between inflation and exchange rates is given below. The framework relies upon the relationships governing the prices of RSA and Botswana products competing in the two countries' markets. In a simplified and aggregated form, these basic price relationships are as follows:

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[8] This may be referred to as a "cost-push" assumption, as opposed to a "cost-absorb" assumption. The latter would imply that local production prices are *un*affected by cost increases, because local producers typically absorb any cost increase (by reducing their profit margins, becoming more efficient etc.) This, however, is unlikely to be the case; the statistical evidence at hand seem to indicate quite the opposite.

i) *In the Botswana market:* Domestic (tradable) products compete against imported substitutes from the RSA. The Pula-price of the latter is equal to the corresponding Rand-price (at source) divided by the Rand/Pula exchange rate.

ii) *In the RSA market:* Botswana's exports to RSA compete against local RSA substitutes. The Rand-price of the former is equal to the corresponding Pula-price (at source) multiplied by the Rand/Pula exchange rate.

118. If the two competing sources of supply to the Botswana market are to be in price equilibrium, their price in the local market must balance, i.e. their *Pula*-designated prices must balance. Hence: the Pula price of imports must equal the Pula price of local products.

119. Similarly, if the two competing sources of supply to the RSA market are to be in price equilibrium, their price in the RSA market must balance, i.e. their *Rand*-designated prices must balance. Hence: the Rand price of Botswana's exports must equal the Rand price of the corresponding RSA products.

120. Let us assume that such price equilibria existed in an initial situation, but that prices have subsequently changed as a result of inflation in RSA and Botswana, the rates of which may, but need not, be the same.

121. If the two inflation rates are the same, all prices are inflated by the same factor. The price equilibria of the initial situation are therefore automatically maintained, without any need to adjust the exchange rate.

122. If this is not the case, and Botswana wants to re-establish price equilibrium vis-à-vis RSA, it will have to react to the implied change in the relative price of Botswana versus RSA products, by adjusting the exchange rate. As shown in Annex B, this will have to be done according to the following formula:

$$(1+ER\%) = (1+R\%) / (1+P\%)$$

where : ER%: the percentage change in the Rand/Pula exchange rate required to maintain price equality in the face of inflation.
: P%: Botswana's inflation rate (affecting local sales and exports alike)
: R%: RSA's inflation rate (affecting local sales and exports alike)

123. Thus, if Botswana wants to re-establish price equilibrium vis-à-vis RSA, it should react to the new price situation by adjusting the exchange rate according to the *relative difference* in the inflation rates. Thus:

- If the two inflation rates are equal, the Rand/Pula rate should be kept constant.
- If the RSA inflation rate is *higher* than the Botswana inflation rate, the Rand/Pula rate should be *increased*, i.e. the Pula should be *revalued* against the Rand.[9]
- If the RSA inflation rate is *lower* than the Botswana inflation rate, the Rand/Pula rate should be *decreased*, i.e. the Pula should be *devalued* against the Rand.

[9] Or, expressed alternatively, the Rand should be *depreciated* against the Pula. Note the Botswana authorities are of course not in a position to directly devalue or depreciate the Rand against the Pula; this is the prerogative of the RSA authorities. Botswana can however change the Rand/Pula exchange rate at will, causing the same result. Rather than taking the trouble to describe this process in 100% correct, but extensive, terms, we will occasionally allow ourselves to use "shorthand language". (For instance: "The Rand should be depreciated X% against the Pula" rather than "the Botswana authorities should adjust the Pula's rate of exchange

a. Reactions to a Rand devaluation against the $

124. In the above we have analysed the effect upon the Rand/Pula exchange rate, assuming that the Botswana and RSA price levels have changed, and that Botswana wants to remain competitive vis-à-vis RSA also in the new price situation. But suppose that the Rand/Pula exchange rate itself has changed, as a result of the Rand being unilaterally devalued against the currencies of its major trading partners. How should Botswana react to such an event?

125. If the Rand is devalued against the $,[10] this has immediate implications for the Rand/Pula exchange rate; the Rand will depreciate also against the Pula. If there are no offsetting changes in the inflation rates of the two countries, the result is a shift in the price of Botswana products relative to the price of RSA products. Botswana's products will become more expensive relative to the RSA ones. To avoid this fate, Botswana will have to bring the Rand/Pula rate back into line with the realities of the price difference. Hence, unless the Rand devaluation against the $ gives rise to a spontaneous change in relative inflation rate difference, the Rand/Pula rate will have to be brought back to its original value, if Botswana is to maintain price equilibrium vis-à-vis RSA.

b. Limitations of above analysis

126. The above conclusions is drawn from a model with pre-supposed inflation rates; i.e. the inflation rate of Botswana is in principle treated *as if* it is independent of the RSA rate. This amounts to an unrealistic description of the real situation, there being ample reasons for assuming that Botswana's inflation rate is, to a considerable extent, dependent upon the RSA inflation rate. Thus, it is recalled that we have earlier, when discussing the trade relationship between Botswana and RSA, drawn the conclusion that RSA generated price-increases will tend to be imported into Botswana.

5 : Model II : Import generated inflation effects

127. To illustrate the link between RSA and Botswana inflation rates, we will investigate the changes in the Botswana price and cost levels that may result if all import prices increase by 10% in response to RSA inflation, while exchange rates and all other factors remain constant. We will use standard input/output technique to estimate the induced Botswana price effects. An input/output table, based on the 1992/93 Social Accounting Matrix (SAM92/93),[11] will be used for this purpose.[12] The input/output derived price relations are described in Annex C, while the input/output matrix itself is given in table 5,1 of Annex J.

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against the basic currency basket in such a way that the Rand/Pula rate is caused to increase so as to effectively depreciate the value of the Rand against the Pula by 10%".)

[10] It is recalled from the earlier presented trade "map" that the $ represents the currency of the Rest of the World, i.e. essentially a basket of foreign currencies.

[11] Social Accounting Matrix - 1992/93, published by the Central Statistics Office, May 1996.

[12] Note that the analysis, being of the input/output type, is rich in structural detail, but rigidly static and linear in nature. Hence, the economic structures are assumed not to change in response to price changes or otherwise. It is therefore best suited for the analysis of moderate changes in the relative prices.

128. As seen from table Cpt5,1, imports represent a significant part of total resource supply in Botswana, both for intermediate input, final consumption and capital formation purposes. Increased import prices will therefore induce inflationary effects into the Botswana economy, directly through the increased costs of final consumption imports etc., and indirectly through the increased costs of the imported inputs used by the local producers.[13]

129. The immediate effect of a 10% increase in the price of imports is a 2.8% increases in the Botswana households' cost of living, while the Botswana producers will face a 3.8% increase in their operating costs (compared to the initial situation). If the producers keep their sales prices constant, they will suffer a 9.6% loss in their operating surplus.[14]

Table Cpt5,1 : Sources of supply to the Botswana economy, 1992/93

Source of supply:	Intermed. Uses	Private Consump.	Public Consump.	Cap.Form. (inc.Stocks)	Total Uses
Domestic	3,537	2,605	2,698	1,180	10,020
Imports[15]	2,123	995	48	1,365	4,531
Total	5,660	3,600	2,746	2,545	14,551
Import-share	38%	28%	2%	54%	31%

Source: SAM92/93, as per table 5,1 of Annex J.

130. This loss of operating surplus reflects the assumption that producers in Botswana will reduce their profits in order to absorb cost increases, rather than pass them on to their customers. In practice this is unlikely to happen. Rather than suffer loss of income, most producers will presumably prefer to pass the cost increases on to their customers, and in a general inflationary environment, many may succeed in doing so.

131. Whether or not a given producer is able to follow this line of action will depend on his strategic position in the market place. It is recalled that we have earlier classified the economic actors as either price-receivers or price-setters. Botswana's traditional exporters are price-receivers. They are facing sales prices that follow the world market or similar, rather than the local markets in Botswana or RSA. They have no direct influence over these prices, and as such have to absorb all cost increases.

132. All other producers are price-setters, trading in the local markets of Botswana and RSA. They are selling products for which there may typically exist an average price level of sorts, but no single definitely given market price as such. They consequently set their own sales prices, in accordance with their perception of what the market will accept. As seen from their point of view, therefore, a generally price-inflated market will allow them to increase their own prices.

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[13] And, in the wider perspective, also in terms of increased cost of capital formation imports from the RSA. These are however ignored in the present analysis.

[14] The 9.6% refers to all sectors *excluding* the "abnormally" profitable mining sector. If the mining sector is included, the average production cost increase is 3.8%, corresponding to a 4.4% loss in operating surplus.

[15] The import content of public consumption may seem surprisingly low at 2%. However, in keeping with National Accounts treatment, most non-capital imports used by government are classified as intermediate inputs into the government production sector. Thus, inspecting table 5,1 (Annex J), it is seen that the central government sector imported Pula 371.8 million worth of goods and services, corresponding to 38% of its total intermediate inputs, and 16% of its Gross Output.

133. If the local producers[16] react to a general cost-increase by passing it on to their customers, but without increasing their own nominal profits, the result is an average price increase (on all price-setter products) of 2.6%, and a 4.6%[17] increase in the Cost of Living (COL) of Botswana households (see: table 5,2 of Annex J, case A). However, even in this case the producers of Botswana will suffer a real loss of earning, because they refrain from increasing their sales prices sufficiently to safeguard their own operating surplus against inflation. Again, such restraint may not be realistic in a general inflationary situation, with both import price and cost of living increases running well ahead of their own price increase.

134. Assuming that local producers *do* safeguard their own income by increasing their sales prices 100% pro-rata with the cost-increases,[18] the result of the 10% price increase on imports is a 3.6% price increase (on local price-setter products), and a 5.4% increase in the Cost of Living (see: table 5,2 of Annex J, case B, col.1).

135. The Botswana employees have consequently suffered a 5.4% loss of real income. Presumably they will demand to be compensated for this by a corresponding wage increase. If no wage compensation is given, their loss becomes permanent, but the inflationary process is broken. The economy will face no further inflationary pressure deriving from the initial import price increase. If so, local products may be said to have gained a comparative price advantage over imports, relative to the initial situation.[19]

136. If the employees are granted wage compensation, a new round of inflation effects throughout the economy results. In the first instance the increased wage *incomes* to the employees will translate directly into increased wage *costs* for their employers. If the latter again react by increasing their sales prices 100% pro-rata with the cost increases, the result is additional inflation, reducing both the real value of the wage increase and the local products' comparative price advantage over imports.

137. Thus, if local employees receive full compensation for the above Cost of Living (COL) increases, the wage rate will initially have to be increased by 5.4%. This will generate 2.5% additional inflation throughout the economy, increasing the rate of COL inflation to 7.9% (see: table 5,2 of Annex J, case B, col.1). If the wages are again increased to fully compensate for the 2.5% additional COL increase, further inflation will result (see: col.2, 3, etc.).

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[16] The local producers referred to in the following sections are the price setters, i.e. all producers except the traditional exporters. The latter are assumed to be facing constant export prices throughout this analysis.

[17] The two inflation rates are different because they refer to the weighted averages of different product "baskets". The price-setter rate refers to Botswana's *production* of goods and services (exc. traditional exports), while the COL rate refers to the *consumption* expenditures of Botswana households. These two "baskets" are different, both with respect to their direct import content and the "mix" of local products. For a similar reason, the price-indices for tradable products will in general be different from the all-product index.

[18] The 100% pro-rata assumption here used implies that the local producers increase their sales prices by a *full* X% in reaction to a X% cost- increase. Note that the producer in so doing *may* be aiming at safeguarding his operating surplus against the *general* rate of inflation affecting his particular segment of the market. If he has no immediately available information about this inflation rate other than the rate indicated by his own cost increase, and assumes his competitors to be similarly affected, he may have reasons to anticipate that the market will bear a corresponding price increase on his own product. If so, he will use this rate to inflate his sales price, and thus also his operating surplus.

[19] The relative price advantage is here explained in terms of a real term decrease in wages. Similar effects may of course also result from increased productivity etc. Such factors are however outside the scope of the present model.

If this process is brought to its logical end, domestic inflation and wage increases will balance out at 10%, i.e. at the same rate as the original import price impetus.[20]

138. The ultimate consequence of a full wage and profit compensation strategy is consequently the generation of full parity between the original RSA price increase and the induced Botswana one. Complete parity will however only have been reached after a number of compensation rounds. As illustrated in table 5,2 of Annex J, the inflation spiral needs about ten wage compensation rounds before it comes to a complete[21] halt. Consequently, if wage negotiations are held for instance once a year, it may take some 10 years before the original price impact has died completely down, given that it has been kept alive in the meantime by regular wage and profit compensations.

139. In this "stepwise static" analysis, therefore, allowing for full wage and profit compensation, but *no other* internal inflation-driving factors, the RSA inflation does reproduce itself 100% in terms of Botswana inflation, but only after a considerable time. In the interim period, the Botswana products will be relatively cheaper than their imported alternatives.

140. The pertinent question is however whether these temporary price advantages are likely to be of any *practical* significance for the Botswana producers. The answer to this question depends upon *how much* cheaper the Botswana products are, and for *how long* they remain cheaper. Inspecting table 5,2 (see: case B) it is seen that the initial inflationary effect is *far* larger than any of the subsequent (incremental) effects, and that the latter are quickly approaching nil. Thus, out of the total induced inflation effect, more than half is accounted for by the initial (direct) price impact, almost 80% is accounted for after the first wage increase, and 90% after the second. The relative price advantage enjoyed by the Botswana producers is therefore both a somewhat limited and temporary phenomenon; reduced to insignificance after one or two wage adjustments.

141. If only partial wage compensation is given, the price advantage brought by a Pula devaluation will comprise both a permanent and a temporary element. Table 5,2 (Annex J) shows the results of granting only 50% wage compensations, while operating surpluses are kept inflation-proof. As seen from the table (case: C), the total inflation effect will in this case be smaller than in the above case (7% versus 10% above). The inflationary process will also move faster; some 77% of the total inflation effect will be accounted for by the initial (direct) price impact, while 95% will be accounted for after the first wage increase.

142. In this case, therefore, any *temporary* price advantage enjoyed by the Botswana producers will be both smaller and more short-lived than in the above case. However, the producers may not be in great need of these temporary advantages, given that they will also enjoy a degree of permanent price advantage over their RSA competitors. This price advantage reflects the difference between RSA and Botswana inflation rates (10% versus 7%), and is made possible by a 3.5% reduction in real wages.

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[20] Also the individual domestic prices will end up by increasing 10%. This is the logical consequence of the fact that the domestic production factors (labour and capital) are both compensated exactly 100% for any cost increase faced.

[21] In theory, the process may go on forever, but the increments will be too small to be of any significance.

6 : Model III : A combined and extended model

6,1 : Introduction

143. Above we have discussed, under separate headings:

- A simple framework for analysing inflation and exchange rates.
- A price formation model based on input/output technique.

144. We will now combine these two elements into a common framework, building a more comprehensive model from the simple structures already presented. In so doing, the simple model structure described in Annex B is refined and expanded, and combined with the input/output structure described in Annex C. The result of this exercise is detailed in Annex D.

a. Profitability and competitive gains

145. The model analyses the relationship between the Botswana inflation rate on the one hand, and the RSA inflation rate and the Rand/Pula exchange rate on the other. In addition, the model gives indications of the changes in the fortunes of various types of Botswana producers. These fortunes are presented in the form of overall profitability gains for the price-receivers and overall competitive gains for the price-setters.[22]

146. The *profitability gain* reflects the percentage change in the total operating surplus of the price-receiving production sectors, i.e. of the traditional export sectors. The operating surplus of these exporters will change in response to any change in their Pula measured sales price or operating costs, the former changing with the Pula/$ exchange rate, and latter with the Botswana inflation rate. The profitability gains express this change in nominal and real terms, relative to the initial situation.

147. Assume, for instance, that the operating surplus earned by the traditional exporters in the initial situation is equal to:

Initial Operating Surplus = Initial Sales Income minus Initial Production Cost
= 100 - 25 = 75

148. Assume further that the price of these exports increases by 10%, while the prices affecting the corresponding production costs increase by 5%. As a result of the price changes the exporters will earn an inflated operating surplus equal to:

New Operating Surplus = New Sales Income minus New Production Cost
= (100*1.10) - (25*1.05) = 84

149. The increase in the nominal value of the operating surplus is then:

Increase in nominal-value Operating Surplus = New Operating Surplus
minus Initial Operating Surplus = 84 - 75 = 9

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[22] Note that the word: gain, as here used, is neutral with respect to the direction of the change involved. It does not necessarily imply a *positive* value. Thus, a profitability or competitive gain may in general be positive, nil or negative in value.

150. The nominal term profitability gain, which equals the increase in operating surplus expressed in percent of the initial operating surplus, is then:

Nominal Term Profitability Gain = Increase in real-value Operating Surplus divided by Initial Operating Surplus = 9 / 75 = 0.120 = 12.0%.

151. The "purchasing power" of the new (nominal) operating surplus will depend on the relevant inflation factor. If the price index for Botswana's total domestic use of goods and services is used to deflate the nominal operating surplus,[23] and the said index is: 1.06 (i.e. the average price of total domestic use increases by 6% from the initial situation), the real (deflated) value of the inflated operating surplus becomes:

Real New Operating Surplus = New Operating Surplus divided by Price Deflator = 84 / 1.06 = 79

152. The increase in real-value operating surplus is then:

Increase in real-value Operating Surplus = Real New Operating Surplus minus Initial Operating Surplus = 79 - 75 = 4

153. The real term profitability gain, which equals the real-value increase in operating surplus expressed in percent of the initial operating surplus, is then:

Real Term Profitability Gain = Increase in real-value Operating Surplus divided by Initial Operating Surplus = 4 / 75 = 0.053 = 5.3%.

154. The *competitive gain* refers to the overall fortune of all price-setting producers, i.e. of all producers other than the traditional exporters. The competitive gain measures the change in Botswana's relative price advantage vis-à-vis RSA. It is measured separately for each of the two main markets, i.e. for the home market and the export market, and relative to the initial situation prior to the price and exchange rate changes.[24]

155. The formulas for calculating home and export market gains are parallel in nature. We may therefore explain these formulas with reference to either. Assume, for this purpose, that the home market price of the Botswana product increases by 6%, while the local Pula price of the corresponding RSA import increases by 10%. The corresponding price indices consequently increase from 1.00 in the initial situation, to 1.06 and 1.10 respectively in the inflated situation. As a result of these price changes the Botswana product will enjoy a direct price advantage over the RSA product equal to:

Botswana's Direct Price Advantage in the Home Market = 10% - 6% = 4%

156. Botswana's competitive gain in the home market, defined as the price advantage expressed as a percent of the new RSA price level, is consequently:

Botswana's Competitive Gain in the Home Market = Botswana's Direct Price Advantage divided by RSA Price Index = 4% / 1.10 = 3.6%

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[23] Throughout this paper we have used the overall price index for Botswana's total domestic use of goods and services to deflate the nominal operating surplus of the traditional exporters. The result is a rather crude measure of their purchasing power, the real purchasing power being a function of how these incomes are actually spent. This point is of some importance, since the larger part of the real term losses estimated for a constant Pula/$ rate is attributable to the deflation of these incomes, rather than to increases in operating costs. In a revised version of the model, one should consequently attempt to refine this deflator.

[24] For a further discussion, see Annex D.

b. *Price and volume effects*

157. It should be understood that the model follows standard input/output procedure for analysing price changes. In so doing it is restricted to the analysis of price effects, assuming no corresponding volume effects. This amount to an obvious simplification of reality. Price changes are known to represent important market signals, which may give rise to producer and consumer reactions in the form of quantity changes. These volume changes may in their turn give rise to further price changes, and so on. It should be understood that although the model take into account both direct and indirect price effects, it does so with reference to the initial transaction volumes; i.e. it does *not* take into account secondary price effects that may arise from any associated volume change.

158. This reflects a desire to keep the model as simple and transparent as possible, not a denial of the existence of such effects. Including such secondary effects into the model promises to bring definite costs and doubtful benefits. Thus, on the one hand it would complicate the technical structure of the model significantly, since equations specifying the marginal behaviour of all economic actors would be required. On the other hand, it would not be capable of producing secondary effect estimates of unquestionable quality. Reliable *estimates* of marginal effects require reliable *data* on underlying price elasticities etc., and such data are not at hand. The estimation of marginal effects could therefore only be achieved by relying on highly speculative elasticity guestimates etc.

159. A pertinent question is nevertheless if the existence of the secondary effects, irrespective of how well we may be able to estimate them, is in itself likely to seriously undermine the validity of our present estimates, and more importantly, the validity of the conclusions drawn from them. It seems undeniable that secondary effects do exist. If so, our estimates, representing the *direct* price effects, must misrepresent the *final* price effect to a degree. We do not know to *what* degree this may be the case, but in keeping with standard input/output assumption we do not anticipate the ignored volume and price effects to be large enough to render our results spurious. Except for scenarios involving extreme price changes, it seems likely that these effects will be marginal both in nature and in magnitude. They may modify the price signals, but not change their direction, or seriously alter their scale.

160. Assuming that the secondary quantity and price changes are functions of the direct price changes, they will therefore merely mirror the latter, but at a much smaller scale. We can consequently simplify our task considerably by limiting our analysis to the direct price variables, if we, in view of above discussed problems of estimating the full price and volume changes, do *not* set our aim at estimating them *definitely*, but content ourselves with illustrating the *direction* and *relative strength* of their movements. Thus, rather than complicating the model by introducing a great number of speculative functions and elasticities describing the sectors' marginal behaviour, we will keep these effects outside the model.

c. *Producer reactions to gains*

i. *Profitability gains*

161. The model estimates the profitability gains earned by the traditional exporters, indicating whether they are winners or losers in a new price situation, but it does *not* tell us

how they will react to such an income change.[25] It merely indicates the direction and magnitude of the income change, when export quantities are assumed constant. It will be clear from the above discussion that the constant export quantities thus *assumed* do not imply a *prediction* to that effect. It merely reflects the fact that these variables are outside the model's area of analysis. Even so, we are free to speculate about what likely effect given price signals may have on corresponding quantity variables.[26]

162. Given that the lion's share of Botswana's total traditional export incomes are earned on diamond sales, and that these are sold in a highly regulated market and at a very high profit, it may be realistic to conclude that traditional export quantities may *on the whole* tend to be unaffected by price changes.[27] However, it is also known that some of the traditional mineral exporters are barely breaking even. A profitability setback may send these producers into bankruptcy, with total close-down of production, considerable loss of employment etc. Even minor profitability setbacks may therefore have the potential of significantly disrupting parts of the economy, although not so much the overall value of the traditional exports themselves.

ii. Competitive gains

163. The magnitude of the competitive gains earned by Botswana's producers of (non-traditional) products indicates the extent to which their prices have become lower or higher relative to the price RSA products. But, again, the model does *not* tell us how the producers react to this price signal, no functions having been specified with respect to these reactions. Neither is it self-evident what their reaction will be. Thus, if for instance faced with a positive gain, the producers may, depending on relevant supply and demand functions:

- react by increasing their sales price up to the level of the competing RSA price, expecting to earn a higher rate of profit on a constant volume of sales;
- or they may keep sales prices unchanged, expecting to increase sales volumes;
- or they may prefer a partial price increase, i.e. they may increase prices, but not quite up to the level of the competitors, expecting to increase both sales volumes and profit margins somewhat.

164. The model does *not* make any attempt at predicting the outcome of these choices. Its function is merely to indicate the direction and strength of the relative price signals that the

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[25] Producer reactions to given price signals will in general depend on the nature of relevant supply and demand functions. These are not specified with any degree of sophistication within the model, but (implicitly) assumed strictly linear without substitution or volume changes.

[26] These speculations will be *model-exogenous*, i.e. outside the scope and logic of the model itself. They will also fail to be 100% logically consistent, given that we first estimate price changes assuming constant quantities, and then speculate about quantity changes given these price changes. It therefore represent a practically convenient "rule of thumb" approach, rather than a theoretically ideal one.

[27] This is not to deny that the Central Selling Organisation reacts to market signals by regulating sales volumes. Sales prices and volumes therefore probably do move together. This is however "behind the scene", and relating to prices stipulated in $. The point made above, however, relates to the fact that:

- Price changes as discussed in the subsequent scenarios result from exchange rate changes, not from changes in the $ stipulated price.
- The market is so tightly regulated that the Botswana producer is not at liberty to react to a higher price, whatever its origin, by increasing the sales volume. (In addition, the short term ability to increase mining production may be limited, depending as it does on exploitable resources and installed processing capacity.)
- The industry being so profitable, it will not normally react to a lower price by reducing the sales volume.

Botswana producers will face if exchange and inflation rates change in certain ways. But, again, we are at liberty to speculate about the likely effect of these price signals. For instance, other things being equal, we may realistically expect that a positive competitive gain will promote the growth of local production, and that this will affect both the home and export market. Therefore, although the model itself has no opinion on the matter, we may postulate for instance a direct relationship between competitive gains and non-traditional export growth.

d. Validity of results

165. Estimates illustrating the direction and magnitude of the economic implications of some alternative inflation and exchange-rate scenarios are presented below. It should be kept in mind that these have all been calculated using the fairly simple economic model described in Annex D, the fundamental elements of which are:

- the nature of Botswana's foreign trade relations during later years, ignoring, for the sake of simplicity and clarity, all minor trading partners;
- the structure of the Botswana economy, as depicted by an input/output table built upon the SAM92/93 matrix.

166. It should also be emphasised that the model is essentially static in nature. As such it spells out the implications of our exogenously specified assumptions, but it does *not* address the affiliated questions of *when*, *how* or *what*. Thus, with the exception of a step-wise approach to wage-increase effects, it does not give any information about when or how the final results may in practice be achieved; nor does it indicate much about what may happen to the economic variables in the interim period. Finally, it does not allow for, or indicate the implications of, changes in the economic structures or trade patterns that may have occurred recently, or that might possibly occur in response to the price changes assumed under the different scenarios.

167. It may be noted, however, that:

- The type of price effects handled by the model may in practice tend to work themselves out over a relatively limited period (say within two to three years).
- Changes in the overall economic structures of a country tend to take effect only slowly and gradually; a *significant* change will therefore have materialised only after a considerable period of time (say five to ten years).
- Also changes in the trade pattern of a country are likely to occur fairly slowly and gradually.[28]

168. Thus, although the model is both static and simple, the trade pattern simplified, and the economic structures somewhat dated, one may have reasons to hope that the derived estimates, though far from gospel truth, may nevertheless be illustrative of realistic magnitudes in the short to medium term perspective.

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[28] This is at least likely to be the case in overall terms, and under normal circumstances. It may however change rapidly in response to sudden dramatic events, for instance the collapse of given export markets. The latter did in fact happen a few years back, when Botswana's exports to Zimbabwe were hurt badly as a result of the economic problems of that country.

169. Finally, it should be understood that the inflation and exchange rate movements assumed in the below scenarios do not exactly mirror the variations in these variables that have actually been observed in the past or present. Rather they are chosen as convenient representations of these movements, introduced in order to bring out the typical model reactions. Moreover, even if model inputs had been specified in line with observed events, model outputs would not be directly observable in practice. In general, the numerical estimates derived from the model for any given *set of assumptions* will not directly correspond to statistical data observed for given *periods*. This point is further discussed in Annex G.

6,2 : Simulation Results

a. Introduction

170. Simulation results for various hypothetical scenarios, reflecting alternative inflation and exchange rate situations, are presented below. Typically speaking, these results illustrate the correspondence between inflation and exchange rates under the following assumptions:

- The general RSA price level, which was P_0 initially, has subsequently changed to P_1 , i.e. it has changed by a given percentage in the interim period.[29]
- The Rand/$ exchange rate has similarly changed by a given percentage during this period.[30]
- The sales price of Botswana's traditional exports, as measured in $, has remained constant throughout the period.[31]
- The economic actors of Botswana behave in certain prescribed ways.

171. How should the Botswana authorities react to these events, in terms of re- or devaluing the Pula against the Rand, if it wants to achieve certain goals, such as the promotion of non-

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[29] The scenarios typically prescribe a 10% RSA inflation rate, a 10% devaluation etc. Such changes may in theory occur as discrete events, but in practice they seldom do. Especially a 10% price increase is unlikely to occur overnight; it is typically the accumulated effect of a large number of minor price increases spread over an extended period, for instance a year. Individually these price increases are however too small to warrant our attention, it is their accumulated effect that is of concern. Our analysis must therefore be directed towards the latter, not to the multitude of small individual "impulses".

Although the 10% inflation rate may in fact have occurred over time, we allow ourselves to analyse it within a simple static model, i.e. we are treating it "as if" it had occurred as a discrete event, the implication of which corresponds to the overall implication of the series of events. In analysing the inflation phenomenon we are consequently ignoring the specific time dimension of the problem, concentrating instead on the structural relationship between the various variables underlying the inflationary process. Such simplification of a complex reality is a standard method of the economic science.

The choice of the 10% RSA inflation rate typically used in the current exercise is not entirely "hypothetical". It roughly corresponds to the average annual rate of increase in the RSA wholesale price index during the 1990s.

[30] Note that we have implicitly specified the RSA rate of inflation and the Rand/$ exchange rate as two independent variables. This is a simplification of the actual facts. Given that the RSA economy is fairly import dependent, the two, together with the inflation rate on RSA's imports, will in reality be functional linked to each other. This relationship is however ignored in the present study, which for the sake of simplicity is limited to the Botswana situation.

[31] Note that these prices relate to a few products only, essentially diamonds, copper/nickle and beef. Our assumption about constant world market prices for these exports does therefore not imply an assumption about constant word market prices in general, (and hence not that for instance imported inflation into RSA is nil).

traditional exports, the containment of local inflation or similar? To study this question we will illustrate the implications of various exchange rate reactions.

b. Scenario : 1

172. The basic assumptions of scenario 1 are:

- All RSA prices increase by a uniform 10%.
- All nominal exchange rates remain unchanged.
- The price of traditional exports, as measured in $, remains constant.
- Botswana's price-setting producers inflate sales prices 100% pro-rata with their cost increases.

173. The current assumptions correspond to those already analysed in the above chapter, using input/output based price equations. Given that the price module then used is a central element also of the present model, current and earlier results will largely be identical; the main difference being that the present analysis will include some additional variables.

174. Thus, the price of imports into Botswana, as measured in supplier's price (i.e. in Rand-prices), increases by 10%. Since the Rand/Pula exchange rate remains constant, this will translate directly into a 10% price increase in the receiver's price (i.e. in the Pula-prices).[32] These imports represent a significant part of resource supply in Botswana. The increased price will therefore generate inflation in Botswana. Given the adopted input/output structure of the economy, and assuming that local non-traditional producers react to a given cost-increase by increasing their own prices 100% pro-rata with the cost increases, an average price increase on Botswana price-setter products[33] of 3.6% will result, and a 5.4% increase in the Cost of Living (COL) of Botswana households. (See: table 6,1 of Annex J; col.1A).

175. The Botswana work force consequently faces an inflation rate of 5.4%, for which it will want to be compensated in terms of wage increases. Below, we will study the effects of the following three compensation alternatives:

- No wage compensation (0%).
- Full wage compensation (100%).
- Partial wage compensation (50%).

*i. Scenario 1, assuming **no** wage compensation*

176. If no wage compensation is given, the economy will face no further inflationary pressure resulting from the initial import price increase (unless other actors or factors create such pressure). The average price-setter price will then have ended up increasing 3.6%. The corresponding increase in the average tradable home market price[34] will be somewhat higher at 4.4% (see table 6,1 of Annex J; col.1A). The latter price refers to the products directly

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[32] The model adds a cost element representing transport charges to the supplier's price before the receiver's price is reached. (See: Annex D). For the sake of simplicity, this element has largely been left out of the following discussion.

[33] It is recalled that the average price-setter price is the weighted average of all product prices set by the Botswana producers, i.e. it covers all Botswana products excluding the traditional exports.

[34] The average tradable home market price is the weighted average price for all Botswana tradable products sold in the home-market.

competing against imports in the Botswana market. The Botswana suppliers of such products have consequently earned themselves a significant competitive advantage over their foreign competitors, import prices having increased by 10%. Thus, as reported in table 6,1 (col.1A) the Botswana products have on average become 5.1% cheaper than the imported ones.

177. A similar competitive gain has also been earned by the non-traditional exporters to the RSA market. Their supplier's price, as measured in Pula, will have increased by approx. the same percentage as has the locally marketed tradable products. This translates directly into a similar increase as measured in Rand, since the Rand/Pula exchange rate has remained constant. If the effects of increased transport costs (inflated at the RSA rate of 10%) is added, the result is a 4.6% price increase in the receiver's price, as measured in Rand, and a 4.9% price advantage gained over RSA local products (see: table 6,1; col.1A).

178. The losers in this process are the Botswana employees, and the traditional exporters. The former have lost 5.1%[35] of their income in real terms, while the operating surplus of the latter have been squeezed between increased operating costs and constant sales prices.[36] As a result they face a profitability loss of 0.7% in nominal terms. This modest loss reflect the fact that their operating costs are on average fairly small compared to their total sales incomes. Given, however, that inflation has deteriorated the real value of their total operating surplus, this small nominal loss corresponds to a 6.0% profitability loss in real terms. The significant real term profitability loss recorded for the traditional exporters consequently results from a deterioration of the purchasing value of their earnings, rather than from an increase in operating costs.

*ii. Scenario 1, assuming **full** wage compensation*

179. Wage *incomes* to the Botswana employees are wage *costs* to their employers. Thus, if the wage rate of the Botswana work force is increased by 5.4%, this immediately increases the operating costs of the Botswana producers. If the latter again increase their sales prices 100% pro-rata with the operating cost increases, the result is additional inflation throughout the economy, increasing the rate of COL inflation to 7.9% (see: table 6,1 of Annex J; col.1A(1)). If the wages are again increased to compensate for the additional inflation, further inflation results (see: col.1A(2), (3), (4) etc.).

180. If this process is brought to its logical end, domestic inflation and wage increases will balance out at 10% (see: col.1B), i.e. at the same rate as the original import price-impetus. Direct price parity between Botswana and RSA products has then been re-established in both the Botswana and the RSA market, but at a 10% inflated level. There are consequently no winners or losers in terms of competitive gain in these markets. The traditional exporters,

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[35] The relevant indices have changed as follows due to the introduction of the changes in prices etc.:

	I: Before	II: After	III: Change
A: Nominal wage index	1.000	1.000	0.000
B: COL price index	1.000	1.054	0.054
C: Real wage index (C=A/B)	1.000	0.949	-0.051 = -5.1%

(NB: I = Initial situation; II = Situation after changes; III = Change from initial situation (III=II-I)).

[36] It is recalled that Botswana's traditional exporters are price-*receivers*; i.e. their sales prices, as measured in $, are given by the world market or similar. We assume no changes in these $-prices throughout the above calculations. Since the current scenario also assumes constant exchange rates, their sales prices, as measured in Pula, are also unchanged.

however, are losing heavily as inflation undermines the purchasing power of their incomes. In real (Pula) terms, they have has suffered a 10.4% decline in operating surplus.

*iii. Scenario 1, assuming a **partial** wage compensation*

181. A 50% wage compensation implies a 3.5% wage increase, and a 7.0% increase in the cost of living[37] (see: table 6,1 of Annex J; col.1C). The corresponding price increases for the domestic production of tradables are slightly lower at 6.3-6.5%, with the result that the Botswana producers win a competitive gain of some 3.2-3.3% over their RSA competitors. The traditional exporters are again losing heavily. In real terms, their operating surplus will fall by some 7.8%.

c. Scenario : 2

182. The basic assumptions of scenario 2 are:

- All RSA prices increase by a uniform 10%.
- The nominal Rand/$ exchange rate is devalued by 10%.[38]
- The price of traditional exports, as measured in $, remains constant.
- Botswana's price-setting producers inflate sales prices 100% pro-rata with their cost increases.

183. The devaluation of the Rand against the $ has the implication that the Rand is also devalued against the Pula. In response to this implicit *revaluation* of the Pula against the Rand, Botswana decides to adjust the value of the Pula in such a way that the Rand/Pula exchange rate becomes:

- the same as it was prior to RSA's devaluation, i.e. the Pula is pegged to the Rand, and devalued by 10% against the $;
- devalued by: 10% compared to the original situation, i.e. the Pula is pegged to the $, and revalued by 9.1%[39] against the Rand;
- devalued by: 5% compared to the original situation, i.e. the Pula is devalued by 4.8% against the $, and revalued 4.8% against the Rand.[40]

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[37] Note that these results are not reached immediately, but after several rounds of wage increases. The same should be understood for all subsequent discussions of the effect of an X% wage compensation.

[38] Note the correct interpretation of this statement. A re/devaluation of the CA/CB exchange rate implies a re/devaluation of the first mentioned currency (CA) against the second mentioned currency (CB). Thus, if the Rand/$ exchange rate is devalued, this implies that the Rand is devalued against the $. Similarly, a devaluation of the Rand/Pula exchange rate implies a devaluation of the Rand against the Pula.

[39] The relevant indices have changed as follows due to the introduction of the changes in prices etc.:

	I: Before	II: After	III: Change
A: Rand/Pula index	1.000	1.100	0.100
B: Pula/Rand index (B=1/A)	1.000	0.909	-0.091 = -9.1%

(NB: I = Initial situation; II = Situation after changes; III = Change from initial situation (III=II-I)).

[40] The relevant indices have changed as follows due to the introduction of the changes in prices etc.:

	I: Before	II: After	III: Change
A: Rand/$ index	1.000	1.100	0.100
B: Rand/Pula index	1.000	1.050	0.050
C: Pula/$ index (C=A/B)	1.000	1.048	0.048 = +4.8%
D: Pula/Rand index (D=1/B)	1.000	0.952	-0.048 = -4.8%

(NB: I = Initial situation; II = Situation after changes; III = Change from initial situation (III=II-I)).

*i. Scenario 2, assuming **unchanged** Rand/Pula rate*

184. This case is similar to the one discussed above. Thus, the price of imports into Botswana, as measured in Rand, increases by 10%. Since the Rand/Pula exchange rate remains constant, this translates directly into a 10% price increase in the Pula-price. This brings about a 5.4% increase in the Cost of Living, which may give rise to demand for wage increases. If nominal wage rates are kept constant, local producers will enjoy a 5% improvement in their terms of trade vis-à-vis their RSA competitors (see: table 6,2 of Annex J; col.2A1). If, on the other hand, full wage compensation is given, inflation will eventually reach 10%, thus effectively re-establishing parity with RSA, but at an inflated level (see: table 6.2; col.2A2).

185. The above results are exactly the same as in scenario 1,A and 1,B above. Nevertheless, there is a significant difference between the overall outcomes of scenario 1 and 2. This concerns the fortunes of the traditional exporters. In scenario 1 these producers had their real operating surplus *reduced* by 6.0% if no wage compensation was given (see: table 6,1; col.1A), but in the present they have them *increased* by 5.4% (see: table 6,2; col.2A1). This increase reflects the fact that by following the Rand, the Pula has been devalued by 10% against the $. Hence, the Pula/$ exchange rate has increased by 10%, and so has the Pula-value of the $-incomes earned by these exporters.

186. These gains refer to a situation without wage compensation. If full wage compensation is granted, fuelling further inflation, the real term profit gain will be wiped out (see: table 6,2; col.2A2). This is however a far better result than in the corresponding situation of scenario 1, where the real operating surpluses were reduced by 10.9% (see: table 6,1; col.1B).

*ii. Scenario 2, assuming a **10% devaluation** of the Rand/Pula rate*

187. Again, the Rand-price of imports from RSA increases by 10%. In this case, however, there is *no* corresponding increase in the Pula price, because the Rand/Pula rate has also increased by 10%. Thus, each Pula translates into 10% more Rand (as compared to the situation prior to the RSA devaluation), thereby sterilising the 10% inflation impulse originating from the RSA. Botswana will consequently avoid the inflation-push threatened by the RSA inflation rate. Unless other factors create local inflation pressures, the Pula-price of local products will therefore remain unchanged.

188. Hence, both local and foreign supplies to the Botswana market will remain constant in price. Also the Pula-price of Botswana's non-traditional exports to the RSA will remain unchanged, but its Rand-equivalent will increase by 10% due to the 10% increase in the Rand/Pula rate. Thus, the Rand-designated price increase on Botswana's exports to RSA will be the same as for the competing RSA products.

189. A 10% devaluation of the Rand/Pula rate, and a 10% devaluation of the Rand/$ rate, implies an unchanged Pula/$ rate. The incomes of the traditional exporters will therefore also remain unchanged, as will their profits (see: table 6,2 of Annex J; col.2B). Consequently, under this scenario, there will be no change in Botswana's competitive situation irrespective of market, and no change in the profitability of the traditional exporters.

*iii. Scenario 2, assuming a **5% devaluation** of the Rand/Pula rate*

190. This case is conceptually similar to the one discussed under 2,A above, although the magnitudes are different. Thus, the price of imports into Botswana, as measured in Rand, increases by 10%. Since the Rand/Pula exchange rate is devalued by 5%, (i.e. the Pula is *revalued* against the Rand), this translates directly into a 4.8%[41] price increase in the Pula-prices. This brings about a 2.6% increase in the Cost of Living (see: table 6,2 of Annex J; col.2C1), which may give rise to demand for wage increases.

191. If wages are kept constant, local (non-traditional) producers will enjoy a 2.5-2.6% increase in their terms of trade vis-à-vis their RSA competitors (see: table 6,2; col.2C1), while the traditional exporters will enjoy a real increase in their operating surplus by some 2.6%. The latter results from a moderate increase in their production costs, and a 4.8% increase in their sales incomes, brought about by the 4.8% devaluation of the Pula against the $.

192. If, on the other hand, full wage compensation is granted, inflation will rise to 4.8% (see: table 6,2; col.2C2), thus effectively re-establishing price-parity with the RSA imports in the home market. The price of exports to the RSA will also increase by 4.8% as measured in Pula, translating into a 10%[42] price increase as measured in Rand. Local (non-traditional) producers will consequently end up winning or losing no long term price advantage Also the traditional exporters will end up without gains or losses. The 4.8% increase in local inflation will exactly match their nominal profitability gain, thus reducing its real terms value to zero.

d. Scenario : 3

193. The basic assumptions of scenario 3 are:

- All RSA prices increase by a uniform 10%.
- The nominal Rand/$ exchange rate is devalued by a massive 20%.
- The price of traditional exports, as measured in $, remains constant.
- Botswana's price-setting producers inflate sales prices 100% pro-rata with their cost increases.

194. The devaluation of the Rand against the $ again has the immediate implication that the Rand is also devalued against the Pula. In response to this *revaluation* of the Pula against the Rand, Botswana decides to adjust the value of the Pula in such a way that the Rand/Pula exchange rate becomes:

i) The same as it was prior to RSA's devaluation, i.e. the Pula is pegged to the Rand, and devalued by 20% against the $.

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[41] Calculated in a way similar to that used in previous footnotes, i.e. as follows:

Pula-price change = Pula-price index (new value) - Pula-price index (initial value)

= Pula-price index (new value) - 1.000

= {[Rand-price index (new value)] / [New Rand/Pula-rate index (new value)]} -1.000

= {1.100 / 1.050} - 1.000 = 0.048 = 4.8%

[42] Calculated in a way similar to that used above, i.e. as follows:

Rand-price change = Rand-price index (new value) - 1.000

= {[Pula-price index (new value)] * [Rand/Pula-rate index (new value)]} -1.000

= {1.048 * 1.050} - 1.000 = 0.100 = 10.0%

ii) Devalued by: 5% compared to the original situation, i.e. the Pula is devalued by 14.3% against the $, and revalued by 4.8% against the Rand.

iii) Devalued by: 10% compared to the original situation, i.e. the Pula is devalued by 9.1% against the $, and revalued by 9.1% against the Rand.

iv) Devalued by more than 10% compared to the original situation, i.e. the Pula is devalued by less than 9.1% against the $, and revalued by more than 9.1% against the Rand.

*i. Scenario 3, assuming **unchanged** Rand/Pula rate*

195. This case is fairly similar to scenario 2,A above. Thus, the price of imports into Botswana, as measured in Rand, increases by 10%. Since the Rand/Pula exchange rate remains constant, this translates directly into a 10% price increase in the Pula-prices. This brings about a 5.4% increase in the Cost of Living, which may give rise to wage increases. If wages are kept constant, Botswana's producers will enjoy a 5% increase in their terms of trade vis-à-vis their RSA competitors (see: table 6,3 of Annex J; col.3A1). If, on the other hand, full wage compensation is granted, inflation will rise to 10%, thus effectively re-establishing parity with RSA, but at an inflated level (see: table 6,3; col.3A2).

196. These results are exactly the same as in scenario 2,A. The significant difference between the two scenarios concerns, as usual, the fortunes of the traditional exporters. In scenario 2,A these producers saw their real operating surplus increase by 5.4% if no wage compensation was given, while it remained constant if full compensation was given (see: table 6.2; col.2A1 and 2A2). In the present scenario, their real gains have increased significantly, to 16.7% if no compensation is given, and to 10.9% if full compensation is granted (see: table 6,3; col.3A1 and 3A2). These increases again reflect the fact that by following the Rand, the Pula has been devalued against the $, in this case by a full 20%. The Pula/$ exchange rate has consequently increased by 20%, and the Pula-value of the $-incomes earned by the exporters have grown accordingly.

*ii. Scenario 3, assuming a **5% devaluation** of the Rand/Pula rate*

197. This case is fairly similar to scenario 2,C above. Thus, the price of imports into Botswana, as measured in Rand, increases by 10%. Since the Rand/Pula exchange rate has been devalued by 5%, this translates into a 4.8% price increase in the Pula-price. This brings about a 2.6% increase in the Cost of Living, which may give rise to wage increases. If wages are kept constant, Botswana's producers will enjoy a 2.5-2.6% increase in their terms of trade vis-à-vis their RSA competitors (see: table 6,3 of Annex J; col.3B1). If, on the other hand, full wage compensation is granted, inflation will rise to 4.8%, thus effectively re-establishing parity with the RSA price, but at an inflated level (see: table 6,3; col.3B2).

198. These results are exactly the same as in scenario 2,C, the difference between scenarios again being the fortunes of the traditional exporters. In scenario 2,C these producers had their real operating surplus increased by 2.6% if no wage compensation was given, and remaining constant if full compensation was given (see: table 6,2 of Annex J; col.2C1 and 2C2). In the present scenario, their real gains have increased significantly, to 13.8% if no compensation is given, and to 10.9% if full compensation is granted (see: table 6,3; col.3B1 and 3B2), reflecting the fact that the Pula has been significantly devalued against the $, in this case by 14.3%.

The Pula/$ exchange rate has consequently increased by this amount, and so has the Pula-value of the $-income earned by the traditional exporters.

*iii. Scenario 3, assuming a **10% devaluation** of the Rand/Pula rate*

199. This case gives results which are fairly similar to the ones obtained in scenario 2,B above. Thus, the price of imports into Botswana, as measured in Rand, increases by 10%, but since the Rand/Pula exchange rate has been devalued by the same amount, this translates into a constant Pula-price.

200. Botswana will consequently experience zero inflation, unless domestic actors behave in such a way as to create it without reference to import prices. If so, the local producers will face no cost increases, and the local sales price of their products will remain unchanged. Hence, both local and foreign supplies to the Botswana market will remain unaffected by price changes.

201. Also the Pula-price of non-traditional exports to the RSA will remain unchanged, but the Rand-equivalent will increase by 10% due to the 10% increase in the Rand/Pula rate. Thus, the Rand-designated price increase on Botswana's exports to RSA will be the same as for the competing RSA products.

202. Consequently, under this scenario, there will be no change in Botswana's competitive situation in the home market, or in the non-traditional export market (see: table 6,3; col.3C). This situation is exactly the same as in scenario 2,B (see: table 6,2; col.2B).

203. The difference between these scenarios is as usual found in the fortune of the traditional exporters. In scenario 2,B these producers experienced unchanged operating surplus. In the present scenario, they get a significant gain, reflecting the significant devaluation of the Pula against the $.

*iv. Scenario 3, assuming a Rand/Pula devaluation in **excess of 10%***

204. If Botswana allows the Rand/Pula exchange rate to devalue by more than 10%, i.e. by more than the RSA inflation rate, the result is deflation (negative inflation) in Botswana. Thus, as seen from table 6,3 of Annex J (col.3D, E, F) the Botswana COL index gets increasingly negative as the rate of Rand/Pula devaluation increases. This is easily explained by the fact that a devaluation of the Rand against the Pula implies that the Rand becomes cheaper in Pula terms. Thus, other things being equal, RSA products become cheaper to buy for Botswana customers. When the devaluation of the Rand equals the price-increase on these products, the former exactly off-sets the latter (from Botswana's point of view), but when the rate of devaluation exceeds the rate of inflation, the former more than off-sets the latter, with the result that Botswana import prices fall even though RSA export prices rise.

205. Cheaper import prices *per se* will benefit local households and producers, by reducing the cost of consumption and production imports. However, if the result is local deflation, undesirable "side-effects" may also be encountered. Thus, deflation will *ceteris paribus* increase the real value of debts and costs fixed in nominal prices.

206. One set of problems likely to be encountered has its roots in the nature of domestic price formation. International experience indicates fairly clearly that whereas employees and

producers alike are rather quick to demand wage- and price-increases in compensation for inflation, they are not so eager to accept wage- and price-reductions in reaction to deflation. Thus, especially wage formation tends to be of a "non-recursive" nature. Once established at a given nominal level, wage-rates may be difficult to reduce, even in a deflationary situation.

207. If this is not the case,[43] there is no problem. Thus, as seen from table 6,3 of Annex J (col.3F2) a general reduction in wages and prices will re-establish a status quo situation *a la* scenario 3,A (see: table 6,3; col.3A2), with real wages and competitive gains back to zero, while traditional exporters will be better off due to the implied devaluation of the Pula against the $.

208. If nominal wages do not decrease in a situation of general deflation, the result is a real wage increase. This "consumers' gain" has to be "paid for" in the form of a worsened competitive situation for the non-traditional producers (as seen from table 6,3; col.3D, E, F1). Note that this results even though the prices of non-traditional products *do* fall "alongside" the prices of their competitors. The problem is that they, due to the real wage increase, do not fall *enough* as compared to the exchange rate converted prices of their competitors.

e. *Scenarios 4, 5 and 6*

209. The basic assumptions of scenarios 4, 5 and 6 are:

i) All RSA prices increase by a uniform 10%.

ii) The nominal Rand/$ exchange rate changes as follows:

a) in scenario 4: the Rand depreciates by 5% against the $;

b) in scenario 5: the Rand/$ exchange rate remains unchanged;[44]

c) in scenario 6: the Rand appreciates by 5% against the $.

iii) The price of traditional exports, as measured in $, remains constant.

iv) Botswana price-setting producers inflate their sales prices 100% pro-rata with the cost increases faced.

210. The change in the Rand/$ exchange rate is again assumed to have the immediate effect of changing also the Rand/Pula rate, a development to which the Botswana authorities have to react one way or the other. The alternative reactions covered by scenarios 4, 5 and 6 are the usual ones: a 0%, a 5% and a 10% revaluation of the Pula against the Rand. In addition, two new alternatives are included: a 5% devaluation and a 15% revaluation of the Pula, the latter being introduced to study the effect of a Pula revaluation in excess of the RSA inflation rate.

211. The results for scenario 4 to 6 are given in tables 6,4 to 6,6 of Annex J. All told, these results are not fundamentally different from those of earlier scenarios. A change in the Rand's value against the $ will affect the fortunes of Botswana's traditional exporters, but only to the

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[43] In a dynamic multi-period environment with repeated inflation impulses originated from imports etc., these deflationary effects may of course serve to lower overall *future* inflation, and thus wage demands. But this can not be directly demonstrated within the present static model handling the effects of a single such impulse. We may nevertheless illustrate the point by allowing a nominal wage reduction.

[44] Scenario 5 corresponds to scenario 1, but is nevertheless specified here in order to cover the same range of Rand/Pula alternatives as for the other scenarios.

extent that this change is reflected in the Pula/$ rate. Other local producers are unaffected by the Rand/$ rate. Their fortunes depend upon the RSA inflation rate and the Rand/Pula rate, not the Rand/$ rate. The latter is consequently irrelevant to them, at least as long as we do not allow for any functional link between the Rand/$ rate and the RSA inflation rate.

212. Thus, inspecting tables 6,4 to 6,6 the results with respect to inflation and competitive gains are seen to mirror our earlier results. For instance, the effect of keeping the Pula/Rand rate constant, when the RSA inflation rate is 10%, is a 5.4% immediate (COL) inflation effect, irrespective of the change in the Rand/$ rate. If no wage compensation is granted, a competitive gain of some 5% for the non-traditional producers results (see: columns 4A1, 5A1 and 6A1 of the above referred tables). If, on the other hand, full wage compensation is granted, the eventual result is a 10% inflation rate and a 0% competitive gain (see: columns 4A2, 5A2 and 6A2).

Table Cpt6,1 : Summary results for scenarios 4, 5 and 6

A : RSA inflation rate	10.0%	10.0%	10.0%	10.0%	10.0%
B : Rand/Pula shift 1)	-5.0%	0.0%	5.0%	10.0%	15.0%
C : Sum (A-B) 2)	15.0%	10.0%	5.0%	0.0%	-5.0%
		Immediate effects			
D : Cost of Living shift	8.5%	5.4%	2.6%	0.0%	-2.3%
E : Competitive gain	7.5%	5.0%	2.5%	0.0%	-2.5%
F : Sum (D + E)	15.0%	10.4%	5.1%	0.0%	-4.8%
		Final effects 3)			
G : Cost of Living shift	15.8%	10.0%	4.8%	0.0%	-4.3%
H : Competitive gain	0.0%	0.0%	0.0%	0.0%	0.0%

Notes: 1) Percentage change in the Rand/Pula exchange rate, as specified in terms of an increasing degree of Pula *re*valuation.
2) The RSA inflation rate minus the degree of Pula revaluation, i.e. the inflation rate affecting import prices (at source) *plus* the degree of Pula *de*valuation against the Rand.
3) Final effects if full wage compensations are given.

213. The results from tables 6,4 to 6,6, in respect of Cost of Living inflation and competitive gains, are summarised in table Cpt6,1. These are, as already stated, in line with our earlier results, and unaffected by variations of the Rand/$ rate. The latter is therefore left out of the table.

214. Looking at the immediate effects depicted in table Cpt6,1, a Pula devaluation against the Rand is seen to *ceteris paribus* improve the competitive situation of Botswana's non-traditional producers, but also to fuel local inflation. The opposite is true for a revaluation. These effects increase with the degree of exchange rate change. This is readily apparent from the table, where both the gain and inflation-fuelling effect is seen to increase with increasing degrees of Pula devaluation, and to decrease with increasing degrees of Pula revaluation.

215. The above conclusions relate to the partial *ceteris paribus* effects of exchange rate changes, i.e. they refer to the marginal and isolated effects of changing the exchange rate. The negative *ceteris paribus* revaluation effect upon the competitive gain therefore implies that the gain is *smaller* than it would have been if the Pula had been revalued to a lesser degree. It does not imply that the gain is necessarily negative in value.

216. A revaluation of the Pula may in fact, under certain conditions, give rise to a positive competitive gain. Thus, as seen from table Cpt6,1, the immediate effect of a 5% revaluation of the Pula is a 2.5% competitive gain, and a 2.6% increase in inflation, when the import inflation rate is 10%. The effect of a revaluation may therefore in certain cases be similar in nature, but not in magnitude, to those of a devaluation. This result emerges when we take into account both the exchange rate change *and* the import inflation rate, instead of focusing upon the isolated effect of the revaluation alone.

217. Inspecting table Cpt6,1, it is seen that a revaluation of the Pula will give rise to a positive (immediate) competitive gain, provided that the degree of revaluation is smaller than the rate of inflation affecting the import prices (as measured in Rand). In this case, the revaluation will serve to dampen the increase in import prices measured in Pula. The "surviving" price increase on imports will however still make them relatively more expensive, compared to local products. The competitive gain reflects this shift in the relative price of imports versus local products.

218. A Pula revaluation equal to the rate of import inflation (at source) will exactly offset the inflation impetus. The result is no competitive gains, and no inflation effects, as seen from table Cpt6,1. A Pula revaluation of this magnitude will consequently ensure a status quo situation, unless other inflation factors act to prevent it.

219. A Pula revaluation in excess of the rate of import inflation will more than offset the inflation impetus, with the result that import prices measured in Pula will decrease, even though they are increasing when measured in Rand. This case was previously analysed in scenario 3 (ref: 3D, 3E and 3F). As then explained, a revaluation of this magnitude may result in local deflation (negative inflation). This will increase the real wage costs of the local producers, and thus hurt their competitive power, unless they are able to reduce the nominal wage rate.

220. Finally, it may be noted that the results of table Cpt6,1 seem to suggest the following "rules of thumb" (to which we shall return later):

i) Immediate effects: The sum of the immediate inflation and competitive gain effects is roughly equal to the sum of the inflation rate affecting import prices at source and the degree of Pula *de*valuation against the Rand. The inflation effect and the competitive gain will each account for roughly half of the above total.

ii) Final effects (after full wage compensations): The final inflation effect will be roughly equal to the above total, while the final competitive gain will be nil.

6,3 : Comparison across scenarios

a. Correspondence across scenarios

221. It is recalled from above discussion that the immediate effect of keeping the Pula pegged to the Rand is a 5.4% increase in COL inflation rate, *irrespective* of the change in the

Rand/$ rate.[45] This is but one example among many of the correspondence between various scenario outcomes. Table 6,7 of Annex J sorts the results of various scenarios into groups, allowing for an inspection of how they correspond to one another.

222. Group I,A of table 6,7 represents scenarios with no wage compensation[46] and no change in the Rand/Pula rate, but different Rand/$ and Pula/$ rates. The results for individual variables are seen to be identically the same across the scenarios, except for the Pula/$ rate and the profitability gain of the traditional exporters. Thus:

i) A change in the Rand/$ rate translates directly into a similar change in the Pula/$ rate.

ii) The Pula/$ rate does not directly affect local prices or *competitive* gains. A constant Rand/Pula rate, combined with a 0% wage compensation, implies a COL inflation rate of 5.4%, and a competitive gain of approx. 5.0%, *irrespective* of the Pula/$ value.

iii) A change in the Pula/$ rate directly affects the *profitability* gain of the traditional exporters. The higher the increase in the Pula/$ rate, the higher the profitability gain of the traditional exporters.

223. Group I,B of table 6,7 represents the corresponding scenarios with full wage compensation. The results are, as expected, different from the above ones, but they are again identical *within* the group of scenarios, except for the Pula/$ rate and the profitability gain, which varies as indicated above. Thus:

i) A constant Rand/Pula rate, combined with a 100% wage compensation, gives an increase in the COL inflation rate of 10%, and a competitive gain of 0%, irrespective of the Pula/$ rate. The implications of full price compensations for local production factors are consequently that Botswana copies the RSA inflation rate, and that the initial competitive gains are wiped out.

ii) A change in the Pula/$ rate again affects the profitability gain of the traditional exporters. The gains are however lower than in the above case, because local inflation is higher.[47]

224. Similarly, groups II,B and II,A represent various scenarios with and without wage compensation. All scenarios are based on a 5% increase in the Rand/Pula rate, equal to half the RSA inflation rate, but they have different Rand/$ and Pula/$ rates. The results are again seen to be different from the earlier ones, but they are identical within each group of scenarios, except for the profitability gains and the Pula/$ rates. Thus:

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[45] It is recalled from above that this result reflects the fact that the present simple model does *not* analyse the RSA inflation process. Given the importance of RSA inflation for Botswana, this might possibly be an additional element of an extended version of the model. In such a model, the Rand/$ exchange rate should probably be allowed to influence the RSA inflation rate, and thus the Botswana inflation rate.

[46] It is recalled that producers are assumed to be fully compensated for cost increases throughout this exercise, only the degree of wage compensation varies.

[47] Roughly speaking, the profitability gain equals the rate of Pula/$ devaluation minus the rate of (COL) inflation.

i) If no wage compensation is given:

- A 5% increase in the Rand/Pula rate gives a COL inflation increase of 2.6%, and a competitive gain of approx. 2.5%, *irrespective* of the Pula/$ rate. The revaluation of the Pula against the Rand, at a rate equal to half the RSA inflation rate, has consequently reduced the rate of inflation and competitive gains to roughly half (compared to constant Rand/Pula situation described above).

ii) If full wage compensation is given:

- The COL inflation effect increases to 4.8%, while the competitive gain drops to 0%. Thus, as in the scenarios of group I,B, full wage compensations implies the cancelling out of all competitive gains, but at lower overall level of inflation. The latter has been roughly halved due to the revaluation of the Pula (as was the case also before the compensations (ref. i) above).
- The 5% increase in the Rand/Pula rate has reduced the increase in the Pula/$ rate accordingly, as compared to case I. Even so, the profitability gains are seen to be the same as before (ref: group I,B). The change in the Rand/Pula rate has consequently not affected them; the income losses resulting from the lower Pula/$ rate are offset by the cost savings brought by the lower inflation rate.

225. Finally, groups III, IV and V represent the corresponding scenarios with 10% increase, 5% decrease and 15% increase in the Rand/Pula rate, each with different Rand/$ rates. The results are seen to conform to the logic of the above discussed cases.

b. Relative gain effects

226. An inspection of the immediate effects[48] of exchange rate changes across the five groups of table 6,7 (Annex J), is seen to confirm the "rules of thumb" put forward in the previous chapter. Thus, it is again seen that the sum of the immediate changes in local inflation and competitive strength roughly equals the sum of the original import inflation rate (at source) plus the rate of Pula *de*valuation, i.e. to the sum of the percentage increase in RSA (Rand) prices minus the percentage increase in the Rand/Pula exchange rate. The local inflation and competitive gain effect each accounts for roughly half of this total. For instance, a 10% RSA inflation rate, combined with a 5% *re*valuation of the Pula (EXRP% = +5%), will produce roughly a 5% total change in the basic price relations. This total is split approx. 50/50 between the inflation (COL) and gain effects, as illustrated in table Cpt6,2.[49]

227. The above observations may be expressed mathematically as follows:

$$COL\% + GAIN\% \approx GRI\% - EXRP\%$$
$$COL\% \approx GAIN\% \approx \{GRI\% - EXRP\%\}/2$$

where: COL% : the immediate percentage change in the local inflation rate,
GAIN% : the immediate percentage change in the competitive strength of local producers,
GRI% : the (percentage) RSA inflation rate,
EXRP% : the percentage increase in the Rand/Pula exchange rate.

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[48] The immediate effects in question are those pertaining to the scenarios without wage increases.

[49] Note that these conclusions represent no more than rough "rule of thumb" measures. They are *not* exact, except for exchange rate changes exactly balancing the RSA inflation rates. In all other cases, the COL increase is slightly higher than the gain, i.e. inflation effect > gain effect, whether positive or negative.

228. Thus, the variables GAIN% and COL%, which will largely follow each other, will both increase if GRI% increases, and decrease if EXRP% increases. In other words, the immediate percentage change in the rate of local inflation, and of competitive gains, will increase with an increasing RSA inflation rate, and decrease with an increasing Rand/Pula exchange rate.

Table Cpt6,2 : Total change in basic price relations, and its split into local inflation and gain effects, for alternative combinations of import-inflation and Rand/Pula movements 1)

Change in Rand/Pula rate	RSA inflation rate											
	+10%			+5%			0%			-5%		
	A	B	C	A	B	C	A	B	C	A	B	C
-10% 2)	20%	12.0%	10.0%	15%	9.0%	7.9%	10%	6.0%	5.5%	5%	3.0%	3.0%
-5% 2)	15%	8.5%	7.6%	10%	5.7%	5.3%	5%	2.8%	2.8%	0%	0.0%	0.0%
0%	10%	5.4%	5.0%	5%	2.7%	2.7%	0%	0.0%	0.0%	-5%	-2.7%	-2.9%
+5% 3)	5%	2.6%	2.6%	0%	0.0%	0.0%	-5%	-2.6%	-2.8%	-10%	-5.1%	-5.8%
+10% 3)	0%	0.0%	0.0%	-5%	-2.4%	-2.6%	-10%	-4.9%	-5.5%	-15%	-7.3%	-8.7%
+15% 3)	-5%	-2.3%	-2.6%	-10%	-4.7%	-5.3%	-15%	-7.0%	-8.3%	-20%	-9.4%	-11.6%

1) The estimates of columns A represent the (percentage) increase in RSA prices minus the increase in the Rand/Pula exchange rate. Column B gives the COL inflation rates, and column C the average of home and export market gains. The above data are derived from model simulations (model III).
2) The Pula is *de*valued against the Rand.
3) The Pula is *re*valued against the Rand.

230. An increase in the Rand/Pula exchange rate implies a depreciation of the Rand against the Pula, or a revaluation of the Pula against the Rand. The partial *ceteris paribus* gain effect of a *re*valuation of the Pula against the Rand is therefore a relative deterioration in the competitive situation, the stronger the stronger the degree of revaluation is.[50] Similarly, the partial *ceteris paribus* effect of *de*valuing the Pula against the Rand is a relative improvement in the competitive situation, the stronger the stronger the degree of devaluation is.

231. These effects are however *relative* in nature. Thus, as explained earlier, a relative improvement or deterioration of this kind does not necessarily imply an absolute improvement or deterioration. A relative improvement may for instance consist of a smaller loss, and a relative deterioration of a smaller gain. This is illustrated in table Cpt6,2, where the gains are seen always to decrease as we read from the top downwards, without necessarily being negative in value. Similarly, the gains always increase as we read from the bottom upwards, without necessarily being positive in value.

232. The condition for obtaining an *absolute* positive or negative gain is also given by the above equation: GAIN% $\approx$ {GRI% - EXRP%}/2. Before doing so, however, we will take a brief look at two alternative exchange rate options which seem to underpin the debate about

[50] This is easily seen by the fact that a larger negative EXRP% value gives a smaller {GRI%-EXRP%} sum than does a smaller negative EXRP% value, the latter gives a smaller sum than a zero EXRP% value, and so on.

the Botswana exchange rate regime. These are: keeping the Pula in line with the Rand, and keeping it in line with the $.

233. For this purpose, we introduce the equation:

$$EXRP\% \approx EXRD\% - EXPD\%$$ [51]

where: EXRP% : the percentage increase in the Rand/Pula exchange rate,
EXRD% : the percentage increase in the Rand/$ exchange rate,
EXPD% : the percentage increase in the Pula/$ exchange rate.

234. We shall first look at the situation encountered during recent years, with the value of the Rand falling significantly against the value of the $. The corresponding EXRD% value has consequently been of a significant positive magnitude.

i) If the Pula had been pegged to the $ in this situation, as some opponents of the current exchange rate policy seem to favour, the value of EXPD% would be nil. The value of EXRP%, being the difference between EXRD% and EXPD%, would then have been equal to the value of EXRD%, i.e. it would have been of a significant positive magnitude. As shown above, the partial effect of a positive EXRP% value is a relative reduction of competitive gains, the larger the larger EXRP% is.

ii) If, on the other hand, the Pula is pegged to the Rand, the value of EXRP% is nil, implying no effect on competitive gains.

iii) Comparing the two alternatives in this perspective, it is therefore clear that the alternative of pegging the Pula to the $ would have carried a price in the form of a significant loss of competitive power.

235. The Rand have fallen significantly against major foreign currencies during recent years. There is therefore a feeling among some observers that it may at present be undervalued against the $. If so, a Rand revaluation against the $ may be on the cards. How should Botswana react to such an event, if it wants to protect or promote its producers?

236. If the Rand is revalued against the $, the effects are the reverse of those described for a devaluation. Thus, a Rand revaluation against the $ implies a negative EXRD% value. If the Pula is pegged to the Rand, this will not matter; the value of EXRP% will in any case be nil, implying nil gain effects. If, on the other hand, the Pula is pegged to the $, the value of EXPD% will be nil, and the value of EXRP% will equal the value of EXRD%, i.e. it will be negative. As shown above, the partial effect of a negative EXRP% value is a relative increase in competitive gains.

c. Absolute gain effects

237. It is recalled from above that the condition for obtaining an absolute positive or negative gain is given by the above equation:

$$GAIN\% \approx \{GRI\% - EXRP\%\}/2$$

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[51] This is derived from the equation: EXRP% = (EXRD%-EXPD%) / (1+EXPD%) [which is derived from the equation: (1+EXRP%) = (1+EXRD%)/(1+ EXPD%)].

Thus: GAIN% > = < 0.0 [52]
if, and only if: {GRI% - EXRP%}/2 > = < 0.0
i.e.: if, and only if: GRI% > = < EXRP%

238. The direction of the immediate absolute changes in competitive gains (and in local inflation), as measured terms of a response to a revaluation[53] of the Pula against the Rand, is consequently:

- A Pula revaluation larger than the RSA inflation rate will *ceteris paribus* result in negative gain and inflation impulses.
- A Pula revaluation equal to the RSA inflation rate will *ceteris paribus* result in zero gain and inflation impulses.
- A Pula revaluation smaller than the RSA inflation rate will *ceteris paribus* result in positive gain and inflation impulses.

239. The nature of these conclusions are also clearly illustrated in table Cpt6,2, where all gains arrange themselves symmetrically around the shaded line representing the situation when the change in the Rand/Pula exchange rate exactly equals the RSA inflation rate. Thus, all gains above the shaded line are increasingly positive, all gains on the line are zero, and all gains below the line are increasingly negative.

d. Summing up

240. Summing up, it is seen that the above inspection of table 6,7 etc. has demonstrate that:

i) The Pula/$ rate does not effect the fortunes of the non-traditional producers, while it is crucial for the fortunes of the traditional ones.

ii) The Rand/Pula rate, on the other hand, is important for the non-traditional producers, but not for the traditional ones.

iii) The overall scale and direction of change in the *immediate* competitive gain and inflation effects brought by a Pula devaluation against the Rand are given by the sum of the original RSA inflation rate minus the rate of Pula *re*valuation, i.e. by the extent to which the external inflation impetus is left unaffected by exchange rate changes. The gain and inflation effect will each account for roughly half of the said sum.

iv) Subsequent wage and profit compensations will act to magnify the initial import price signal. Full compensation will eventually result in the total erosion of the initial competitive gain or loss, due to the induced changes in the local price level.

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[52] The notation "> = <" represents a mathematical symbol with the meaning "greater, equal or less than". Similarly, "< = >" means "less, equal or greater than". The statement "A > = < B if, and only if C < = > D" therefore reads "A is greater, equal or less than B if, and only if C is less, equal or greater than D". Or, as expressed in full: A is greater than B only when C is less than D, it is equal to B only when C is equal to D, and it is less than B only when C is greater than D.

[53] Note that the exchange rate changes, whether positive, nil or negative, are here specified in terms of *revaluations* of the Pula against the Rand. Thus, a devaluation is given as a negative revaluation, and a constant exchange rate as a 0% revaluation.

6,4 : Interpreting the above estimates

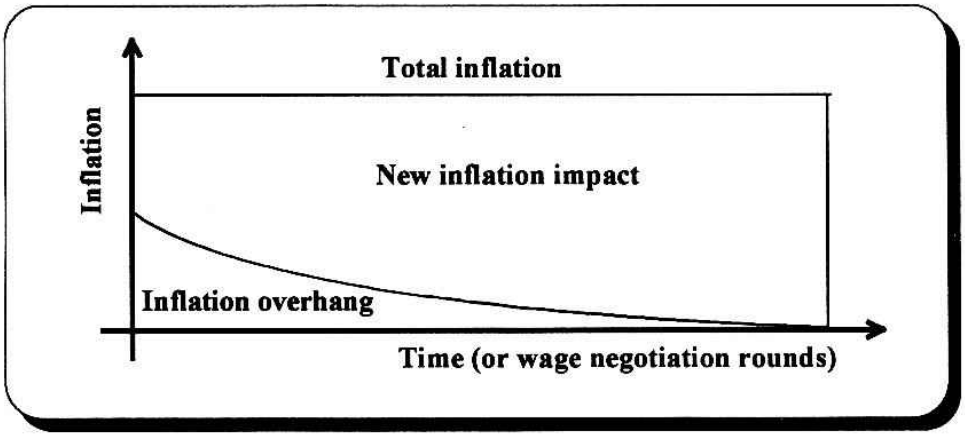
a. *Partial and total inflation impact*

241. Inflation is sometimes compared to a train; once set in motion it is hard to stop. Due to its own force of mobility, it will keep on rolling, even after the locomotive has stopped pulling. The speed of the train at any given time is therefore determined both by the energy exerted by the locomotive at that time, and by the speed already reached prior to that time. If we accept this to be the case also for inflation, it is clear that the total inflation rate applicable to any given period is functionally linked to both past and present inflation impulses.

242. In the above scenarios we have illustrated the Botswana inflation rates resulting from a given RSA inflation rate, a given Rand/Pula rate etc. It should be emphasised that the inflation rates thus calculated are of a *partial ceteris paribus* nature. They do *not* take into account the lagged effects of past inflation levels, which we for the sake of simplicity will call the inflation *overhang.*[54]

243. The partial nature of our inflation estimates is illustrated by the fact that no level of local inflation overhang is specified in the present model. Implicitly, therefore, we have treated the Botswana inflation overhang as if it was zero. In reality the overhang will rarely be zero; during later years it have probably been of a significant positive magnitude. If so, the *total* inflation rate (inclusive of the overhang) will be higher than the partial rate illustrated above, at least initially. When interpreting the above results, this basic fact should be kept clearly in mind.

Figure Cpt6,2 : Rough illustration of the components of total inflation



244. The inflation overhang from previous periods will gradually die away, as roughly illustrated in figure Cpt6,2. The final inflation rates, derived after several rounds of wage compensations, should consequently not be significantly affected by inflation overhang; i.e. our final inflation estimates may be seen as representative of the corresponding total inflation

[54] In order to properly handle such lagged inflation effects, we ideally require a multi-period dynamic model. The construction of such a model has not been attempted. The effect of introducing the inflation overhang is nevertheless somewhat crudely illustrated in a later chapter, based on a simple reformulation of the existing model.

effects. The question of inflation overhang therefore concern the interpretation of inflation estimates relating to the period *before* the final is reached, and especially to the initial period itself.

b. *Partial and total gains*

245. The partial nature of the immediate inflation estimates has implications for the interpretation of the gains estimated. The magnitude of the immediate gains depend upon the magnitude of the immediate inflation effects. Since the latter are of a partial nature, the former will also be of this nature.

246. In the above chapter we have indicated how Botswana may secure a positive (immediate) competitive gain for its producers by appropriate exchange rate responses to given RSA inflation rates etc. It should be noted that the gains in question are only partial in nature, referring to the price and exchange rate factors specifically analysed, but ignoring the effect of other factors such as for instance the inflation overhang. If the latter is positive, as we may realistically assume it to be, the partial gain will be modified by the negative effects of the inflation overhang.

247. A positive (partial) gain may consequently be a *necessary* condition for securing status quo situation in respect of the total gain situation, but it is not automatically a *sufficient* condition. A positive (partly) gain may not ensure such as result irrespective of magnitude; a small gain may prove insufficient. In order to maintain an unchanged overall competitive situation for its producers, Botswana may therefore need to secure a positive (partial) gain of a certain magnitude, reflecting the magnitude of the overhang.

248. The above discussion relates to immediate and "early" gain estimates. The "late" and final gain estimates are *not* similarly affected. These gains refer to late and final inflation estimates, which, as explained above, are not significantly affected by the inflation overhang.

c. *A numerical example*

249. Table 6,8 of Annex J illustrates the points discussed above. The estimates given in the table all refer to scenario 1,A; i.e. to a 10% RSA inflation rate, constant exchange rates and full wage compensations. The only difference from the original scenario specification is:

- The introduction of an inflation overhang, i.e. of the lagged effects of previous inflation levels.
- An assumption to the effect that the inflation overhang is taken on board in the first round of wage increases.

The table gives the results of these new model specifications for some alternative values of the inflation overhang.

250. Section A of the table gives the results of a zero overhang. This case is identical to the one covered in the original scenario specification, i.e. the same as when the overhang is ignored. The results are therefore the same as given in table 6,1 (Annex J). They are nevertheless given here for the sake of easy comparison between old and new estimates.

251. Sections B, C and D illustrate the new scenario specifications, with alternative positive inflation overhangs. Comparing the results of these sections to the results of section A, it is

readily seen that they all converge towards the same (final) inflation rate, i.e. to the final inflation rate of the original scenario specification, although at different speed. This confirms the earlier statement to the effect that the inflation overhang will gradually die away, thus ensuring that the final inflation rates are not significantly affected by it. The same is seen to be the case for the various gains. The final results are therefore in general unaffected by the introduction of the inflation overhang, and by the magnitude specified for it.

252. Section B of the table gives the results of a fairly modest overhang of 2.5%. Given that the immediate partial inflation rate is 5.4%, this implies a total inflation rate (prior to any wage increases) of 7.9%, i.e. below the 10% final inflation rate (after various wage increases). This case therefore describes a situation in which inflation will increase over time.

253. Looking at the outcome of the first round of wage increases, it is seen that the resulting inflation rate is 9.0%, considerably higher than the 7.9% of the original scenario specification. This is explained by the fact that the wage increases in question are 7.9% versus 5.4%, the former equalling the latter plus the 2.5% inflation overhang.

254. The extra inflation increase affects the gains earned by various producers negatively. Thus, the competitive gains of the producers of non-traditional tradable products fall from around 2.3% to around 1.0%, while the nominal and real losses of the traditional exporters increase from 1.4% to 1.7% and 8.7% to 9.9% respectively. Further rounds of wage increases bring further inflation increases, until the final equilibrium rate is reached. This again affects the fortunes of the producers negatively.

255. The introduction of a modest 2.5% inflation overhang has therefore resulted in a noticeable reduction in the temporary competitive gains of the non-traditional tradables producers. The immediate gain (before the first round of wage increases) is unaffected by the overhang, but all later gains are reduced to less than half of what they were in the original scenario specification. The profitability losses of the traditional exporters are similarly affected. The temporary respite enjoyed against the full eventual loss is significantly reduced.

256. Section C of the table gives the results of an overhang of 4.6%. Since the immediate partial inflation rate is 5.4%, this implies a total immediate inflation rate of 10.0%, i.e. the same as the 10% final inflation rate. This case therefore describes a situation of a stable level of inflation; total initial and final inflation rates being the same.

257. In this case, the final inflation level is reached already after the first wage increase. The temporary gains earned in the original scenario specification are consequently quickly eroded. All gains, except those earned during the period before the first wage increase, are erased as a result of that wage increase.

258. Section D of the table gives the results of a 6.5% overhang. Given that the immediate partial inflation rate is 5.4%, this implies a total inflation rate of 11.9%, i.e. well above the 10% equilibrium rate. This case therefore describes a situation in which the inflation rate will fall over time.

259. Looking at the outcome of the first round of wage increases, it is seen that the resulting inflation rate is 10.9%, i.e. again higher than the 10.0% final equilibrium rate. Nominal wage rates will therefore have to be reduced somewhat during subsequent wage

negotiations, if the 10.0% rate is to be achieved.[55] If this does not happen, the producers of non-traditional tradables will end up with a competitive loss, instead of the re-establishment of the status quo situation that result if the 10.0% inflation rate is achieved. Thus, if no wage reductions are possible, these producers will end up with a permanent competitive loss of approx. 1.0%.

260. However, even if the wage rate is reduced, these producers will be temporarily disadvantaged. Instead of enjoying temporary competitive gains, they will suffer temporary competitive losses after the initial wage increase. The plight of the traditional exporters are similarly affected; they will suffer temporary *additional* profitability losses until the inflation rate is brought down to 10.0%.

261. The above results refer to scenario 1,A, as extended by the inclusion of an inflationary overhang. The analysis of other scenarios may be extended in the same way. The results of doing so are not given in this paper, but their general nature will conform to those given above. The introduction of a positive inflation overhang will consequently increase the local inflation rate, and effect the various gains earlier recorded negatively, irrespective of the exchange rate changes etc. stipulated.

d. Interpretation of resent events

262. How do the conclusions presented in the various earlier chapters relate to the actual events of recent years? In the following we will try to interpret these events in light of these general conclusions. In doing so, we will:

- Look at the implications for the local competitive gain and inflation effects[56] resulting from the present policy of allowing the Pula to largely follow the Rand, in a situation when the latter has fallen considerably against the $.
- Look at the likely implications of an alternative policy of allowing the Pula to follow the $ instead of the Rand.

Table Cpt6,3 : Some inflation and exchange rate data, 1994-96

Year	GRI% 1)	EXRP% 1)	EXRD% 2)	COL% 1)
1994	8.9%	-1.9%	9.4%	10.6%
1995	10.0%	-1.1%	2.4%	10.5%
1996	7.4%	-1.3%	15.7%	10.1%
Average	*8.8%*	*-1.4%*	*9.2%*	*10.4%*

1) Annual average data, based on table 7,1 of Annex J.
2) Annual average data, based on table G,1 of Annex J.

[55] The results reported in table 6,8 of Annex J are measured relative to the initial (before change) situation. The increase in the wage index can therefore only change from 11.9% towards 10.0% if there is a wage reduction (relative to the level reached after the first round of wage increases). The problem of achieving a reduction in nominal wage rates has been discussed earlier.

[56] The exchange rate does of course not only effect these variables. In the wider context, it also affects the Pula value of any foreign currency liability or asset. The question of which currency to follow therefore has implications over and above what is analysed here.

263. It should be emphasised that the results presented are rough, based on average developments during the period. As such, they may only serve to illustrate the approximate order of magnitude involved.

264. The changes recorded in central inflation and exchange rate variables during the period 1994-96 are set out in table Cpt6,3, where it is indicated that these years have seen RSA inflation rates varying between 10.0% and 7.4% pa, with a direct arithmetic average of 8.8% pa. The corresponding movements in the Rand/Pula exchange rate have been *de*creases in the area of 1.9% to 1.1% pa, with an arithmetic average of 1.4% pa. We will base our analysis on these averages.

265. As seen from table Cpt6,4 a zero EXRP% value, combined with a 10% RSA inflation rate, imply a competitive gain of 5.0%, and a local inflation effect of 5.4%. The partial effect of reducing the EXRP% value from 0% to -1.4% is to increase these results, while the partial effect of reducing the RSA inflation rate from 10% to 8.8% is to decrease them. Adjusting for these partial effects, we find that an RSA inflation rate of 8.8% and an EXRP% value of -1.4%, produces a local inflation effect of 5.6%, and a competitive gain effect of 5.2%.[57]

Table Cpt6,4 : Local inflation and gain effects, for selected combinations of import-inflation and Rand/Pula movements 1)

Change in Rand/Pula rate	RSA inflation rate			
	+10%		+5%	
	B	C	B	C
-5%	8.5%	7.6%	5.7%	5.3%
0%	5.4%	5.0%	2.7%	2.7%
+5%0	2.6%	2.6%	0.0%	0.0%
+10%	0.0%	0.0%	-2.4%	-2.6%

1) The estimates are copied from table Cpt6,2. The estimates of columns B contains the COL inflation rates, and column C the average of home and export market gains.

266. If, alternatively, the Pula had been pegged to the $, the changes in the Rand/Pula rate would have been the same as the changes in the Rand/$ rate;[58] which according to table Cpt6,3 increased by an average of 9.2% pa over the period. Using this value, instead of the actual EXRP% value of -1.4%, we find that the local inflation effect, and the competitive gain effect, are both equal to -0.2% (see table 6,9 of Annex J; section 2,A).

267. We have consequently found that the policy of largely following the Rand during recent years has (*ceteris paribus*) brought measurable benefits to the producers of non-traditional tradable products, at least on a temporary basis, but also significant inflation. The alternative policy of following the $ would have erased both the temporary gains and the inflationary pressure.

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[57] It should be noted that the competitive gain in question is:
- immediate: i.e.: it refers to the situation prior to any wage increases,
- temporary: i.e.: it will eventually be eroded if full wage compensations are granted.
- partial: i.e.: it ignores the effect of the inflation overhang.

[58] The changes in the Rand/Pula rate may be calculated from the equation: EXRP% = {(EXRD% - EXPD%) / (1 + EXPD%)}. If the Pula is pegged to the $, the variable EXPD% is nil, and hence: EXRP% = EXRD%.

268. The above results do not take into account the effects of the inflation overhang. According to table Cpt6,3 the Botswana inflation rate was fairly stable at around 10% pa during the period. This suggests an overhang of some 4-5%. Thus, it is recalled from the above chapter that a stable 10% local inflation rate resulted when the RSA inflation impulse was 10% and the overhang 4.6%.

269. Part 1,A of table 6,9 (Annex J) illustrates the case discussed above, based on the average of actual developments during 1994-96. Part 1,B illustrates the corresponding case with the overhang taken on board. An overhang of 4.8% is *assumed*, making the total (initial) inflationary effect equal to 10.4%, i.e. equal to the inflation average for the period. Comparing the two set of estimates, it is seen that the effect of introducing the overhang is a substantial reduction in the aggregate value of temporary gains enjoyed by the non-traditional producers. The immediate gains, before the first round of wage increases, are the same as before, but all later gains have evaporated. Also the traditional producers suffer a loss of aggregate temporary gains.

270. Section 2 of the table gives the comparable estimates for the alternative case of pegging the Pula to the $. Part A of the section gives the results for the case without any inflation overhang. As already noted above, these results are decidedly less advantageous to the Botswana producers than the results of section 1. Taking the same inflation overhang as above into account, the case grows even worse. The outcome of the first wage increase is competitive and profitability losses, accompanied by a real wage increase. Subsequent reductions in (nominal) wages may over time erase these losses, *if* such reductions are possible. If not, the losses becomes a permanent burden upon the producers.

271. In conclusions, it seems clear that by allowing the Pula to follow the Rand rather than the $, in a situation when the Rand has depreciated significantly against the $, the traditional exporters have reaped substantial nominal benefits.[59] At the same time, the non-traditional producers have been protected against loss of competitive power, earning a certain degree of temporary gains in the process. The policy of following the Rand has however carried a price in the form of increased inflation.

272. The alternative policy of following the $ would have given significantly lower inflation; but it would also have affected the producers negatively. The traditional exporters would not have benefited from devaluation-profits earned on their sales incomes, while the competitive position of other producers (of tradable products) would have been measurably undermined.[60] True, these competitive losses may be only temporary in nature, amounting to the price paid for the eventual benefit of a lower inflation rate. But the price could prove too high for the local industries in question. A significant setback in their fortunes, even if only temporary in nature, may possibly cause them to collapse before the situation returns to normal.

273. In the final analysis, therefore, it all comes down to a question of the financial strength of the local producers. If they are financially strong, Botswana may be able to afford a

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[59] The real value of these gains may possibly be limited, depending on how these incomes are spent.

[60] The "worst case" depicted in table 6,8 of Annex J gives a competitive loss of 2.8%. (See alternative 2,B, and assume nominal wage reductions to be out of the question). A loss of this magnitude may not seem very dramatic. It may nevertheless be substantial to the firms concerned, because such losses will normally translate into *much* larger losses in operating surplus.

significant increase in the Rand/Pula rate. If, on the other hand, the financial stamina of the typical local producer is weak, Botswana can not afford such a luxury.

274. Given that much of Botswana's industries are essentially infant in nature, competing against well entrenched RSA industries, they may not be able to survive a severe setback in their fortunes. In choosing between the alternatives of following the Rand and the $, it therefore seems the safest option to follow the Rand. However, such a choice represents a choice between extremes. Botswana obviously also have the option of following both the Rand and the $ *to some degree*. This is in fact what it officially does, as evidenced by the fact that the Pula is pegged to a *basket* of currencies.

6,5 : Gain targeting

a. *Condition for status quo*

275. In model I we found that Botswana could maintain price parity vis-à-vis the RSA by adjusting the Rand/Pula exchange rate according to the relative difference in the RSA and Botswana inflation rates, following the following formula:

$$(1+ER\%) = (1+R\%) / (1+P\%)$$

where : ER%: the percentage change in the Rand/Pula rate required to maintain price equality in the face of inflation.
: R%: RSA's inflation rate (affecting local sales and exports alike)
: P%: Botswana's inflation rate (affecting local sales and exports alike)

276. Does a similar relationship apply also in model III? The question is addressed in Annex F, where the corresponding formula of model III is shown to be:

$$EXRP = (1 - GAIN\%) * (RI / PI)^{61}$$

where: GAIN% : Botswana's competitive gain
EXRP = (1+ER%) : Rand/Pula exchange rate index
PI = (1+P%) : Average production price index for Botswana tradables
RI = (1+R%) : General RSA inflation index

277. The above formula is seen to resemble the corresponding formula of model I, the only obvious difference being the variable representing the competitive gain. This variable is however zero if we assume, as in model I, that the goal is an unchanged relative price. Given such price-parity we consequently get the following direct parallel to the model I equation:

$$EXRP = RI / PI \quad \text{i.e. } (1+ER\%) = (1+R\%) / (1+P\%).$$

278. There is nevertheless a fundamental difference between the above formula and the corresponding formula of model I. In model I the RSA and Botswana inflation rates were treated as if they were independent of each other, and of the exchange rate. In model III in contrast, the Botswana inflation rate (P%) is derived as a function of both the RSA inflation rate and the exchange rate. This difference has implications for how the formulas might translate into practical actions (as further explained in Annex F).

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[61] This is a simplification of the corresponding formulas of Annex F, which are slightly different for the home market and the export market. As shown in Annex F, however, the difference is marginal in practical terms. It is therefore ignored in the above summary of the main points of the annex.

b. Conditions for given types of gains

279. The above formula gives the conditions for maintaining a competitive status quo situation in the face of price changes. But what if the Botswana authorities want to "secure" a given level of gain, or want to know roughly what kind of gain will result from a given de/revaluation?

280. To answer these questions, we return to the formula:

$$EXRP = (1 - GAIN\%) * (RI / PI)$$

which may be rewritten: $GAIN\% = 1 - \{EXRP / (RI / PI)\}$

The general condition for obtaining a positive, nil or negative competitive gain is therefore:

$$GAIN\% >=< 0$$

if, and only if: $EXRP <=> RI / PI$

i.e. if, and only if: $(1+ER\%) <=> (1+R\%) / (1+P\%)$

281. We will first investigate the *ceteris paribus* conditions for obtaining a given competitive gain, taking into account the exchange rate only. In doing so, we disregard all price movements prior to the de/revaluation. We may do so mathematically by setting the price changes of the above formula to zero, i.e. by assuming, for the purpose of the present analysis, that: $R\% = P\% = 0.0$. Doing so, we get: $GAIN\% >=< 0$

if, and only if: $(1+ER\%) <=> 1$

i.e. if, and only if: $ER\% <=> 0$

282. Hence, we have found the standard textbook results:

- A devaluation of the Pula against the Rand will *ceteris paribus* result in an improved competitive situation ($GAIN\% > 0$ if, and only if $ER\% < 0$).
- A constant Rand/Pula exchange rate will *ceteris paribus* result in a status quo situation ($GAIN\% = 0$ if, and only if $ER\% = 0$).
- A revaluation of the Pula against the Rand will *ceteris paribus* result in a deteriorated competitive situation ($GAIN\% < 0$ if, and only if $ER\% > 0$).

283. The magnitude of the gain is directly proportional to the degree of Pula *de*valuation. For instance, a 5% devaluation produces a 5% competitive gain, while a -5% devaluation (i.e. a 5% revaluation) produces a 5% competitive loss, as seen from the formula:

$$GAIN\% = 1 - \{EXRP / (RI / PI)\} = 1 - \{(1+ER\%) / [(1+0)/(1+0)]\}$$

$$\text{i.e. } GAIN\% = - ER\%$$

284. The above results represents the conditions for gains irrespective of past price changes. We may extend the scope of the analysis by taking into account these price changes, i.e. by studying how Botswana may de/revalue the Pula in response to given price changes, if it wants to secure a certain competitive gain.

285. The above formulas again applies, i.e. the condition for obtaining a positive, nil or negative competitive gain is: $GAIN\% >=< 0$

if, and only if: $EXRP <=> RI / PI$

i.e. if, and only if: $(1+ER\%) <=> (1+R\%) / (1+P\%)$

286. Consequently, if the Botswana authorities wants to secure a positive, nil or negative competitive gain (GAIN%) in the face of given price changes (R% and P%), they may do so by changing the Rand/Pula exchange rate by ER%, where the value of ER% is such that the exchange rate index (EXRP) becomes smaller, equal or larger than the relative difference in the RSA and Botswana inflation rates (RI/PI).

287. The direction of gain changes for various combinations of EXRP and (RI/PI) values is illustrated in table Cpt6,5, while the magnitude of some gains thus secured is illustrated in table Cpt6,6.

Table Cpt6,5 : Direction of competitive gains resulting from various combinations of inflation and exchange rate movements

	RSA inflation rate higher than Bot. inflation rate I.e. RI% > PI% & RI/PI > 1	RSA and Bot. inflation rates equal I.e. RI% = PI% & RI/PI = 1	RSA inflation rate lower than Bot. inflation rate I.e. RI% < PI% & RI/PI < 1
Pula revalued I.e. ER% > o & EXRP > 1	GAIN% > = < 0 if, and only if: EXRP < = > RI/PI	GAIN% < 0	GAIN% < 0
Pula unchanged I.e. ER% = 0 & EXRP = 1	GAIN% > 0	GAIN% = 0	GAIN% < 0
Pula devalued I.e. ER% < 0 & EXRP < 1	GAIN% > 0	GAIN% > 0	GAIN% > = < 0 if, and only if: EXRP < = > RI/PI

Table Cpt6,6 : The magnitude of GAIN% for some combinations of EXRP and (RI/PI)

		RI / PI RSA's inflation rate relative to Botswana's inflation rate				
		1.10	**1.05**	**1.00**	**0.95**	**0.90**
EXRP Pula/Rand exchange rate index	**1.10**	**0.0**	-5%	-10%	-16%	-22%
	1.05	+5%	**0.0**	-5%	-11%	-17%
	1.00	+9%	+5%	**0.0**	-5%	-11%
	0.95	+14%	+10%	+5%	**0.0**	-6%
	0.90	+18%	+14%	+10%	+5%	**0.0**

288. The interpretation of the various cells of table Cpt6,5 is as follows:

i) The immediate outcome of a devaluation of the Pula against the Rand:

a) in excess of the inflation relative,[62] is an increase in the competitive strength of the Botswana producers;

b) equal to the inflation relative, is the maintenance of a status quo situation;

[62] The inflation relative equals the RSA inflation index relative to the Botswana inflation index, i.e. it equals the fraction RI/PI.

c) within the limit of the inflation relative, is a decreased competitive status for the Botswana producers, the degree of devaluation being insufficient to fully offset the detrimental effect of the higher Botswana inflation rate.

ii) Similarly, the immediate outcome of a revaluation of the Pula against the Rand:

a) in excess of the inflation relative, is a decrease in the competitive strength;

b) equal to the inflation relative, is the maintenance of a status quo situation;

c) within the limit of the inflation relative, is an increased competitive status;

iii) Finally, the immediate outcome of keeping the Pula pegged to the Rand is:

a) an improved competitive status, if the inflation relative exceeds unity; i.e. if the RSA inflation rate exceeds the Botswana inflation rate;

b) status quo, if the inflation relative equals unity; i.e. if the inflation rates of RSA and Botswana are equal;

c) a deteriorated competitive status, if the inflation relative is below unity; i.e. if the Botswana inflation rate exceeds the RSA inflation rate.

289. Note that the competitive effects described above are the temporary, short term ones arising immediately after the re/devaluation in question. They do not take into account the effect of subsequent price changes *arising* from the exchange rate change. They are therefore valid only until local prices react to the change in import costs. When that happens, the local price changes will start modifying the above effects. Thus, as already shown in chapter 6,3, the direct import-cost-effects will cut the above estimates roughly in half.

290. Furthermore, they will, as always, be further modified when local wage rates react to inflation. Thus, it is recalled that a devaluation of the Pula will tend to increase the cost of living. If this results in local wage increases, the outcome is accelerated inflation, which will erode the value of the gains initially earned. Similarly, a revaluation of the Pula will *ceteris paribus* make future imports to Botswana comparatively cheaper in Pula terms, and thus reduce future cost of living increases. If these cost savings lead to lower price and wage increases, the result is a lower rate of inflation, which may eventually erode any initial competitive loss.[63]

6,6 : Summary of main conclusions

a. The non-traditional producers

291. The fortunes of the non-traditional producers do not appear to be sensitive to the movements in the Pula/$ exchange rate. The movements in the Rand/Pula rate, on the other hand, appear to be important to them, both directly via their implications for the competitive situation, and indirectly via their implications for local inflation.

i) The direct effect of a Pula devaluation against the Rand, as seen in isolation from all other factors, is an increase in the competitive status of the local producers of

[63] It is recalled from our earlier model analysis that the total erosion of a competitive loss brought by a revaluation will require a nominal wage reduction, something that may be difficult to achieve in practice. The particular case referred to was however one of general deflation. The problem of reducing the nominal wage does not arise if the partial deflationary effect is *superimposed* upon a general inflationary situation.

non-traditional tradable products. Similarly, the effect of a revaluation is a decrease in the competitive status. The magnitude of the gain is proportional to the degree of Pula *de*valuation.

ii) Movements in the Rand/Pula rate will consequently result in positive or negative competitive gains to the non-traditional producers, but they will also result in the introduction of stronger or weaker inflationary signals into the local economy.

iii) The magnitude and durability of the competitive gains depend on how the inflationary signals translate into higher or lower local inflation rates. The latter depends on the typical reaction of the local production factors when faced with price and cost signals, i.e. on the price reaction of local producers to costs increases, on the frequency and outcome of local wage negotiations etc.

iv) The level of local inflation may in itself be an important issue; a high inflation rate is in many respects an undesirable phenomenon.[64] Our concern in this paper is however the inflationary effects upon the competitive gains.

v) If local production factors tend to be fully compensated for inflation, any competitive gain earned through the exchange rate change will eventually be wiped out by subsequent movements in the inflation rate, the quicker the faster the factor prices are inflated.

vi) If, on the other hand, local production factors tend to be only partly compensated for inflation, the subsequent movements in the inflation rate will be smaller, allowing part of the competitive gain earned through the exchange rate change to become permanent.

vii) Consequently, the movements of the Pula exchange rate are important to the non-traditional producers, and especially so if wages and cost increases can be effectively restrained. If this is not the case, the importance is more limited, confined to, on the one hand, the induced inflation effect, and on the other, the temporary competitive gains.

viii) In the latter case, therefore, the movement in the Rand/Pula rate may not appear altogether crucial to the fortunes of the Botswana producers. The competitive gains or losses brought by alternative Rand/Pula scenarios will in all cases be cancelled out over time, while the induced level of inflation, which will be quite different for the various alternatives, will outlive the gain effects themselves.

ix) In the final analysis, however, the degree of importance carried by temporary changes in the competitive situation of the Botswana producers, depends upon the solidity of that situation itself. If the underlying competitive situation is weak, even gains or losses of a temporary nature may be crucially important. The competitive standing may be too weak to weather any temporary weakening, or even so precarious as to require immediate strengthening. In such a situation, a devaluation of the Pula may be required. But it will represent a *short term* measure only; it will not in itself suffice to rectify the situation on a permanent basis.

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[64] It is generally agreed that macro economic instability in the form of a high inflation rate is an undesirable phenomenon. This view is adopted in this paper. It is not, however, possible to demonstrate from the model itself that this is indeed the case. Instead, it has to be accepted as an "act of faith".

x) Finally, notwithstanding the limitations of the present analysis, it should be emphasised that the exchange rate is but one of several measures deciding the future of the Botswana economy. In and by itself it is unlikely to be an effective instrument in promoting economic growth, combating inflation etc. on a sustained basis. Complementary measures, pertaining to monetary, fiscal, trade, wage policy etc., are required for this purpose.

b. *The traditional exporters*

292. The group of traditional export producers are significantly affected by the exchange rate question. The same is true for the Government of Botswana, which receives a substantial share of their profits in tax revenue etc. The fortunes of the traditional exporters are primarily decided by the Pula/$ rate, not by the Rand/Pula rate.[65]

i) Thus, the movements of the Pula/$ rate is of primary importance to this group of producers; the Pula-value of their total sales income depends crucially upon this rate. These producers will *ceteris paribus* earn a higher (nominal) income the more the Pula is devalued against the $.

ii) The movements of the Rand/Pula rate is only of secondary importance to these producers. It is important to the extent that it induces domestic cost inflation affecting their production costs, and thus their operating surplus. It does not affect the value of their sales, which for these producers as a whole *completely overshadows* the production costs. Operating surplus is therefore much more sensitive to changes in sales prices than to changes in costs.

iii) However, this overall conclusion does not reflect an important difference within the group of traditional exporters. The group consists of *one* major producer (Debswana), and several minor producers. The above conclusion reflects the situation for the group as a whole, and for the major producer, but not necessarily for the minor ones. Thus, most of the minor producers tend to operate at, or near, a loss. Even a moderate cost increase may be a serious problem for them, unless offset by increases in their sales income.

7 : Analysis of competitive gain trends

293. In this chapter we shall first calculate rough time series estimates of the competitive gains earned by the Botswana producers. Next, we shall study the variation in these gain estimates against the variation in the underlying inflation and exchange rate variables, and compare the emerging pattern to the main conclusion reached within model III.

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[65] This statement applies for the group of traditional exporters when treated as a whole. In practice, some of the traditional exporters (Botash and BMC) are dependent upon the RSA market, and hence the Rand/Pula rate. These particulars, however, are overshadowed by Debswana's US$-nominated sales.

7,1 : Estimation formula

294. From the inspection of statistical data undertaken in Annex G we know that the quarterly RSA inflation rates differ from the corresponding Botswana rates. Unless offset by comparable exchange rate changes, these differences will, as explained elsewhere, translate into competitive gains or losses to the Botswana producers of tradable products. We will estimate the magnitude of these gains, adopting a simplified version of the gain-formulas found in model III:[66]

295. The adopted formula is: GAIN% = 1.0 - EXRP' * CPI' / WPI' [67]

which alternatively may be written: GAIN% = 1.0 - EPI' / WPI'

or: GAIN% = 1.0 - CPI' / IPI' [68]

where: GAIN% : Percentage competitive gain earned or lost during the period, i.e. relative to the situation in the previous period.

and: EXRP', CPI', WPI' etc. are all relative index values, representing present period's index value over last period's index value.

i.e.: EXRP' : Rand/Pula exchange rate during current period, divided by the same during the previous period; i.e. $EXRP' = EXRP_t / EXRP_{t-1}$.

CPI' : Botswana Consumer Price Index during current period, divided by the same during the previous period; i.e. $CPI' = CPI_t / CPI_{t-1}$.

WPI' : RSA Wholesale Price Index during current period, divided by the same during the previous period; i.e. $WPI' = WPI_t / WPI_{t-1}$.

EPI' : Botswana Export Price Index during current period, divided by the same during the previous period. Note that EPI' refers to prices measured in Rand, and is calculated as: EPI' = CPI' * EXRP'.[69]

IPI' : Botswana Import Price Index during current period, divided by the same during the previous period. Note that IPI' refers to prices measured in Pula, and is calculated as: IPI' = WPI' / EXRP'.

7,2 : Estimates

296. Table 7,1 of Annex J summarises the data pertaining to the current effort. The estimates of the GAIN% variable are given in column 9 of the table. The gains are seen to be mostly modest in magnitude, unless a significant exchange rate change is recorded for the period in question. This reflects our previous observations that the RSA and Botswana inflation

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[66] Note that all gain estimates thus calculated are rough illustrations of magnitude at best, based on data the nature and limitations of which are discussed in Annex G. For instance, the below formula ideally requires price indices referring to Botswana's imports and sale of tradable products. Such indices are not available; we instead have to rely on the RSA Wholesale Price Index and the Botswana Consumer Price Index. The resulting estimates should therefore not be taken at face value, but merely as indications of possible levels and movements in the competitive gains.

[67] This equation, which is a simplified version of the BCGHM% and BCGEX% equations described in Annex F, corresponds to the parallel equation of chapter 6,5.

[68] GAIN% may also be expressed in terms of movements in the real exchange rate, which is often used to illustrating the change in the country's competitive situation. The link between the GAIN% and the real exchange rate is set out in Annex I.

[69] Note also that the CPI may be a poor base for an export price index. It refers to local consumption, the composition of which will be quite different from the composition of exports.

rates, although not identical, tend to be fairly close to each other. The gains are also seen to oscillate; periods of net gains are followed by periods of net losses, and vice versa, indicating that gains and losses tend not to be sustained for any greater length of time.

297. Column 5 of table 7,1 gives the corresponding percentage increases in the Rand/Pula exchange rate. Comparing these exchange rate changes to the percentage gains we find that the two tend to move together, but in opposite directions. This is intuitively plausible; an increase in the Rand/Pula exchange rate, i.e. a revaluation of the Pula against the Rand, should *ceteris paribus* imply a competitive loss to the Botswana producers, by making RSA products less expensive for Botswana consumers, and Botswana products more expensive for RSA consumers.

298. A regression analysis of the co-movement of these two variables yields an R^2 value of 0.73;[70] i.e. a fairly high degree of correlation is indicated. It may be tempting to see this as conclusive evidence that de- and revaluations do work, i.e. that they tend to result in inflation rate differences, which in turn result in competitive gains or losses. Extreme caution should however be exercised in interpreting this coefficient. A high degree of correlation is only to be expected, given that the gains are not independently observed, but estimated *inter alia* from the exchange rate data.[71]

299. Furthermore, these gain estimates represent the immediate de/revaluation effects only, corresponding to the gains found under wage round: 0 of the model simulations. We recall from these simulations that the initial gains may eventually be lost as local production factors seek compensation for increased import costs. What, then, are the long term effects implied by the present estimates?

300. To study this aspect further, we may turn to column 10 of table 7,1, which illustrates the cumulative effects of the quarterly gains. These data show that gains and losses largely balanced out during the early 1980s. There was a worsening of the competitive situation during the middle of the decade, but this proved a temporary phenomenon; the competitive situation improved again throughout the later part of the 1980s. In the first three years of the 1990s the competitive situation deteriorated fairly sharply. The last four years have seen a stabilisation of the competitive situation, but at an unprecedented low level, and without any obvious sign of a recovery. On the whole, therefore, gains and losses largely balanced out during the 1980s, while considerable competitive power was lost during the 1990s.

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[70] The interpretation of R^2 is explained in Annex G.

[71] It is recalled from above that the gains are calculated as a product of exchange and inflation rate data. If the latter are directly related, for instance because the exchange rate is a *direct* function of the RSA inflation rate, and the Botswana inflation rate a *direct* function of both, it would be inappropriate to invest the correlation between gain and exchange rate estimates with any explanatory significance. Such a correlation would only express the obvious, i.e. that the transformed version of a variable is correlated with the variable itself. If so, however, we implicitly assume that the Botswana authorities passively reacts to RSA inflation rates, and that the Botswana inflation rate automatically follows suite, with no scope for independent action or influence on Botswana's part. If we refrain from such a strong assumption, allowing Botswana independence both of action and influence, there is a degree of independence also between gain and exchange rate estimates, allowing us to regard them as separate entities, although no more than barely so.

7,3 : Trend analysis

301. We will try to explain the above described gain trend in terms of the underlying trends in the determining variables, i.e. in terms of the Rand/Pula exchange rate and the inflation rates of Botswana and RSA. In doing so we will look at the parallel movements in all these variables *between* and *within* selected periods. Table 7,2 of Annex J summarises the relevant data.

a. The 1980s

302. The early 1980s (1980-83) did on the whole see a fairly stable nominal exchange rate, and an equally stable competitive situation. The exchange rate index increased on average by 0.1% pa within the period, while the competitive gain index increased by 0.3% pa. In other words, an insignificant revaluation of the Pula against the Rand coincided with a small improvement in the competitive standing of the Botswana producers. Investigating the underlying inflation factors behind this small improvement, it is evident that the RSA inflation rate (WPI) and the Botswana inflation rate for imports (IPI) moved in step during the period, the former by 12.0% pa and the latter by 12.1% pa. This should come as no surprise, the IPI being a direct function of the WPI and the exchange rate. More to the point is the fact that also the Botswana overall inflation rate (CPI) kept largely in step with them. Nevertheless, at 11.5% pa, the CPI increase was slightly below the IPI increase, with the result that the competitive index improved as described above.

303. Comparing these data to the model simulations, it is seen that they would correspond to a scenario with an almost stable Rand/Pula exchange rate, and nearly full wage and profit compensations for import inflation. This particular scenario is not analysed, but it comes very close to the scenario of a constant Rand/Pula exchange rate and full wage and profit compensations. It is recalled that under these conditions, the CPI would eventually copy the WPI, with the result that no permanent competitive gains or losses ensued. The experience of the early 1980s therefore corresponds fairly well to the model results.

304. The middle 1980s (1984-86) saw fairly substantial devaluations of the Rand against major foreign currencies. As a result, the Pula was effectively revalued against the Rand. Despite occasional devaluations of the Pula, the average Rand/Pula exchange rate of the mid-1980s was 13.7% above the corresponding rate of the early 1980s, amounting to an average increase of 3.7 % pa. The competitive situation of the Botswana producers at the same time deteriorated significantly. The average gain-index for the mid-1980s dropped by 7.3% compared to the corresponding value for early 1980s, corresponding to an average 2.2% pa decrease.

305. As earlier explained, the immediate effect of a revaluation tend to be a competitive loss. The above loss is therefore in agreement with the immediate revaluation effects. It also seems to be in keeping with the short term effects of a revaluation indicated by the model, but not with the long term effect. Thus, it is recalled that the model simulations suggest that the initial competitive loss will eventually be erased, provided that wage and profit compensations are exactly 100%.

306. However, we are here faced with a situation of *more* than 100% compensation. Investigating the underlying factors behind the loss of competitive strength, it is seen that the IPI

fell significantly behind the WPI, as dictated by the revaluations, while the CPI outstripped the IPI. The average CPI for the period increased by 38.5% (9.7% pa) over the previous period, versus 31.3% (8.1% pa) for the IPI, and 49.7% (12.2% pa) for the WPI. Hence, domestic inflation factors *more* than copied the IPI increases, i.e. local production factors were more than 100% compensated for increased import costs.

Table Cpt7,1 : Summary data for the 1980s 1)

	Average index level	Change *between* periods % (total)	% pa	Change *within* period, % pa
Rand/Pula Exchange Rate Index				
1980-83	0.99	NA	NA	0.1%
1984-86	1.13	13.7%	3.7%	5.4%
1987-89	1.21	6.9%	2.3%	4.1%
South African Wholesale Index (WPI)				
1980-83	1.30	NA	NA	12.0%
1984-86	1.94	49.7%	12.2%	15.3%
1987-89	2.99	54.1%	15.5%	13.9%
Botswana Import Price Index (IPI)				
1980-83	1.31	NA	NA	12.1%
1984-86	1.71	31.3%	8.1%	10.3%
1987-89	2.47	44.1%	12.9%	9.5%
Botswana Consumer Price Index (CPI)				
1980-83	1.28	NA	NA	11.5%
1984-86	1.77	38.5%	9.7%	9.1%
1987-89	2.33	31.5%	9.5%	9.9%
Botswana Competitive Gain Index				
1980-83	1.01	NA	NA	0.3%
1984-86	0.94	-7.3%	-2.2%	0.2%
1987-89	1.02	8.5%	2.7%	-0.5%

1) Source: Table 7,2 of Annex J. The definition of *between* and *within* period growth rates are given in table 7,2.

307. The revaluations did consequently to some extent fail to contain domestic inflation, because local production factors over-compensated for the prevailing rate of import inflation. The degree of over-compensation was not so large as to render the revaluations completely ineffective in terms of keeping the Botswana inflation rate below the RSA rate, but it did not succeed in reducing the Botswana inflation rate *enough* to counterbalance the exchange rate effect. The price of local products therefore increased faster than the corresponding import price, (and the export price, when converted to Rand, increase faster than the corresponding RSA home market prices). The partial success in reducing the local inflation rate therefore carried a price in terms of reduced competitive strength of local producers.

308. The fact that the domestic factors over-compensated for prevailing IPI increases may possibly be due to the dynamic nature of the inflation phenomenon. If we look at the average inflation rates *within* the periods in question, we find that the early 1980s was a period of rather high inflation. Thus, the typical inflation rate during the early 1980s was 11.5% pa, but it dropped to 9.1% during the middle 1980s. The revaluations of the mid-1980s consequently may have succeeded in bringing the Botswana inflation rate down, but not

immediately. If this was indeed the case, it may serve as a warning that the curtailment of an entrenched inflation trend is not achieved overnight. The inflationary process may have built-in lag-structures ensuring that it keeps on moving under its own impetus for quite some time.

309. Although the model is static in nature, the existence of such lag-structures is in accordance with the previously presented simulation results, in so far as these may be represented by the wage compensation *rounds*. It is recalled that the full effect of inflation induced local wage compensations is only felt after several rounds of compensations. If we assume that wage compensations are typically granted once a year, the model simulations consequently demonstrate that it may take quite a few years for this processes to work itself out completely. However, it is also recalled that the larger bulk of these effects tend to be felt fairly quickly. The relatively high CPI rate recorded for the mid-1980s can therefore hardly be the result of inflation-overhang from the previous period alone.

310. Inspecting the quarterly data for the period it is seen that both the CPI and the exchange rate varied greatly and abruptly during the period. On the whole, the mid-1980s was a period of unusually high CPI instability, and unprecedented exchange rate instability. Large revaluations were followed by large devaluations, closely followed by new revaluations, and so on. Possibly, the mere experience of such instability did in itself cause inflationary pressure, as producers, unsure of the direction of future price and exchange rate movements, sought to protect themselves against coming eventualities.

311. The last part of the 1980s (1987-89) saw further revaluations of the Pula against the Rand, although relatively smaller than in the previous period. Looking at the changes from the previous period, it is seen that the average Rand/Pula exchange rate of the period was 6.9% above the corresponding rate in the previous period, amounting to an average increase of 2.3 % pa. Contrary to the experience of the previous period, and to the typical short term revaluation effect, the competitive situation of the Botswana producers this time responded by improving significantly. The average gain-index for the period rose by 8.5% compared to the previous period, corresponding to an average 2.7% pa gain.

312. Investigating the underlying factors it is seen that the CPI this time fell significantly behind the IPI, while the latter fell significantly behind the WPI in response to the revaluations. Thus, the average CPI for the period increased by 31.5% (9.5% pa) over the previous period, versus 44.1% (12.9% pa) for the IPI, and 54.1% (15.5% pa) for the WPI. Hence, the domestic inflation factors this time *less* than copied the IPI increases. This corresponds to a situation of less than 100% wage and profit compensations as described in model III.

313. The fact that the domestic factors under-compensated for prevailing IPI increases may again possibly be due to the long-term dynamic nature of the inflation phenomenon. If we look at the average inflation rates *within* the periods in question, we find that the typical inflation rate during the mid-1980s was 9.1% pa, and 9.9% during the late 1980s. The relatively lower inflation rate of the mid-1980s consequently may have dampened the corresponding rate of the late 1980s somewhat, but not by much. It is also possible that the Botswana producers might have felt restrained by their somewhat weaker competitive position during the preceding years, and decided to hold back further price increases.

314. On the whole, however, these suggestions do not amount to a satisfactory explanation of the events of the late 1980s. These years are known to have seen the start of an economic

boom in Botswana, with especially construction costs growing rapidly. Construction prices do not, of course, affect the CPI rate directly, but the underlying demand pressure revealed by these price increases will normally tend to show up also in the CPI.

315. Why did this not happen to a larger extent in the late 1980s? The answer to this question is not obvious, but the fact that Botswana's capacity to import is unrestricted by any balance of payment problem is probably an important factor. Unlike in many other developing countries, general demand increases (in respect of tradable products) therefore have two effective outlets: local products *and* imports. Local producers, if faced with a sudden burst of demand, is likely eventually to experience supply constraints. When this happens, further demand will largely result in price increases. Similar supply constraints, and price effects, are not likely to arise for imports. Imports may therefore serve as a "safety valve" against the serious inflation effects often associated with demand pressure; some of this pressure may result in increased imports rather than increased inflation.

316. This is apparently what may have happened. Thus, inspecting table 8,3 (Annex J), our estimates of imports at constant prices indicate annual growth-rates of 13% to 21% for the years 1987/88 to 1989/90; rates which are much higher than for any other period covered in the table. However, the table also indicates that domestic production of manufactured goods grew extremely fast during these years, implying that local manufacturers were able to respond efficiently to increased demand. The factors behind these developments, and the relatively low CPI increase, during this period deserve further investigation.[72]

b. The 1990s

317. The year 1990 was a period of transition from re- to devaluations. The Pula was at first significantly revalued against the Rand; the Rand/Pula exchange rate reached its maximum value in the third quarter of 1990. Thereafter, a significant devaluation of the Pula followed. This was however insufficient to bring the average 1990 exchange rate anywhere near the average of the previous period; the former ended up being 10.8% (5.3% pa) higher than the latter. This was accompanied by a 6.1% (3.1% pa) fall in the competitive index, caused by a 22.7% (10.8% pa) increase in the average CPI over the previous period, versus a corresponding increase of 15.7% (7.6% pa) for the IPI, and 27.9% (13.1% pa) for the WPI. Essentially, Botswana faced a repetition of the earlier events of the mid-1980s.

318. The period 1991-92 saw further devaluations of the Pula against the Rand. The average Rand/Pula exchange rate of the period was 2.7% below the average 1990 rate, corresponding to an average decrease of 1.8 % pa. Although the immediate effect of a devaluation tend to be a competitive gain, the competitive situation of the Botswana producers did not improve in response to these devaluations. Instead it worsened slightly; the average gain-index for the period dropped by 0.5% (0.3% pa) compared to 1990. Investigating the underlying factors it is seen that the IPI outstripped the WPI, as dictated by the revaluations, while the CPI largely followed the IPI. The average CPI for the period increased by 20.8% (13.4%

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[72] The possibility that our estimates are misleading should not be ruled out. Thus, as noted in table 8,3 of annex J, the GDP data before and after 1988/89 may not be directly comparable, and some of them do look rather strange. It is also recalled that although we rely on the CPI, it is far from ideal for our current purpose. It refers to consumption products, both traded and non-traded. It is therefore possible that the CPI may seriously under-report the extent of price increase on tradable products during the period, for instance because important administered prices like rents were kept "artificially" low.

pa) over the previous period, versus 20.3% (13.1% pa) for the IPI, and 17.1% (11.1% pa) for the WPI.

Table Cpt7,2 : Summary data for the 1990s 1)

	Average index level	Change *between* periods % (total)	% pa	Change *within* period, % pa
Rand/Pula Exchange Rate Index				
1990	1.34	10.8%	5.3%	1.2%
1991-92	1.30	-2.7%	-1.8%	-0.6%
1993-96	1.27	-2.3%	-0.8%	-1.1%
South African Wholesale Index (WPI)				
1990	3.83	27.9%	13.1%	13.1%
1991-92	4.48	17.1%	11.1%	9.4%
1993-96	5.72	27.7%	8.5%	8.6%
Botswana Import Price Index (IPI)				
1990	2.86	15.7%	7.6%	12.1%
1991-92	3.44	20.3%	13.1%	10.2%
1993-96	4.50	30.8%	9.4%	9.8%
Botswana Consumer Price Index (CPI)				
1990	2.86	22.7%	10.8%	12.0%
1991-92	3.46	20.8%	13.4%	14.6%
1993-96	4.96	73.5%	12.8%	10.8%
Botswana Competitive Gain Index				
1990	0.95	-6.1%	-3.1%	-0.3%
1991-92	0.95	-0.5%	-0.3%	-4.0%
1993-96	0.86	-9.4%	-3.3%	-1.0%

1) Source: Table 7,2 of Annex J. The definition of *between* and *within* period growth rates are given in table 7,2.

319. Looking at the events *within* the 1991-92 period, the competitive index is seen to have fallen significantly, on average by 4.0% pa. This reflects the movements in the CPI and the IPI. The average CPI inflation rate within the 1991-92 period was exceptionally high at 14.6% pa, considerably in excess of the corresponding IPI rate of 10.2% pa. Local production factors consequently reaped an extraordinarily high degree of over-compensation as compared to the import cost increase faced. This can hardly be explained in terms of a devaluation effect. Neither can it be explained in terms of an inflation overhang from previous periods, the internal inflation rate of 1991-92 being considerably higher than that of the preceding years. Possibly, we are here faced with the after-effects of an over-heated boom economy. Increased food prices due to draught, and substantial increases in government imposed user charges, are also possible explanations.

320. The later part of the 1990s (1993-96) saw further devaluations of the Pula against the Rand, although relatively smaller than in the previous period. The average Rand/Pula exchange rate was 2.3% below the corresponding rate in the mid-1980s, amounting to an average decrease of 0.8 % pa. The competitive power of the Botswana producers again weakened significantly. The average gain index was 9.4% below the average for the previous period, corresponding to an average 3.3% pa loss. Investigating the underlying factors it is seen that the CPI this time significantly outstripped the IPI, while the latter was somewhat higher than

the WPI in response to the revaluations. Thus, the average CPI for the period increased by 43.5% (12.8% pa) over the previous period, versus 30.8% (9.4% pa) for the IPI, and 27.7% (8.5% pa) for the WPI.

321. Looking at the events *within* the 1993-96 period, the period is seen to have brought a return to more normal rates of inflation, following the exceptionally high inflation rates experienced during the early 1990s. The typical rate during 1993-96 was 10.8% pa, down from 14.6% pa during 1991-92. The gain index was relatively stable during 1993-96; the typical rate of change during the period was only -1.0% pa, versus -4.0% pa for 1991-92. The dramatic 9.4% reduction recorded in the average index level over the previous period was consequently mainly caused by the rapid decreases during the years 1991-92.

c. *Summing up*

322. Summing up the events of the 1980s it seems clear that the decade saw a relatively stable competitive situation, despite a temporary decline around the mid-1980s. On the whole, the decade also saw a fairly steady revaluation trend in the Pula against the Rand. The degree of revaluation was strongest during the middle of the decade, coinciding with the temporary loss of competitive power. It therefore seems that in the short term these revaluations did depress the competitive standing of the Botswana producers, but in the longer term perspective the negative effect was cancelled out because Botswana's inflation rate was lower than RSA's. If we accept that this was caused by the revaluations of the Pula against the Rand, we have a situation largely as described in model III; i.e. a situation in which a revaluation tend to bring initial competitive losses, which in the longer term perspective are cancelled out by a reduction in the inflation rate.[73]

323. Summing up the events of the 1990s it seems clear that the period, on the whole, saw a significant deterioration in the competitive situation. The period was also one of Pula devaluations against the Rand. The outcome of these devaluations seems to have been increased local inflation, especially during the first few years, which saw the larger devaluations. During these first few years, inflation completely outstripped the potential competitive advantages of the devaluations, thus depressing the competitive index. If interpreted in terms of our previous model results, this describes a situation with wage and profit over-compensation.

324. However, the events of the period 1990-92 may not have been representative for our present purpose. The exceptionally high CPI rates experienced during the period were probably caused by factors associated with an over-heated boom economy, persistent draught and huge increases in government imposed user charges, rather than by exchange rate movements as such. If we exclude the 1990-92 period from our analysis, we find that Botswana did on the whole devalue the Pula fairly slowly and steadily against the Rand up to 1996, and that the result was a fairly stable competitive situation. This result corresponds to the conclusions reached within model III, for cases of exact wage and profit compensation.

325. Consequently, the available data suggest that the end-effects of the gradual revaluation policy followed in the 1980s, and the gradual devaluation policy followed in the 1990s, were

[73] This result refers to the situation of full wage and profit compensation. It is recalled from our earlier model analysis that this implies a reduction in nominal wages and operating surpluses under conditions of general deflation, and that this may be difficult to achieve in practice. In the present case, however, we are not dealing with a general deflationary situation, but a partial deflationary effect in a general inflationary situation. The problem of reducing nominal wages etc. therefore does not apply to the present case.

largely the same in terms of the competitive gains. Both resulted in a fairly unchanged competitive situation. The big difference between the outcome of these alternatives concerns the inflation rate. In the 1980s the average Botswana inflation rate was significantly below the RSA rate (10.5% pa versus 13.9% pa), while the opposite has been the case in the 1990s (10.8% pa versus 8.6% pa).[74] These conclusions are in accord with the central results of model III.

7,4 : Summary of conclusions

326. Due restraint should be exercised in drawing conclusions from the above discussion. The data used are undoubtedly open to challenge. The gains estimates are not observed, but calculated as functions of basic inflation and exchange rate data. The inflation data themselves are far from ideal for our purpose, and some of them may even be unrepresentative for our present purpose because they cover a period of economic "boom and bust". Neither is the causal link between exchange and inflation rates necessarily as simple as describe. Hence, we have implicitly argued that exchange rate movements cause inflationary effects, which is undoubtedly true, but we have ignored the possibility that inflation may indirectly cause the authorities to make exchange rate changes, i.e. that the relationship between the two may to some extent be circular in nature.

327. However, looking at the overall picture implied by these data, it appears that:

i) The competitive situation of the Botswana producers, despite occasional ups and downs, was on the whole fairly unchanged throughout the 1980s, when the Pula was gradually revalued against the Rand.

ii) The competitive situation of the Botswana producers deteriorated significantly in the 1990s, when this process was reversed, and most notably so in the early 1990s when the degree of revaluation was strongest. The data for the early 1990s may however be seriously distorted as regards our current purpose. Excluding these years, the rest of the 1990s saw fairly marginal devaluations, and a fairly stable competitive situation.

328. Looking at the picture in more detail, our tentative conclusions may therefore be:

i) The gradual revaluations of the Pula during the 1980s did not in the longer term perspective hurt the overall competitive standing of the Botswana producers.

ii) Looking at the experience of the 1980s in even further detail, it seems clear that the larger of these revaluations, undertaken during the mid-1980s, did result in temporary loss of competitive power, but also that subsequent periods of more modest revaluations brought the situation "back to normal".

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[74] These rates refer to the period 1992,IV to 1996,IV. If we extend the start of the period further into the early 1990s, we get larger differences. Thus, the rates for some alternative periods are:

	1989,IV - 1996,IV	1990,IV - 1996,IV	1991,IV - 1996,IV
RSA (WPI)	9.4% pa	8.9% pa	8.5% pa
Botswana (CPI)	12.0% pa	12.0% pa	12.0% pa

iii) The revaluation effect upon the local inflation rate is likely to have been an underlying factor behind this achievement. The revaluations seem on the whole to have been quite successful in containing local inflationary pressures.

iv) The gradual devaluations of the 1990s, in contrast, may at first glance appear to have been equally instrumental in fuelling local inflation, thus hurting the competitive standing of the Botswana producers.

v) Looking at the experience of 1990s in further details, however, it is clear that the most severe inflationary pressure and loss of competitive power occurred during the early 1990s. These developments coincided with relatively substantial devaluations, and the latter may well have been instrumental in causing the former. However, it seems highly improbable that the devaluations were solely or mainly responsible. In all probability, the unusually high inflation rate experienced during the early 1990s was largely caused by other inflation driving factors.

vi) It is not clear if the devaluations of the early 1990s were *partially* successful in reducing the competitive losses that may have resulted from these other inflation-driving factors. It seems evident, however, that they, *in total*, failed to remedy the rapidly deteriorating competitive situation of the Botswana producers, caused by the high inflation rate.

vii) The subsequent smaller devaluations during the last few years appear to have stabilised the situation, but not to have brought any measurable improvements in the competitive standing of the Botswana producers. There appears to be no sign of a recovery towards earlier levels of competitive power.

viii) If the basic aim of the small devaluations made in recent years has been defensive, intending *merely* to stabilise the situation after the setbacks of the early 1990s, it consequently appears to have succeeded. If, however, the aim has been more offensive, trying to improve the competitive power of local producers, in order to accelerate the country's export-led economic growth, it appears to have failed.

8 : Analysis of trade statistics

8,1 : Introduction

329. Above we have analysed the developments in the competitive strength of the Botswana producers during the period 1980-96. These developments ought to have affected the fortunes of the Botswana producers of tradables. Other things being equal, a strengthening of the competitive position of the Botswana producers should result in increased market shares in both foreign and local markets, i.e. in growth of exports and import substitution. A weakening of the competitive position of the Botswana producers, on the other hand, should result in loss of exports and home market shares. But what do the export and import data show? Do they support our conclusions? In the following we shall briefly investigate this question.

330. Before doing so, however, it is recalled that the competitive index was calculated as a function of inflation and exchange rate movements alone. These are of course not the only factors affecting production and exports; other factors are also at play. The implication of this is for instance that exports may occasionally seem to respond to changes in the competitive situation in unexpected ways. Should this happen, a simple data analysis will indicate no relationship between the competitive situation and the export growth, or even a negative one, although the result is in reality caused by factors not included in the analysis.

331. Furthermore, it is recalled that our competitive gain estimates are economy-wide, illustrating average market conditions. The specific circumstances of individual firms may differ from these broad averages. This would not have mattered too much if we were dealing with large numbers of firms, and huge volumes of trade. Individual characteristics would then tend to balance each other out, with the result that they would all "disappear in the greater mass".

332. This, however, is hardly the case for Botswana's non-traditional exports. Thus, it is recalled that the total volume of such exports is relatively small. As such it has not reached the critical mass required to be largely unaffected by special events and conditions applicable to certain firms or branches.

333. The relatively small amount of non-traditional exports reflects *inter alia* Botswana's limited production of such products. As seen in this perspective, Botswana's small non-traditional export volume merely reflects the fact that the country has but little to export, its total production of such products being limited. But, if so, the problem of critical mass may equally apply to the total production of tradable products, as well as to their home market use.

334. The above description was especially true for the early 1980s. Local production of tradables has grown considerably since then. It seems doubtful, however, that exchange rate policies may have played the major role in these events. They are more likely to reflect upon the special industrial policies etc., aimed at promoting the growth of local industries, that have been put in place over the years.

335. This is not to deny that factors such as the exchange rate and the competitive situation may affect the fate of domestic producers, only to suggest that they may, on the whole, have had no more than a supporting role, other factors having been equally or more important. In other words, the exchange rate *per se* is unlikely to have carried the industrialisation or exports promotion process; its function has been to support (or hamper) the general efforts being made towards these ends. All told, we should therefore be cautious in drawing conclusions about the effects of exchange rate changes and competitive gains from the available data on exports, imports and local production.

8,2 : Non-traditional exports

336. Table 8,1 of Annex J illustrates the growth of Botswana's non-traditional export of goods. The price-deflated value of these exports appear to have grown considerably and consistently over the period 1980-95. Thus, the growth rates are nearly all positive, although their magnitude have varied considerable from year to years. Growth has consequently

occurred by leaps and bounds. This is not surprising given their relatively small overall magnitude. The introduction of one or two new export articles or firms into such an aggregate may make a substantial impact.

337. The year 1986, and the period 1993-95, had especially high growth rates with respect to total exports. The growth record of the latter period was the best ever recorded in table 8,1. These results appear to be in stark contrast to our earlier analysis, which indicated that the competitive power of the Botswana producers was somewhat depressed during the mid-1980s, and at a record low level during the 1990s.

338. Due care should however be exercised in interpreting these data. It is recalled that our estimates of competitive power relate to Botswana's position vis-à-vis the RSA *only*. This measure is not entirely relevant to the developments of non-traditional exports in the 1980s. Textiles are seen to constitute a large part of these exports. These were typically exported to Zimbabwe, until this export market abruptly collapsed in 1991/92 due to Zimbabwe's internal economic problems. To properly analyse the development of these exports, we ought therefore to take into account Botswana's competitive position vis-à-vis Zimbabwe; i.e. to take into account the Pula/Zim$ rate and the Botswana versus Zimbabwe inflation rate. This, however, is outside the scope of the present study.

339. Inspecting the sub-group data it is seen that the high growth rate of 1986 was to a significant degree due to the partially recovery of textile exports, which had suffered a temporary setback in 1985. The bulk of the growth nevertheless occurred in other products, the identity of which does not appear in our data. These products experienced a growth spurt around the mid-1980s. The value of these exports roughly doubled from 1984 to 1987, but the growth process then ran out steam, and eventually collapsed.

340. The high growth recorded for the period 1993-95 is easily explained. It was entirely due to the introduction of a single new export product: vehicles. The impressive growth record for this period was in fact caused by a single event, the establishment of a vehicle assembly plant by a major foreign car manufacturer. The choice of Botswana as the location for this activity presumably had more to do with special incentives and general economic environment than with inflation and exchange rate movements as such.

341. The performance of non-vehicle exports has on the whole been rather dismal during later years. Textile exports suffered a severe setback in 1999/92, due to the above mentioned collapse of the Zimbabwe market. In the last few years these exports have started to recover, largely due to exports to the RSA, but according to the price-deflated data of table 8,1 (Annex J) their 1995-volume was still some 25% below the peak level reached in 1990.

342. Exports of other products have suffered less dramatic developments, but their trend during the 1990s has been negative. This is in stark contrast to their earlier growth record. Thus, total real term exports of these goods almost trebled during the period 1980-90, but around 1990 the growth trend broke. Export volumes then started to slide back, and by 1995 they had dropped more than 20% compared to 1990. The reasons behind this development is not clear.[75]

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[75] One obvious possibility is that our constant price estimate are unrepresentative, because the CPI based deflator employed in table 8,1 (Annex J) may tend to distort the picture with respect to these exports. Furthermore, given that we are dealing with fairly small export volumes, it seems likely that relatively few exporters and products are involved. It is therefore possible that these developments reflect firm level or market seg-

8,3 : Local market shares

343. Local products compete against imports in the Botswana market. In order to analyse how the former have fared compared to the latter, we need data of both imported and local supplies to the Botswana market. Data on imports are readily available, but data on local supplies are not. In fact, with the exception of the infrequently published SAM matrices, we are faced with an almost complete lack of data covering the value of locally produced goods and services.[76]

344. Table 8,3 of Annex J nevertheless provides a tentative illustration of supplies to the Botswana market, based on rough and indirect estimates of the domestic supply of tradable goods. The estimates in question are based on GDP data published by the CSO. The GDP estimates for manufacturing are converted to corresponding Gross Output (GO) estimates, using GO/GDP ratios based on the available SAM-matrices. The GO values thus estimated represent the total marketed value of all products emanating from the manufacturing sector, whether exported or sold locally. Estimates of local sales are therefore obtained by deducting exports from GO.

345. The current price data of table 8,3 are calculated as described above. The table also provides the corresponding constant price data, illustrating the parallel volume developments. These are in principle calculated in the same way as the current priced ones, but with one additional complication. This concerns the import and export data, which are only available in current prices. They consequently have to be deflated to constant price value, using appropriate price indices. No indices are available representing these imports and exports prices as such; instead we have to make do with whatever "close" alternatives are at hand.[77]

346. This being the case, the deflated estimates are in general less reliable than the current priced ones, which themselves are very rough.[78] At best the estimates of table 8,3 may therefore serve as crude illustrations of general trends.

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ment specifics more than general economy-wide conditions. It is also possible that they reflect on the economic troubles of neighbouring countries (as exemplified by the 1991/92 collapse of the Zimbabwe market), drought conditions or similar. It is even possible that exports got crowded out by local demand from the government and/or private sector. These, however, are mere suggestions; further analysis is required into these matters.

[76] The CSO publishes time series estimates of Gross Domestic Product (GDP), but not of the corresponding Gross Output (GO), which represents the marketed value of goods and services produced.

[77] The South African Wholesale Price Index (WPI) has, as before, been used to deflate imports, while the GDP price deflator for manufacturing is the obvious choice for deflating exports of manufactured goods.

[78] It will be evident that our estimates of tradable goods supplied to the local market are based on rather rough estimates of GO, minus certain broad groups of exports, plus total imports of goods. The GO estimates themselves are based on *guestimate* GO/GDP ratios, applied to *total* GDP for manufacturing, and for manufacturing only. In the case of the constant price estimates, exports and imports are deflated by less than ideal price index. Given some efforts, better estimates of tradable supplies to the home market might therefore be possibly to develop, for instance by:

- breaking the highly aggregated GDP totals into finer sector subgroups ;
- defining the tradable goods more accurately in terms of such sector subgroups;
- harmonising export and import estimates with the derived sector definitions;
- finding better estimates of the GO/GDP ratios, and more representative price deflators.

347. Such as they are, however, they all point in the same direction; the local product share of total supplies (to the Botswana's market) has increased substantially since the early 1980s, reflecting the underlying growth in the total national production of tradable goods. This is no more than ought to be expected, given that the local market share was only 9-10% at the time, and that definite efforts to foster local industry have since been made.

348. These developments, however, did not start until the mid-1980s; the early 1980s saw a falling local market share. Looking at the constant price estimates, it appears that this fall was caused by a reduction in local production, combined with a slight increase in imports and total demand. It consequently seems that Botswana's total demand for goods increased in response to the general growth of the economy, but this did not benefit local industry, which lacked the capacity or ability to respond to the market signals. This problem was overcome by the middle of the decade. After 1985/86 local industry started increasing its volume of production rapidly, possibly in response to government efforts to promote local industry.[79] Total demand for goods also increased rapidly, especially during the later years of the period, which saw the rise of a local economic boom, but the growth in local industry was sufficient to ensure a rapidly increasing local market share.

349. The upward trend in the local market share continued throughout the rest of the 1980s and into the early 1990s, but flattened out in 1991/92. Inspecting the data, it appears that this coincided with a stagnation in the total demand for tradable goods. Total supply in real terms levelled out, after the heavy increases of the preceding boom years, and so did foreign and local supply. The only real growth recorded for this period was in local production for export, reflecting the establishment of a vehicle assembly plant in Botswana.[80]

350. The local market share is seen to be considerably higher for constant price estimates than for current price ones. During the last few years these shares have stood at approx. 1/3 in constant price terms, and 1/4 in current. The difference is especially noticeable for years after 1986/87, when the local market share started to grow in earnest. In economic terms, this difference implies that import prices have increased more rapidly than local product prices since 1985/86 (which is the the price deflator base year of these calculations), i.e. that local industry has on the whole had a relative price advantage over imports during the period.[81]

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[79] The Financial Assistance Policy (FAP) was introduced in 1982. An industrial policy, largely based on an import substitution strategy, was introduced in 1984.

[80] Note, however, the data problem. Especially the significant increase in the local market share recorded for 1988/89 over the previous year may be spurious. Thus, as noted in table 8,3 of Annex J, the data for the two years are not directly comparable.

[81] An examination of the price indices underlying the above results confirms this conclusion. Thus, the import price index (WPI) outgrew local production price index (GDPI) considerably after 1985/86, which is the base year used in above calculations. During the period 1985/86 - 95/96 the WPI increased by 198%, while the GDPI increased by 122%. This was largely due to a higher rate of import inflation during the late 1980s and early 1990s; during the period 1985/86 - 1991/92 the WPI grew by 116% against 43% for the GDPI. During the following period (1992/93 - 1995/96) in contrast, the WPI grew slower (38%) than the GDPI (55%).

Price Index estimates from table 8,3 (Annex J)		WPI	GDPI	CPI
Whole period:	1985/86 - 1995/96	198%	122%	195%
Part periods:	1985/86 - 1991/92	116%	43%	86%
	1992/93 - 1995/96	38%	55%	58%

These price trends correspond roughly, but only roughly, to the corresponding price trends earlier encountered. The difference is entirely due to the GDP based price index applied to local production (GDPI), the import price index (WPI) used being the same as before. The GDPI does in some instances deviate quite substantially from the CPI elsewhere applied to local products. Thus, the GDPI records a 0% price change for

8,4 : Conclusion

351. Above we have described the trends in Botswana's non-traditional exports and local market shares. How do these developments compare to the corresponding trends in the exchange rate and the competitive strength of the local producers? The relevant trends are summarised in table Cpt8,1, in order to facilitate an investigation of this issue.

Table Cpt8,1 : Overall trends in exchange rate, competitive situation, non-traditional exports and local market share

Overall trend in the exchange rate and competitive situation

Period	*Rand/Pula rate*	*Competitive gain index*
1980-83	Pula stable	Stable around unity
1984-86	Pula revalued	Falling below unity
1987-89	Pula revalued	Rising back to unity
1990	Pula revalued	Starting to fall below unity
1991-92	Pula devalued	Falling further below unity
1993-96	Pula devalued	Stabilising at record low level

Overall trend in the non-traditional export volume

1980-90	Rising
1991-92	Falling
1993-96	Total of "old products" falling, but overall total rising due to introduction of vehicle exports.

Overall trend in the local producers' share of the Botswana market

1981/82-85/86	Falling
1986/87-91/92	Rising
1992/93-95/96	Constant

352. Non-traditional exports excluding vehicles grew steadily throughout the 1980s, but the positive trend could not be maintained in the 1990s; after 1990 exports started to fall. In overall terms these developments seem to correspond fairly well with the corresponding developments in exchange rate and competitive strength. Thus, the 1980s as a whole saw gradual revaluations of the Pula, and a fairly comfortable competitive situation, while the 1990s on the whole saw devaluations, and a deteriorated competitive situation.

353. To study this topic in further detail, table 8,2 (Annex J) summarises the export data into the same periods as earlier used for the analysis of the competitive gains. The table confirms that the 1980s was on the whole a period of real export growth, gradual revaluations, and a comparatively stable competitive situation. The mid-1980s do however stand out from the rest of the decade. Despite a temporary drop in competitive power, the mid-1980s had the highest average growth rates of the entire decade.

1983/84 and a 12% *de*crease for 1987/88, while the CPI records *in*creases of 9% and 8% for these years (see table 8,3 of Annex J). The reason for these differences is not clear; possibly they are caused by falls in the price of traditional exports. However, whatever the reason, the GDPI does look rather "peculiar". It is consequently not used elsewhere in this paper. It nevertheless is used for the present calculations of local production supply; to use another index, for instance the CPI, would imply a rejection of the official National Accounts estimates. The problem ought, however, to be analysed in further detail, with a view to identify a better price deflator for local supply of tradable goods.

354. The export growth continued into 1990, but dropped considerably during 1991-92. These years also saw considerable devaluations of the Pula and a deteriorating competitive situation.[82] Total exports grew considerably during the years 1993-95, but only due to the exports of vehicles. Other exports declined during 1993-95, but at a slower rate than in 1991-92. This coincided with a stabilisation of the competitive situation at an unprecedented low level.

355. On the whole, therefore, and excluding the events of the mid-1980s, the development of non-traditional exports may seem to correspond reasonably well to the corresponding development in exchange rate and competitive power. Caution should however be exercised in drawing any firm conclusion about cause and effect. The fundamental reasons behind the growth and fall of the non-traditional exports are not identified, and the estimates by which we have measured these developments are themselves uncertain.

356. The estimates of the corresponding development in local producers' share of the Botswana home market are even more uncertain. In overall terms it does nevertheless seem probable that this share fell during the first half of the 1980s, but thereafter grew significantly until the early 1990s. The growth process then appears to have run out of steam; the last few years have seen a fairly static market share.

357. The general trend of events described above may appear to be roughly corresponding to the trend in the exchange rate, and in the competitive strength of the local producers. Thus, it is recalled that the Pula remained fairly constant during the early 1980s. It was next revalued until 1990, and thereafter devalued. The corresponding trend in the competitive situation was a deterioration from 1983 to 1986. It improved after 1986, but deteriorated again during the 1990s.

358. It may therefore be tempting to see developments in the local market share as a reasonably clear reflection of the corresponding changes in the exchange rate and the competitive situation. However, the time sequence of these various developments are only roughly overlapping. This may serve to indicate a considerable degree of influence upon our variables emanating also from other factors. All told, we are left with the indication that the estimates may possibly indicate a causal link of sorts between these variables, but probably only a partial or indirect one.

359. This in not unexpected. As noted in the introduction to this chapter, the overall fortunes of the Botswana producers are influenced by various factors. The same goes for their fortunes vis-à-vis their various markets, i.e. the local and foreign market. The exchange rate is but one of these factors, and it may not even be a major one. Other factors may have been more important in shaping the events of the past, and may still be so. The establishment of a vehicle assembly plant during the last few years may serve to illustrate this point. The development of this industry, which is now Botswana's largest exporter after the diamond industry,[83] has probably occurred *irrespective* of the exchange rate movements, not *because of* them.

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[82] Note, however, that this period also saw considerable economic turbulence, such as the end of an economic boom, the collapse of the Zimbabwe market etc. as earlier described.

[83] The value of vehicle exports grew from nil in 1992 to 623 million Pula in the first six months of 1996, corresponding to 24% of the diamond exports, and to 115% of all goods exports other than diamonds and vehicles. Its contributions to GDP and employment is of course much smaller.

360. But, again as noted in the introduction to this chapter, this is not to imply that the exchange rate is irrelevant to the fate of domestic producers, only to suggest that it may have a *supporting* rather than a major role, and that we should show great caution in drawing conclusions about the effects of exchange rate changes and competitive gains from these data. The above result should therefore neither be taken as conclusive proof that our earlier conclusions are correct, nor that they are wrong. However, such as they are, they may seem to lend *some* support to these conclusions.

9 : Evaluation of recent events

361. We now return to the concerns mentioned in the opening paragraphs of this paper. It is recalled that the concrete background for these concerns are the events of the last few years, which have seen a high RSA inflation rate combined with a rapid depreciation of the Rand against major foreign currencies. Despite its inherent strength, the Botswana authorities has, in this situation, chosen to let the Pula follow the Rand. The Pula has consequently been effectively tied to the Rand, with the result that it has "dropped like a stone". The wisdom of pursuing such a policy has been questioned by certain economic stake-holders. Is this justified according to our analysis?

362. These concerns have already been addressed in chapter 6.4, where the possible effect of tying the Pula to the $ was investigated, and compared to the effect of tying the Pula to the Rand. In this chapter we return to these, and similar, issues, in an attempt to analyse the justification for the current exchange rate policy from various perspectives.

9,1 : Nature of present policy

363. The above description of the background to the concerns about the present exchange rate policy may create a general impression of an ever softening Pula. This impression is largely correct, but only with respect to the Pula's rate of exchange against the major currencies of the world economy. Thus, it is worth emphasising that the fall of the Pula is only part of the overall picture, and in some respects not even its most important part. Botswana has, on the whole, experienced only marginal changes in the all-important Pula/Rand rate. The significant change in the Pula's rate of exchange during later years has been against the US Dollar, the UK Pound etc., not against the Rand. When the current exchange rate policy is sometimes labelled a devaluation policy, reference is consequently made mainly to the latter, not the former, exchange rate.

364. Looking closer at events of the last few years we find that the Pula has, on the whole, been gradually devalued against the Rand, but only on a relatively marginal scale. The basic aim of the adopted exchange rate policy therefore appears to have been to maintain approximate stability in the Pula/Rand rate, even in the face of considerable variations in the rate against other currencies. This is noteworthy, given that the officially professed policy is one of pegging the Pula to a basket of currencies, rather than to the Rand alone.

365. Interpreting this policy in terms of the competitive fortunes of local (non-traditional) producers, it therefore appears that the aim has been largely defensive, focused on the

protection of local industry against competitive setbacks, rather than offensive, trying to secure them any significant competitive gains. In other words, the basic aim seems to have been to maintain an unchanged competitive situation vis-à-vis the RSA, by refusing to let the Pula appreciate against the Rand.

9,2 : Effects of present policy

366. Given the fact that the Pula has not been significantly devalued against the Rand, one may perhaps be tempted to conclude that the associated problem of import inflation has not been too serious. However, even a stable Pula/Rand rate will induce considerable inflation into the local economy if the RSA inflation rate runs high, which it has been doing during the period in question. True, the RSA inflation rate has not been accelerated too much by the adopted exchange rate policy, something which would have been the case if the Pula had been significantly devalued against the Rand, but neither has it been deflated, which it would have been if the Pula had been revalued against the Rand. Instead, the high RSA inflation rate has largely been allowed to enter the local economy unchecked.

367. To the extent that the concerns about the present exchange rate policy refer to the inflationary effect *as such*, they do therefore appear to be justified. The policy does appear to have left the country wide open to inflationary pressure from abroad. The *direct* inflationary impact alone must have been considerable, with the full force of the high South African inflation rate being allowed to enter unchecked into the local economy, and the *full* impact even more so, as internal economic actors have fuelled further inflation in their efforts to catch up with the initial import driven price increase.

368. Whether this has created serious problems for the average local producer is more unclear. It is generally accepted that a high inflation rate gives rise to a host of problems, both macro economic and otherwise, and it is undeniably true that inflation (*ceteris paribus*) affects producers negatively by increasing their costs. However, unless their sales prices are in some way frozen, the inflationary process may equally make room for price increases of their own, thus allowing them to keep abreast of events. If so, the adopted exchange rate policy may even have brought them some marginal benefits, for instance by temporarily reducing their real term wage costs.

369. The policy of tying the Pula to the Rand does, on the whole, appear to have been beneficial to the Botswana producers, at least as long as negative inflation effects *additional* to those included in the present analysis are ignored. Thus, Botswana's traditional exporters appear to be have benefited significantly from the policy. Also the producers of non-traditional tradables appear to have benefited, at least marginally and temporarily, and especially when compared to their probable situation under an alternative regime.

370. The group of traditional exporters of beef and mineral products appears to have benefited significantly from the policy. Their export incomes reflect prices given in US Dollar, British Pound etc. In consequence, the nominal Pula value of these exports has been inflated in direct proportion to the significant devaluations of the Pula against these currencies.

371. Their operating costs have of course also increased, due to local inflation effects associated with these events, but for the group as a whole these costs are relatively small

compared to the sales incomes. They have therefore had a fairly limited effect upon the operating surplus of these producers. This, however, reflects the overall situation of the group of traditional exporters as a whole. The situation is known to be very different for *some* of the firms within the group. The situation is known to be very different for *some* of the firms concerned. But even these firms will have benefited, due to the substantial increase in the Pula value of their sales incomes brought by the Pula's depreciation against major foreign currencies.

372. The above conclusion refers to net incomes as measured in current prices. The general inflationary effect upon the purchasing power of these nominal incomes may well have been substantial, significantly modifying the value of these benefits, but this will essentially depend on the purposes for which these incomes have been used.

373. The Government of Botswana has shared in the nominal income increases of the traditional exporters. A substantial share of the total profits earned by Botswana's largest traditional exporter (Debswana) accrues to Government in the form of dividends, royalties and tax revenues.[84] Again, the actual purchasing power of these nominal revenues will depend on the purposes for which they have been used.

374. However, according to the advocates of the current policy of linking the Pula to the Rand, its primary concern is not the fate of the above sectors of the economy. Rather, it is concerned with the fate of the non-traditional producers facing RSA competition both at home and abroad. Also these producers appear to have benefited from the policy, especially when compared to what might have happened if an alternative (de-linking) policy had been adopted.

375. As already noted above, the present exchange policy, although largely one of keeping the Pula in line with the Rand, has not been absolute. Thus, the period 1993-96 saw a minor devaluation of the Pula against the Rand, implying that the non-traditional producers did benefit from an improvements in their competitive strength. Given, however, the marginal nature of the devaluation in question, the benefits thus secured can not have been very substantial.

376. What has probably been of greater importance to these producers is the fact that the Pula has not been allowed to appreciate against the Rand. The latter alternative would in many ways seem to be the natural alternative to the present policy. Thus, as already noted earlier, this policy has cost Botswana dearly in terms of inflation. An obvious alternative would therefore be to pursue a policy inducing less inflation into the local economy, i.e. essentially a policy of allowing the Pula to appreciate against the Rand. This would seem all the more reasonable, given that the Pula would seem an inherently strong currency, backed as it is by extensive foreign exchange reserves etc.

377. Such a policy would however have implied competitive disadvantages for the producers concerned. It is especially in this perspective that the present policy may be said to have

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[84] The Government of Botswana may possibly also have benefited in a more indirect way. The group of traditional exporters consists of one large and highly profitable firm (Debswana), and several minor ones. Many of the latter are not particularly profitable, and the Government has on several occasions had to bail them out. It may consequently be said to have benefited to the extent that the increased Pula sales income of these firms has saved it from having to do so yet again.

benefited local producers; the benefits concerned have not been so much in the nature of competitive advances, as in the nature of protection against competitive reverses.

378. But these benefits may have been of a temporary nature only. Local cost pressure, ignited by the initial inflationary impact, is likely to have partly or wholly erased the competitive benefits actually earned by the Pula devaluation against the Rand.[85] Similarly, reduced inflationary pressure would probably have reduced or erased the competitive disadvantage potentially derived from an alternative revaluation policy. Botswana may therefore have paid a high price for granting producer support that may have been both limited and temporary in nature.

9,3 : A justified price?

379. Even a high price is not necessarily *too* high if paid for something sufficiently desirable. Whether or not the above price is justified, will therefore depend upon the inherent economic and political importance attached to the inflation rate and producer support in question. Depending on circumstances, the benefits of even a limited degree of producer support may well outweigh the costs of a substantial degree of inflation. Allowing one's industrial base to collapse in order to promote overall price stability is not generally regarded a viable policy option.

380. The crucial question is therefore *how important* these relative benefits have been for the fortunes of the recipient industries. The present paper can offer no answer to this question. Thus, it may be argued that much of Botswana's present industry is of an infant nature, and therefore too weak to face significant reverses in their operating conditions. Even so, it does not seem an indisputable fact that the industries concerned are in such a perilous competitive position that they could not possibly have weathered the relatively limited setbacks brought for instance by a gradual revaluation policy.

381. Thus, it is recalled that such a policy was in fact implemented during the 1980s, and that local industry seems to have prospered, even though they are unlikely to have been any less infant in nature than they are at present. Furthermore, the recent experience of the Botswana textile industry may seem to indicate that the Botswana producers are able to overcome even considerable hardship, if forced to do so. This industry faced an abrupt collapse of its traditional market (Zimbabwe) in 1991/92. As a result, it suffered badly, but nevertheless managed to re-emerge, directing its exports towards the RSA.

382. However, some of the established textile firms reportedly *did* collapse, and it is not obvious that the rest of the industry would have been able to capture a share of the RSA market if the Pula had been allowed to appreciate significantly against the Rand. The question of whether or not the price paid for these supportive measures has been fully justified is therefore left open, as is the related question of whether or not the same benefits could, or should, have been secured by alternative means, for instance by tax concessions, direct subsidies or similar.

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[85] This will depend upon the degree to which the inflationary effects arising from the initial price impact have been effectively contained. The statistical evidence at hand is not absolutely conclusive on this point. It does, however, appear unlikely that these effects have, on the whole, been very effectively contained in the past.

383. This is not, however, to suggest that the adopted exchange rate policy has been totally, or even largely, unjustified. The difference between being fully justified and largely unjustified is considerable, and not many policies may be truly said to be either. In order to illustrate that the present policy is not without merits, we need only consider the likely implications of following a significantly different policy, for instance one of pegging the Pula to the US$.

9,4 : Implications of a significantly different policy

a. Summary of assumptions and implications

384. To illustrate the merits of the present exchange rate policy, we will investigate the likely implications of what may be considered its logical opposite. In other words, we will look at the outcome that might have emerged if the Pula had been completely de-linked from the Rand during recent years, remaining instead close to the US Dollar (US$) or similar.

385. Intuitively, the feasibility of such a revaluation policy may seem to follow logically from the argument put forward elsewhere in this paper about the inflation-driving effect of the present policy of pegging the Pula to the Rand. A policy of revaluing the Pula against the Rand would therefore seem an obvious alternative to this policy, if the aim is to restrain local inflation.

386. This, however, represents a partial outlook, concentrating on the inflation aspect alone. In the wider context, taking into account producers' competitive strength, things may not be that simple. Thus, as will be further explained later, the likely overall implications of such a US$-pegging policy does *not* appear particularly attractive, given the particular circumstances of the last few years.

387. It does on the whole seem highly probable that local producers would have faced severe problems, had the Pula been allowed to trail the US$ rather than the Rand. Given that the Rand's fall against the US$ has not been an isolated incidence of limited magnitude, this would have caused the Pula to appreciate *significantly and persistently* against the Rand during recent years. Such a development might have placed local producers, who are mainly competing against the RSA, at a seemingly permanent disadvantage.

388. This conclusion may seem to be contrary to our general policy conclusions. Thus, it is recalled that although a Pula revaluation against the Rand will give rise to a competitive loss, this loss might eventually be erased by accompanying inflation gains. This, however, does not necessarily imply that the loss in question is too small to be of any real consequence to the industries concerned. In the present case we are considering a considerable revaluation, which will result in a considerable competitive loss.

389. It is also recalled that the erasure of the initial competitive loss represents the ultimate outcome of a rather drawn-out process, when local wages and profits are assumed to respond to price signals, and a host of other inflation driving factors are ignored. In the present case, in contrast, we would not be dealing with the result of a single revaluation launched under such favourable circumstances, but with the aggregate result of a very long series of substantial revaluations, and a number of other inflation factors simultaneously hard at work.

390. In this situation, the exchange rate effects would tend to create a long term loss situation for local producers, with the ever increasing appreciation of the Pula bringing a steady flood of fresh competitive losses before time had allowed prior ones to die down. The existence of other inflation factors would serve to reverse the competitive situation further, these factors seeming on the whole to have fuelled local inflation during the 1990s. Unless the Botswana producers were able to respond to such a combined challenge by operating more efficiently, they could have found themselves in a serious predicament.

b. Underlying analysis

391. In this chapter we will expand on the above conclusions. In so doing, a more detailed analysis of the actual and potential events of the last few years is provided, drawing, initially, on the statistical evidence at hand and manipulations of the previously presented (static) model (i.e. model III). In the last section these efforts are complemented by a crude attempt to analyse these issues from a more dynamic perspective.

i. Basic analysis

392. If the Pula had been pegged to the US$ during recent years, the Rand would have depreciated against the Pula to the same extent that it has depreciated against the US$. The latter development is given in table Cpt9,1, where it is seen that the years after 1990 have seen a 61.5% aggregate depreciation of the Rand against the US$, corresponding to an annual average of 8.3% pa. The comparable rate for the last three years (1993-96) is an aggregate rate of 29.6%, corresponding to an annual average rate of 9.0% pa.

393. It should be clear already from these simple observations, that Botswana's producers would have been faced with a series of very substantial annual revaluations (of the Pula against the Rand), with an obvious risk of substantial competitive setbacks, if the Pula had been pegged to the US$.

394. Even so, however, they could in theory have emerged without permanent loss of competitive power, but only after a relatively long time, and only if Botswana had little or no internal inflation. Thus, the overall rate of import-price increase (WPI) during the 1990s is seen to be roughly of the same magnitude as the revaluation in question (see table Cpt9,1). The revaluations could therefore largely have served to offset the import-price increases. This might leave Botswana virtually inflation free, and able to eventually regain its competitive standing.

395. However, this would only be possible if other local inflation factors remained dormant. According to the below analysis they were however far from dormant during these years. The likely outcome would therefore be local price increases, resulting in a permanent loss of competitive power.

396. To clarify the matter further, we may analyse the events of the table's last three years within the earlier presented model (i.e. model III). The period 1993-96 saw a 29.6% (9.0% pa) depreciation of the Rand against the US$, and a 28.7% (8.8% pa) increase in the RSA price index. A model scenario based on these developments, and an unchanged Pula/US$ exchange rate, gives results indicating that a considerable permanent competitive loss will

emerge, *unless* local inflation is kept at a very low level. In order to *completely* avoid a permanent competitive loss, moreover, a negative inflation rate is required.

Table Cpt9,1: Exchange rates, inflation and competitive power for selected years 1)

	Exch. rate indices		Price indices			Competitive
Year	Rand /Pula	Rand /US$	RSA WPI	Bot. IPI	Bot. CPI	gain index
1980	1.000	1.000	1.000	1.000	1.000	1.000
1981	1.047	1.123	1.142	1.091	1.164	0.930
1982	1.058	1.391	1.298	1.227	1.294	0.939
1983	1.016	1.433	1.435	1.413	1.430	0.977
1984	1.131	1.869	1.557	1.377	1.552	0.875
1985	1.167	2.836	1.791	1.535	1.678	0.887
1986	1.216	2.923	2.126	1.748	1.846	0.912
1987	1.213	2.619	2.449	2.019	2.027	0.957
1988	1.243	2.911	2.786	2.241	2.196	0.981
1989	1.302	3.374	3.199	2.456	2.451	0.962
1990	1.388	3.335	3.597	2.591	2.730	0.908
1991	1.368	3.528	4.026	2.943	3.051	0.921
1992	1.335	3.645	4.394	3.292	3.544	0.885
1993	1.352	4.156	4.702	3.478	4.052	0.816
1994	1.325	4.547	5.121	3.863	4.479	0.819
1995	1.310	4.654	5.631	4.297	4.950	0.823
1996	1.294	5.386	6.049	4.675	5.449	0.813
Total cumulative % changes during selected periods 2)						
1989/80	30.2	237.4	219.9	145.6	145.1	-3.8
1990/89	6.6	-1.2	12.4	5.5	11.4	-5.6
1996/90	-6.8	61.5	68.2	80.5	99.6	-10.4
1996/93	-4.3	29.6	28.7	34.4	34.5	-0.4
Average annual % pa changes within the above selected periods						
1989/80	3.0	14.5	13.8	10.5	10.5	-0.4
1990/89	6.6	-1.2	12.4	5.5	11.4	-5.6
1996/90	-1.2	8.3	9.1	10.3	12.2	-1.8
1996/93	-1.4	9.0	8.8	10.4	10.4	-0.1

Notes: 1) Annual averages index data based on tables 7.1 and G.1 (Annex J), with 1980 used as base.
2) The total growth from 1980 to 1989, expressed in terms of 1989 value over 1980 value, etc.

397. The latter case implies that reduced (Pula term) import costs are allowed to produce a slightly deflationary situation in Botswana, that nominal wage-rates would follow suit, and that no other local price factors act to reverse these deflationary effects. These are strong conditions, unlikely to be met in practice, especially in view of the actual developments during the 1990s (see below). The most realistic outcome of pegging the Pula to the US$ under conditions similar to those of the last few years would therefore again seem to be a significant permanent loss of competitive power vis-à-vis South Africa.

ii. Local inflation factors

398. The above analysis referred to local inflation factors, i.e. inflation factors other than those directly associated with import prices and exchange rate impacts, at work during later years. We may try to illustrate the existence and strength of these factors. Using the data of table Cpt9,1, the total impact of these factors is roughly indicated by the difference between the Import Price Index (IPI, which equals the RSA inflation rate (WPI) as directly translated into Pula terms by the prevailing exchange rate) and the Consumer Price Index (CPI).

399. Note that due care should be exercised in comparing the IPI and CPI values; they are neither directly nor entirely comparable in nature. Thus, the CPI measures the *actual* local inflation rate during a given period, irrespective of whether this results from events arising within that period, or from inflation overhang from previous periods. The IPI, in contrast, measures the *potential* multi-period inflation impact arising from the imports of goods during that particular period.

400. Thus, the IPI measures the local price inflation on *imports*, not the inflation on *all products* sold in the local market. Since imports represent only a part of Botswana's overall supply of resources, the IPI rate will (*ceteris paribus*) overstate the corresponding impact upon Botswana's overall inflation rate. The full import impact expressed by IPI may nevertheless materialise, but only over time, and to the extent that the initial import-price impact gives rise to secondary price effects in the form of local wage and price reactions. One should therefore compare overall index trends over time, rather than individual index values for any given year.

401. Keeping this in mind, it is seen from table Cpt9,1 that the CPI index at first exceeded the IPI index somewhat, especially during the mid-1980s. The two were however brought back together during the latter part of the 1980s. This suggests that local inflation factors may have fuelled inflation in the early and mid-1980s, but that the reverse was true in the late 1980s, with the result that the IPI and the CPI became almost equal in 1989. From 1990 the CPI index again started to grow quickly, significantly outpacing the IPI index, suggesting that the local inflation factors may again have been hard at work.

iii. Dynamic analysis

402. In order to look deeper into the issue of an alternative exchange rate policy one ought ideally to adopt a truly dynamic approach. To do so would however be rather a "tall order", exceeding the limits of the present effort. Even so, a limited effort at making the above analysis somewhat more dynamic has been attempted. In presenting the result of this attempt it should be emphasised that it is by nature both crude and approximate, capable of illustrating crude orders of magnitudes at best.

403. Figures Cpt9,1 and Cpt9,2 may serve to give a rough illustration of the picture emerging if one makes the earlier discussed scenario more "dynamic" by considering a series of consecutive revaluation events rather than as a single such event. The latter is illustrated in figure Cpt9,1, where the standard result is depicted: a revaluation results in an immediate competitive loss, which gradually evaporates over time, provided that the associated price effects are allowed to work themselves out.

Figure Cpt9,1 : Illustration of a single, individual revaluation loss

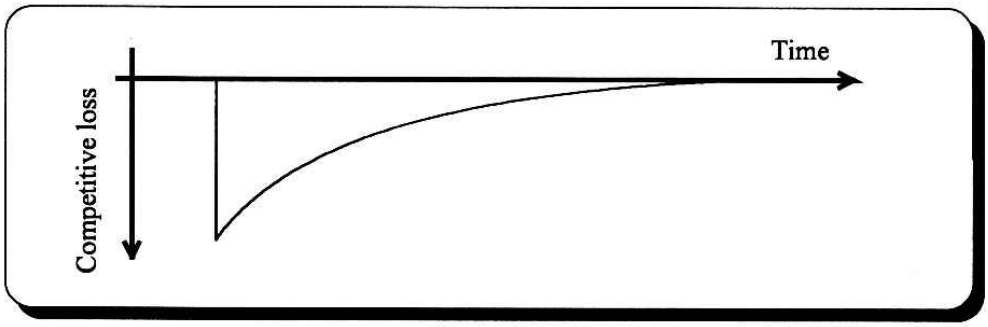
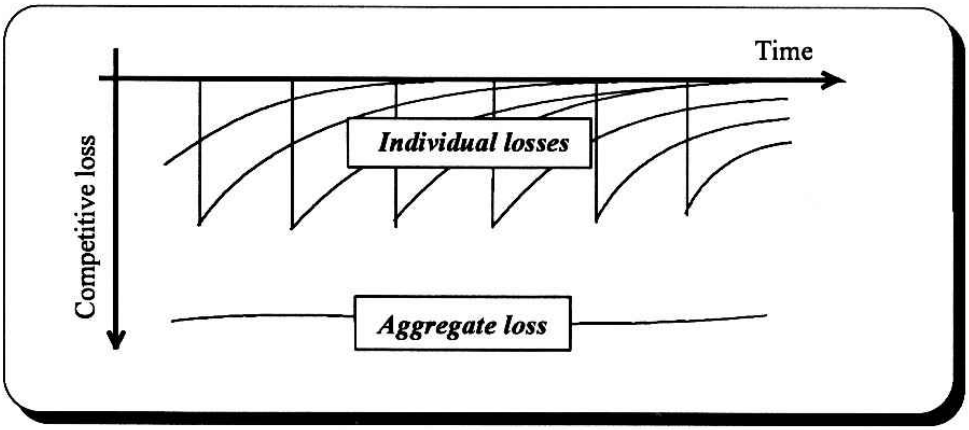


Figure Cpt9,2 : Rough illustration of a individual and aggregate revaluation losses



404. Figure Cpt9,2 gives a rough illustration of the dynamic nature of the inflationary process by introducing a series of individual revaluation effects. Each effect is identical to the revaluation effect depicted in figure Cpt9,1, but they follow each other in an overlapping series of events. Each new revaluation will therefore bring a fresh competitive setback *before* prior setbacks have had sufficient time to evaporate.

405. The total competitive setback faced by local industry is equal to the aggregate revaluation loss, i.e. to the sum of all revaluation effects still "alive" at any given time, be they freshly introduced ones and overhangs from previous periods. The overlapping nature of the revaluations therefore implies that the aggregate competitive loss exceeds any individual revaluation loss. It also prevents the competitive situation from returning to its initial state at any time during the revaluation process. The competitive situation will consequently remain *permanently* depressed until the series of revaluations has come to an end.

406. An exchange rate policy implying a prolonged series of substantial revaluations of the Pula against the Rand therefore promises to bring a relatively severe and long-lasting setback in the competitive fortunes of local producers. True, this setback may eventually evaporate, provided that the revaluations eventually come to an end. This, however, may be small comfort to producers facing possible bankruptcy as a result of a significant loss of competitive power during the entire period *before* this happens.

407. A rough set of estimates for the period 1993-96 may serve to illustrate that the danger of bankruptcy may be real. As shown elsewhere, the Rand's rate of depreciate against the US$, and the rate of RSA inflation, both averaged approx. 9% pa during this period. If the Pula had followed the US$ rather than the Rand during these years, the Pula would have appreciated against the Rand to the same degree that the US$ appreciated against it, i.e. by roughly 8% pa, while the price of RSA products, as converted into Pula, would have remained nearly constant.

408. A *crude* attempt to calculate the magnitude of the aggregate competitive setback brought by a series of revaluation (of the Pula against the Rand), indicates that the former may be of *roughly* the same magnitude as the annual aggregate of the latter. In other words: a series of overlapping revaluations amounting to some 8% pa, may bring an aggregate setback of roughly the same magnitude in the competitive fortunes of the local producers.

409. Faced with such a loss of competitive power, local producers may have to reduce their sales price accordingly.[86] A price reduction of this magnitude amounts to a major setback in their operating conditions. If local producers have limited possibilities of offsetting the price decrease by reducing their production costs, it may even deal them a "crushing blow" by seriously undermining their operating profits. Thus, according to table 5,1 (Annex J) the average rate of Gross Operating Surplus in Botswana's manufacturing sector was only around 9% of its total sales value in 1992/93. A price reduction close to 8% would therefore spell industrial disaster, wiping out almost the entire Gross Operating Surplus earned by the average local producer.

410. Aggregate effects of the *general nature* described in the above will materialise for any revaluation series, irrespective of the magnitude of individual revaluation events. This may perhaps seem to rule out the option of a consistent revaluation policy altogether. To do so, however, would be wrong. Thus, it should be emphasised that the negative conclusion drawn above with respect to the feasibility of a revaluing the Pula against the Rand, refers to a specific alternative involving a series of *substantial* revaluations. A series of *smaller* revaluations will of course result in effects which, although similar in nature, will be quite different in magnitude. Hence, although self evident, it should not be forgotten that there is a considerable difference between "a flood and a trickle" when it comes to a practical policy approach.

9,5 : Conclusion

411. On the whole, the policy of having the Pula follow the Rand do appear to have been justified. Given the circumstances of the last few years, an alternative policy of following the US$, or of allowing the Pula's value to be decided solely by its own inherent strength, could easily have resulted in a significant and persistent appreciation of the Pula against the Rand. Such a development would probably have brought Botswana a dose of the so-called Dutch decease, "crowding out" local industry, rather than promoting or protecting it.

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[86] It is recalled from chapter 6,1,a that a competitive loss measures Botswana's direct price *dis*advantage vis-à-vis the RSA, divided by a price index representing the Pula equivalent of the RSA prices, all relative to the initial situation. In the present case the said price index will remain close to unity, since the Pula equivalents of the RSA prices remain approx. unchanged. The implication of a 8% loss of competitive strength will in this case therefore be a similar reduction in the sales prices obtained by the local producers, assuming that they have to reduce these prices in order to remain price-competitive with their RSA competitors

412. Even so, the possibility that the policy could be improved upon, at least marginally, should not be discarded out of hand. This is all the more so in view of the fact that a somewhat different policy has been successfully implemented in the past.

413. Summing up, therefore, the pertinent question is not so much if the Pula should have been completely de-linked from the Rand, but if it should have been allowed a somewhat larger degree of flexibility towards it.

414. Virulent opposition to the present exchange rate policy is therefore unjustified. This is all the more so, given the fact that there is also an operative side to the exchange rate question. The Botswana authorities have no influence over the value of the Rand against foreign currencies, yet changes in this value directly affect the all important Rand/Pula rate. The authorities *have to* react to these developments in one way or another, either by deciding to adjust the emerging Rand/Pula rate, or by allowing it to remain unchallenged. This decision may typically have to made under conditions of considerable time pressure and uncertainty about the precise outcome of their actions.

415. Therefore, if the authorities suspect that local industries may be ill equipped to suffer a competitive setback, and especially if employment creation is an over-riding objective, their best course of action will be to choose the lesser peril. In the present case this would seem to imply that they should risk inflation rather than industrial failure. If judged in this perspective, there seems considerable justification for the adopted exchange rate policy.

10 : Looking towards the future

416. Our aim in evaluating past events is not so much to pass judgement upon events that cannot be undone, as to draw out the possible implications for the future. Looking towards this future, it is evident that Botswana will have to expand both its industrial base and its export base significantly, if the goal of creating employment and prosperity for a growing population is to be achieved. Much of the industrial base required to lead the economy on its envisaged export oriented growth path into the future has not yet come into existence.

417. This base can not be created by "government decree"; the task will largely have to be left to the private sector. The authorities must nevertheless play an important part in enabling and promoting such private sector involvement. They will have to make considerable efforts to attract new enterprises, and to avoid subjecting existing industries to undue reverses in their operating conditions. These efforts will have to involve the implementation of appropriate policies and measures in a wide variety of areas, not only in the area of exchange rate policy.

418. In doing so, however, the authorities should keep in mind the ever inherent danger of fostering an overprotected and inefficient industrial sector, unable and unwilling to face prevailing market conditions without everlasting government assistance in one form or another. It can hardly be in the long term interest of the nation to create a local industry dependent on open-ended government support, draining the public coffer, and tying the authorities' hands.

419. The costs and benefits to the nation of providing various types of support to local industry should therefore be closely monitored; otherwise they could over time turn out misconstrued, or even counterproductive to the nation's interests.

420. As part of these efforts, the question of adjusting the present exchange rate policy should be considered. An important aim of such an adjustment could be to reduce inflationary pressure emanating from RSA, should the RSA inflation rate continue to run high. This may be achieved by appropriate movements in the Pula/Rand exchange rate, i.e. essentially by trading such limited competitive gains as may be associated with the present exchange rate policy off against a reduction in the inflation pressure emanating from the RSA.

421. In implementing such a policy, however, it should not be overlooked that the inflationary process is a dynamic phenomenon, with present inflation rates typically feeding upon past inflation impulses. Local inflation may therefore run strong for quite some time, even after the total or partial sterilisation of new inflation impulses from abroad.

422. Thus, it is recalled from above that local producers may be faced with serious problems if the Pula is allowed to appreciate significantly and persistently against the Rand. As long as these producers are mainly competing against the RSA, such a development might placed them at a considerable disadvantage.

423. The average Botswana producer may be ill equipped to weather such setbacks in their competitive fortunes. It may therefore be wise to implement any de-linking policy only partly, gradually and cautiously, for instance by relying on a succession of gradual and small revaluations against the Rand, even if the latter should continue its substantial decline against major foreign currencies.

424. The introduction of such a policy would institute no revolutionary change in Botswana's foreign exchange regime. It implies little more than an adjustment of the present policy, and it is no stranger to the Botswana authorities, who relied on this very policy for the better part of the 1980s. It is recalled that the experience of doing so were largely positive, suggesting that such a succession of gradual and small revaluations may work reasonably well in dampening local inflation to a degree, without significantly harming local industry.

425. Admittedly, there may have been particular circumstances favouring this positive outcome in the 1980s; a subsequent attempt at repeating the success, made around 1990, appears to have failed. But, if so, the particular circumstances behind the success of the 1980s, and the failure of the 1990s, ought to be investigated, with a view to identify the conditions under which a gradual revaluation policy may, or may not, be expected to work reasonably well in reducing inflation without unduly harming the Botswana producers.[87]

426. Such an investigation could possibly indicate that the success of the 1980s was less due to especially *favourable* circumstances, than the failure of 1990 to especially *unfavourable* ones. Thus, it is recalled that definite boom conditions prevailed around 1990, with significant demand and price pressures affecting the local economy. Therefore, in the absence of

[87] The particular circumstances favouring the revaluations of the mid-1980s are not fully known, but an important factor may have been the existence of spare capacity in a number of production sectors, especially the construction sector, after the hectic activity in earlier years, when the Jwaneng mining complex was established. Is so, the subsequent attempt at copying the success, made around 1990, may have failed largely because the economy was then faced with considerable demand pressure.

any evidence to the contrary, a policy of gradually revaluing the Pula against the Rand, would seem to remain a tenable option, should the RSA inflation rate continue to run high.

11 : Concluding remarks

427. The results and conclusions presented in this paper are derived from a simple and static model, taking into account only a selected few variables, based on a simplified trade pattern etc. These results do to a certain extent seem to be supported by an analysis of available inflation and exchange rate statistics, but the relevance and reliability of some of these data may be questioned, as may the analysis built upon them.

428. For instance, we have allowed ourselves to draw general conclusions about long term causality from these data, even though a crude statistical investigation of their short term relationship failed to show any clear link between them. Our conclusions are therefore far from gospel truth; they are to a certain degree both simplistic and inaccurate, and as such they may well be challenged.

429. Finally, it should be emphasised that the present paper refers to a *pilot* study, undertaken in the expectation that a more comprehensive project may in due course follow. As such it has concentrated upon the analysis of a relatively few scenarios, suggestive of past and present events. Also, in analysing the concrete experiences of the 1980s and 1990s, it has no more than "scratched the surface" of the events in question.

430. In formulating a more comprehensive exchange rate project, these developments ought to be studied in further depth and detail. A central aim of these efforts may be the one already suggested above, i.e. to identify the general conditions (if any) under which:

i) A policy of revaluing the Pula against the Rand may be expected to work reasonably well in reducing inflation without unduly harming the Botswana producers.

ii) A policy of pegging the Pula to the Rand, or of devaluing the Pula against the Rand, may be required in order to promote or safeguard local industry and employment.

431. A closely related issue, left unresolved in the present paper, is the question of how crucial the temporary benefits associated with the present exchange rate policy are to the overall fortunes of the recipient industries. Have these benefits really been vital to their prosperity; to what extent could they have prospered without them? This issue may constitute another important area for analysis, but probably also a difficult one to investigate.

432. Attention should however not be focused solely upon past and present events; conditions that may arise in the future ought also to be considered. It should not be taken for granted that current trends will continue indefinitely, or that Botswana's response should be the same irrespective of circumstances. Thus, questions for instance of the following nature may be addressed:

i) Assuming that the RSA remains Botswana's main trading partner also in the foreseeable future, how should Botswana's respond if the Rand stabilises or appreciates against major currencies, and/or the RSA inflation rate drops significantly?

ii) Widening the scope of the study, one may also try to analyse questions arising from Botswana's envisaged export led path into the future.[88] What exchange rate policy will, for instance, be best suited to attract and retain foreign investments and entrepreneurs, assuming that a significant inflow of both will be required? [89]

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[88] In widening the scope of the studying in this direction, it should however be kept in mind that the success of an export oriented growth policy will depend upon Botswana's *general* economic regime, its international trade arrangements etc., rather than upon exchange rate policy alone.

The nature of Botswana's future trade arrangements may be of special concern. These arrangements are not subject to Botswana's preferences and decisions alone, and they do seem subject to considerable uncertainty. What does seem clear is that the *present* trade arrangements will not remain in force indefinitely. For instance:

- The possible creation of a wider regional trade arrangement under the SADC umbrella would seem to have the potential of becoming an alternative to the present SACU arrangement. Alternatively, it may become a mere supplement to it. It does not at present seem clear *if and how* the two will be combined.
- Even if Botswana remains within the SACU, the years ahead will bring considerable changes. Thus, the process of renegotiating the present SACU agreement has already been under way for some time. In addition, the concrete implications of the SACU arrangement will be affected by such factors as the currently discussed trade arrangement between South Africa and Europe, the general trade liberalisation measures undertaken through the World Trade Organisation etc.

Botswana's response to such developments will be crucial to the nation's future. The various options and implications involved ought therefore to be analysed. Ideally, however, this should be done in terms of economic policy at large, *including* exchange rate policy, rather than in terms of the exchange rate *alone*.

[89] Will this, for instance, require the Pula to be kept fairly stable against major foreign currencies, rather than against the Rand, as has been argued by some commentators? The answer to this question would seem to depend upon many factors, not least the future direction of Botswana's international trade. If South Africa remains Botswana's main trading partner, the Rand/Pula rate must be expected to remain crucially important. Given, however, that the tariff barriers around the Common Customs Area will be reduced in the years ahead, and that Botswana's future enterprises of foreign origin *may* tend to tie their sources of supply and demand into a more global network, Botswana's future exports may be increasingly directed towards markets other than the RSA, and its future imports increasingly sourced from third countries. If so, the importance of the Rand/Pula rate should diminish, at least gradually and over time.

III. Annexes

Annex A

Classification of tradability and price behaviour

Tradable and non-tradable products

a. *Introduction*

433. The distinction between tradable and non-tradable products reflects whether or not they lend themselves to international trade, i.e. whether they can be exported and/or imported. The distinction consequently gives indication of whether or not the products in question enjoy effective protection against import competition in their home market, but also whether or not they may have any export potential.

434. The distinction between tradable and non-tradable products is not, in most cases, an absolutely clear cut one. Thus, even typical non-tradable services like transport, trade, education and health will to a certain degree be sold to foreigners in Botswana, and bought by Batswana abroad. These, however, are relatively marginal phenomena. More important may be the fact that the input/output representation of the Botswana economy used for the present study is a highly aggregated one. It is unavoidable, within such a framework, that some production sectors will comprise both tradable and non-tradable products. The *assumed* specification of individual production sectors in terms of tradable and non-tradable products is given in Annex C.

b. *Non-tradable products*

435. Products that do *not* lend themselves to be internationally traded are classified as non-tradable. Government services and services of local trade and transport producers may serve as typical examples of such products. Non-tradable products have no export potential; they are only traded in the home market, in which they are effectively protected against competition from imports. As such their producers may have considerable autonomous scope for setting the sales prices in question, at least collectively. Essentially, the buyer of such products has the option of accepting the prices demanded, or to go without them altogether.

c. *Tradable products*

436. Products that *do* lend themselves to be internationally traded (exported or imported) are classified as tradable. Manufactured goods may serve as typical examples of such products. Tradable products do, by definition, have export potential; they may either be supplied to the home market, or exported. In either case they will face competition from foreign substitutes. Since their customers in general have a choice between alternative substitutes and sources of supply, the Botswana's producers of tradables may have a more limited scope for setting their own prices; in general they may have to set them with reference to the prices of their competitors. In the final analysis, this will however depend upon the product in

question. The degree to which they may set their own sales prices is reflected in the below described classification of price-setters and price-receivers.

Price-receivers and price-setters

a. Introduction

437. The price formation mechanism underlying the present analysis reflects the assumed price behaviour of broad groups of economic actors. The nature of such behaviour may not, in reality, be altogether clear cut. Thus, a consumer may not have much direct influence over the price paid for given commodities. As a group, however, the consumers may yield considerable indirect influence over the prices of certain commodities, by their collective decision to buy, or abstain from buying, at given prices.

438. In the present analysis the price behaviour is simplified and classified into two distinct groups, reflecting main characteristics. Thus, the economic actors are assumed to either set or accept the going market prices of given products. The distinction between price-receivers and price-setters reflects this difference.

439. The price-setters are assumed to be able to influence their own market prices. This does not necessarily imply that they may set them without regard to prevailing market conditions. In most cases their actions may in fact be guided by the parallel actions of their co-actors, thus effectively restricting them to adhere to some general market trend, cost trend, or similar. The price-receivers, in contrast, have no such influence over their prices; they have to accept the prices set by the price-setters, no matter if these prices agree with for instance the cost trend faced by these actors.

440. The difference between the price-setter and price-receiver may seem trivial, given that the former may be largely adhering to some market trend, while the latter will obtain a price also reflecting some market trend. In general, however, these trends will not be comparable with respect to production costs. Thus the former will in general be assumed to reflect production costs, while the latter will not. The difference between the two therefore translates into a technical difference in the way producer prices and profits are calculated within the input/output model, as will be explained later.

441. By concentrating our attention solely upon the price behaviour of these groups of market agents we are implicitly ignoring a host of other economic actors and factors that may also cause inflation. For instance, government authorities are often accused of causing inflation by increasing the money supply, running budget deficits or similar.

442. The Botswana authorities do not have a record of running budget deficits etc., but it have been accused of fuelling inflation during past boom experiences by credit and budget expansions, of crowding out private sector activities etc. However, even if this is true, it still remains a fact that a price increase will only materialise if somebody is physically setting the new price, i.e. if somebody is actually offering or demanding a higher price. Even though government may indirectly cause inflation, it seems highly unlikely that it should do so by offering to pay above the going market price. Its actions are more likely to cause increased

demand pressure in the market, enticing suppliers (including suppliers of trade services) to demand higher prices.[90]

443. Both customers and producers, importers and exporters, may be classified as price-receivers or price-setters. The important factor is not whether they are buyers or sellers in a given market, but whether they have the more important role in deciding the price of the transaction.

b. The price-receiver

444. The price-receiver is facing a market price for his products which he has to accept. Botswana's traditional mineral and beef exporters are in this position. They are typically facing a world market where prices are firmly set by "outside markets agents".[91] The Botswana exporters have to sell at this price, or not at all. Their customers will not buy their products at a higher price, and the producers will gain no additional sales by offering to sell at a lower price.

445. Also the Botswana consumers and importers are assumed to be price-receivers. Thus, the consumers are assumed unable to directly influence the market prices of the products they buy.[92] The importers of Botswana are similarly assumed unable to significantly influence the price of products bought from RSA. Botswana is the "junior partner" in this trade relationship, and as such is unlikely to "dictate terms" to the RSA exporters. Hence, the Botswana importers have to accept the prevailing prices, or take their business elsewhere.

c. The price-setter

446. The price-setter decides his own sales price, but in so doing he may have to take into account the price signals in the market, especially the price movements on directly competing products. The degree to which this is required will depend upon whether he is a strong and relatively independent, or a weak and relatively dependent, price-setter. A domestic producer of a non-tradable basic necessity might serve as an example of a strong price-setter. He may enjoy a virtual monopoly position in the local market for a price-inelastic product.[93] A weak price-setter, in contrast, may be facing competition which will only allow him to set his price roughly in line with the prices of competing products.

447. A price-setter, as here defined, is therefore not necessarily, or even normally, a price maker or monopolist in the sense that he can dominate the market by freely dictating his own sales price. But neither is the market able to impose a clearly defined sales price upon his

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[90] The government is of course also a producer and provider of goods and services in its own right, and may as such set a number of important prices (user charges) directly. This point is all the more relevant because it will tend to be a strong price setter, as defined later.

[91] The "outside market agent" may for instance be the receiving market (ref: the European market in the case of beef), the word market (ref: Cu/Ni and soda ash), or some other "market regulator" (ref: the Central Selling Organisation in the case of diamonds).

[92] Although being price-receivers, they can of course influence the prices indirectly through their collective decision to buy more or less of a certain product at a given price, but such effects are outside the present analysis.

[93] Government, and some parastatals, may serve as typical examples of such producers on the national scale. Also other producers, especially trade and other services, may possibly enjoy a partial local monopoly in some parts of Botswana, due to their relative isolation and smallness.

product. Thus, he may for instance be dealing in a highly differentiated market in which many slightly different individualised products, brand names or similar are selling at slightly different prices, rather than in a market where a single product is sold at a single price. Clothing articles may serve as an example of such individualised products, and primary bulk products of the opposite. It is hard to imagine a single "going price" for products such as women's dresses, but easy to imagine such a price for products such as wheat grain bought in bulk.

448. Hence, the price-setter *has* to set his own price, in the absence of a clearly imposed "going market price". But he can not necessarily force anybody to accept his price. He consequently has to evaluate current market and price trends in order to decide what price increases the market will allow him; i.e. he will have to observe the price movements especially of competing products, and set his sales price accordingly.

449. The producers of non-tradable products are assumed to be price-setters. They are not facing competition from imports, leaving them considerable scope for independent price setting. Even so, they may not be entirely free to disregard the general price trends, unless they enjoy a monopoly for a price-inelastic product.

450. Also the producers of tradable products *other than* traditional exports are assumed to be price-setters. Their products are typically competing against RSA products, either in the home market or in the RSA market. They therefore have to observe the price trends of the market fairly closely, but nevertheless have *some* scope for deviating from it. If they do, their price movements may occasionally be below, or above, those of competing products, resulting, presumably, in increased or decreased market shares.

d. Functional implication

451. The distinction between price-setters and price-receivers has an important mathematical implication for the functional relationship between prices and profits in the sectors concerned, and hence the way they have to be handled in terms of the input/output derived price functions.

452. If a given Botswana producer is a price-*setter* he will try to sell his products at a price that covers his production costs, plus a return to himself. His sales-*price* is consequently a function of profits and production costs. Assuming that also profits are functions of production costs, i.e. that a cost plus formula applies, we may employ the standard input/ output price relationship linking the producer's sales price directly to all cost prices, i.e. in principle to all market prices, including his own.

453. If the producer is a price-*receiver* he is only able to sell his products at a price determined by the world market or similar. His *operating surplus* is therefore a function of the given sales-price, net of production costs. There is consequently no direct functional link between his own sales price and the cost prices faced. Price-receivers therefore have to be treated mathematically different from the price-setters.[94]

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[94] In the present case, all price-receiver *sales*, i.e. all traditional exports, are netted out of the basic input/output matrix *before* the standard price functions are employed.

Annex B

Model I : A simple exchange rate framework

454. In a highly simplified and aggregated form, the basic price relationships affecting RSA and Botswana products competing in the two countries' markets are as follows:[95]

i) *In the Botswana market:* Domestic (tradable) products with price: PL, compete against imports of corresponding products, the Pula-price (PI) of which is the following simple function of their Rand-price (RI) and the Rand/Pula exchange rate (ER): PI = RI/ER.

ii) *In the RSA market:* Botswana's export to RSA, the Rand-prices (RE) of which is the following simple function of their Pula-price (PE) and the Rand/Pula exchange rate (ER): RE = PE*ER, compete against corresponding local RSA products with price: RL.

455. If the two above competing sources of supply to the Botswana market are to be in price equilibrium, their price in the local market must balance, i.e. their *Pula*-designated prices must balance. Hence: PL must equal: PI (= RI/ER); where:

PL: Pula-designated price of local (Botswana) products
ER: The Rand/Pula exchange rate
PI: Pula-designated price of RSA imports to Botswana
RI: Rand-designated price of RSA imports to Botswana

456. Similarly, if the two competing sources of supply to the RSA market are to be in price equilibrium, their price in the RSA market must balance, i.e. their *Rand*-designated prices must balance. Hence: RL must equal: RE (= PE*ER); where:

RL: Rand-designated price of local (RSA) products
ER: The Rand/Pula exchange rate
PE: Pula-designated price of Botswana's export to RSA
RE: Rand-designated price of Botswana's export to RSA

457. Assume an initial situation in which the above described price equilibria existed; i.e. a situation in which:

PL(1) = PI(1) (= RI(1)/ER(1))
RL(1) = RE(1) (= PE(1)*ER(1))
where: (1) denotes the initial situation

458. Assume further a subsequent situation, with prices inflated relative to the initial situation. The new prices are:

- for Bot. products: PL(2) = PL(1)*(1+P%) & PE(2) = PE (1)*(1+P%)
- for RSA products: RL(2) = RL(1)*(1+R%) & RI(2) = RI(1)*(1+R%)

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[95] The adopted relationships ignore such cost elements as: transport costs (on imports and exports), sales taxes etc. These are all assumed to change pro rate with the variables concerned, and as such there is no need to specify them in our "final analysis", which deals with relative changes only, not absolute costs.

where: (2) denotes the new ("after inflation") situation
and: P%: Botswana's inflation rate (affecting local sales and exports alike)
R%: RSA's inflation rate (affecting local sales and exports alike)

459. Assume that the Rand/Pula exchange rate is adjusted in order to maintain the price equality between local and foreign products also in the new situation, i.e. that the exchange rate is adjusted by the following formula:

$ER(2) = ER(1)*(1+ER\%)$
where: ER(2): the exchange rate required to achieve price equality in the new situation.
ER%: the corresponding percentage change required in the Rand/Pula rate (i.e. the required depreciation of the Rand against the Pula).

460. Maintaining the price balance between local products and imports in the Botswana market, given the new prices, will then require that:

$PL(2) = PI(2)$
Hence: $PL(2) = RI(2)/ER(2))$
i.e.: $PL(1)*(1+P\%) = RI(1)*(1+R\%)/ER(2)$
i.e.: $PL(1)*(1+P\%) = \{PL(1)*ER(1)\}*(1+R\%)/ER(2)$
i.e.: $(1+P\%) = ER(1)*(1+R\%)/ER(2)$
i.e.: $(1+P\%)/(1+R\%) = ER(1)/ER(2)$
i.e.: $(1+P\%)/(1+R\%) = ER(1)/\{ER(1)*(1+ER\%)\}$
i.e.: $(1+P\%)/(1+R\%) = 1/(1+ER\%)$
i.e.: $ER\% = \{(1+R\%)/(1+P\%)\}-1.0$

461. Similarly: maintaining the price competitiveness of Botswana products in the RSA market will require that:

$RL(2) = RE(2)$
Hence: $RL(2) = PE(2)*\ ER(2)$
i.e.: $RL(1)*(1+R\%) = PE(1)*(1+P\%)*ER(2)$
i.e.: $RL(1)*(1+R\%) = \{(RL(1)/ER(1)\}*(1+P\%)*ER(2)$
i.e.: $(1+R\%)/(1+P\%) = ER(2)/ER(1)$
i.e.: $ER\% = \{(1+R\%)/(1+P\%)\}\ -1.0$

462. Consequently, in order to maintain a situation of price equilibrium vis-à-vis RSA products, given the new price situation, Botswana should adjust the exchange rate according to the formula: $ER\% = \{(1+R\%)/(1+P\%)\}\ -1.0$

463. In other words, Botswana should adjust the exchange rate in response to the *relative difference* in the inflation rates. Thus:

- If the two inflation rates are equal, the Rand/Pula rate should be kept constant.
- If the RSA inflation rate is *higher* than Botswana's, the Rand/Pula rate should be *increased*; i.e. the Pula should be *revalued* against the Rand.
- If the RSA inflation rate is *lower* than Botswana's, the Rand/Pula rate should be *decreased*; i.e. the Pula should be *devalued* against the Rand.

Annex C

Model II : An Input/Output based price model

Table format

464. An input/output matrix is used for the purpose of estimating the Botswana price indices etc. The adopted matrix, which is given in table 5,1 of Annex J, is based on the most recent SAM[96] matrix as aggregated into the MEMBOT[97] Input/Output-format. It contains the following 16 production sectors:

Table AnxC,1 : Input/Output sectors

Production sector:	Export type	Tradability ratios Local	Total
1: Cattle	Non-traditional	50%	50.1%
2: Other agriculture	Non-traditional	50%	50.8%
3: Mining	Traditional	50%	96.4%
4: Meat and meat prod.	Traditional	100%	100.0%
5: Other manufacturing	Non-traditional	100%	100.0%
6: Water	Non-traditional	0%	0.3%
7: Electricity[98]	Non-traditional	0%	0.4%
8: Construction	Non-traditional	0%	0.3%
9: Trade and hotels	Non-traditional	5%	21.5%
10: Rail transport	Non-traditional	0%	49.1%
11: Other transport	Non-traditional	20%	29.7%
12: Financial services	Non-traditional	5%	8.9%
13: Domestic services	NA	NA	NA
14: Oth. personal services	Non-traditional	5%	9.4%
15: Local government	NA	NA	NA
16: Central government	NA	NA	NA

465. Each production sector is seen to be specified in terms of export type and tradability ratio. The meaning of these are as follows:

i) *Export type:* The export type is either traditional or non-traditional. All production sectors against which exports are recorded (in the input/output table, see table 5,1 of Annex J) are classified in this way, i.e. as either traditional or non-traditional

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[96] Social Accounting Matrix - 1992/93, published by the Central Statistics Office, May 1996.

[97] MEMBOT (Macro Economic Model for Botswana) is, as the name suggests, a macro economic model for Botswana, reflecting, to a large degree, the structure of the economy depicted by the SAM matrixes for Botswana. MEMBOT has been a central planning tool in the Ministry of Finance and Development Planning for the last two decades.

[98] Note that electricity, although imported from RSA, is assumed essentially a non-tradable product. This is because the local electricity supplier, although itself importing electricity from RSA, is not facing any competition from abroad in supplying the local consumers. Botswana's electricity production is furthermore assumed to have no significant export potential over and above what little is already exported.

exporters. The traditional exports comprise Botswana's mineral and beef exports, while all other exports are classified as non-traditional.

ii) *Tradability ratio:* It is recalled from Annex A that tradable products are products that are either exported, or facing competition from imports in the home market. The tradability ratio expresses the amount of tradable products supplied by a given sector, expressed as a percentage of its total production. Two different sets of tradability ratios are given: local and total. The *local* ratios refer to each sector's total local sale of tradable products, in percent of its total local sale of tradable *and* non-tradable products; i.e. these ratios refer to *non-export* sales only. The *total* ratios refer to each sector's total local and foreign sale of tradable products, in percent of its total local and foreign sale of tradable and non-tradable products; i.e. these ratios refer to both export and non-export sales. The local ratios are exogenously specified, while the total ratios are functions of the local ratios and the export ratios of the SAM-based Input/Output matrix.

466. It is seen that the tradability ratios are in many cases assumed to be larger than 0%, but smaller than 100%, implying that the sectors in question are producing both tradable and non-tradable products. This follows from the fact that the production sectors of the Input/Output table are in general aggregates of many individual production activities, each of which is classified according to its *main activity*. Each sector therefore tends to produce many types of products, some of which may be quite non-characteristic to it. A typical producer of tradable products may consequently produce some non-tradable products, and vice versa. If this is the case, it would be incorrect to classify the products of the sector as either fully tradable or fully non-tradable.

467. Furthermore, even for fairly narrowly defined product groups, degrees of tradability may exist. For instance, domestic services are typically non-tradable, but if bought by foreign diplomats they are in principle exported. Similarly, retail trade services may be imported through RSA mail order firms etc. Such features are however of marginal importance, and largely ignored in the above percentages, which mainly reflect rough guesses as to the nature of the product mix of the various sectors.

468. The fact that sectors may produce non-characteristic products may also affect the traditional/non-traditional export dimension. Thus, a traditional export sector may in principle also export some non-traditional export products, and vice versa. This is however assumed to be a very marginal phenomenon, and is, for that reason, ignored.

A simple calculation example

469. A simplified example may serve to illustrate the way in which the input/output data are used to calculate the price increases for the domestic production sectors.

470. Assume that a given producer has the simple input structure given in column I of table AnxC,2 in some initial situation. His total production[99] value consequently equals 100 Pula, while his total operating costs, consisting of the cost of labour inputs, plus the cost of

[99] Total production = total gross output = total sales.

intermediate inputs purchased from other local producers and from imports, equals 80 Pula. The remaining 20 Pula represents the producer's own operating surplus.

471. Assume further that the price of inputs subsequently increases as indicated in column II, with the result that the new (inflated) costs are as given in column III. The producer's *total* operating costs have consequently increased from 80.0 to 85.8 Pula, i.e. by 7.2%.[100]

472. If these cost increases are seen by the producer as a reflection of a general inflationary trend, and his own output is sold in a market affected by this trend, he may have reason to expect that the market will allow him to increase his own prices to a similar degree. If so, he may increase his own sales price 100% pro-rata with the overall cost increase, with the implication that he will:

- pass all cost increases on to his own customers,
- safeguard his own profit margin.

473. Assuming that the producer behaves in this way, the last two estimates of column III may be calculated by inflating operating surplus and total gross output by 7.2%.

Table AnxC,2 : Calculation example

Inputs	I : Base costs	II : Cost-inflation	III : Inflated costs
Dom. Int. Inputs 1)	30.0	7.5%	32.3 2)
Imp. Int. Inputs 1)	20.0	10.0%	22.0 2)
Labour inputs	30.0	5.0%	31.5 2)
Total operating costs	80.0	7.2%	85.8 3)
Operating surplus	20.0	7.2%	21.4 4)
Total gross output	100.0	7.2%	107.2 4)

Notes:

1) Intermediate inputs bought from domestic sectors, and from abroad (imports).

2) Each individual cost element is inflated by its relevant (individual) price-index.

3) The sum of inflated costs is: 85.8, implying an overall cost inflation rate of 7.2% (85.8/80.0=1.072).

4) Operating surplus and total gross output are inflated pro-rata with the operating costs, i.e. by 7.2%.

474. Above we have illustrated the direct effects of cost increases faced by a given producer. But the full effect will normally exceed these direct effects. To illustrate this point, let us follow these price increases further, assuming that no unrelated price changes are introduced.

475. The initial 7.2% cost increase is first passed on to the producer's customers in the form of a similar price increase. If these customers are also producers, using the product in question as an input into their own production, they may react to the implied cost increase in the same way as described above. If so, they will pass *their* cost increase on to *their* customers, including our initial producer. In this way his own original price increase will "return" to him in the form of a further cost increase, but in a much diluted form. If he again reacts by increasing his price, new rounds of price and cost increases will follow, until the price effect has worked itself out completely.

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[100] Note that these cost increases are the effect of price increases on intermediate and labour inputs only, assuming a *constant* volume of production.

Input/Output based price functions

476. In the above illustration we have treated the various input costs etc. as absolute values expressed in Pula. While these represent the underlying basis for the input/output price calculations, the latter do in fact rely on the percentage input coefficients derived from the absolute values. This, however, represents no problem; the mathematics of the operations remains the same, the difference being that we deal with *average* costs per unit of production rather than with *absolute* production cost totals.

477. Furthermore, above we have looked at one producer only. In reality there are many producers, aggregated into several production sectors. All these sectors are in principle interlinked via their dependence upon each other for inputs and sales. The above cost-equation is therefore no more than a very aggregated illustration of one among several input-equations. Taken together these equations may form a rather large and complex simultaneous equation system, which may only be solved by matrix algebra or similar. To illustrate this point, let us investigate the problem from a more formal mathematical point of view.

478. Summing the input costs of each production sector, i.e. summing the row-entries of each column of the input/output matrix, we the get the following set of equations:

$ZZ_j = \text{Sum}(XX_{1j}+.....+XX_{nj}) + \text{Sum}(YY_{1j}+.....+YY_{mj})$; for $j = 1,.....,n$ [101]

where:

: X_{ij} represents the cost of sector-i-products used as intermediate inputs by sector j, as measured in the initial price; while XX_{ij} represents the same input cost measured in the inflated price.

: Y_{rj} represents the cost of primary production factor-r-inputs (wage or capital service) used by sector j, as measured in the initial price; while YY_{rj} represents the cost of the same input measured in the inflated price.

: Z_j represents the total value of production by sector j, as measured in the initial price; while ZZ_j represents the same output measured in the inflated price.

479. Inflated price values must equal the corresponding constant price values multiplied by the price index of the product (or primary production factor) in question. Hence:

$ZZ_j = P_j \cdot Z_j$
$XX_{ij} = P_i \cdot X_{ij}$
$YY_{rj} = Q_r \cdot Y_{rj}$

where:

P_j and P_i are the price indices for the products of sectors i and j

Q_r is the price index for primary production factor r.

480. The above equations may be re-written:

$P_j \cdot Z_j = \text{Sum}(P_1 \cdot X_{1j}+.....+P_n \cdot X_{nj}) + \text{Sum}(Q_1 \cdot Y_{1j}+.....+Q_m \cdot Y_{mj})$; for $j = 1,.....,n$

481. The standard input coefficients are:

$A_{ij} = X_{ij} / Z_j$ i.e. $X_{ij} = A_{ij} \cdot Z_j$
$A_{rj} = Y_{rj} / Z_j$ i.e. $Y_{rj} = A_{rj} \cdot Z_j$

[101] There is one such equation for each production sector. Each sector is represented by the general subscript: j. There are a total of n sectors. Hence, the equation system covering all sectors is specified by the typical equation for sector j, with the proviso: "for j=1,...,n", i.e. that j takes all values from 1 to n .

482. Introducing these coefficients into above equations, we get:

$$P_j * Z_j = Sum(P_1 * A_{1j} * Z_j + ... + P_n * A_{nj} * Z_j) + Sum(Q_1 * A_{1j} * Z_j + ... + Q_m * A_{mj} * Z_j)$$

i.e.: $$P_j = Sum(P_1 * A_{1j} + ... + P_n * A_{nj}) + Sum(Q_1 * A_{1j} + ... + Q_m * A_{mj})\ ;\ for\ j = 1,.....,n$$

i.e.: $$P_j - Sum(P_1 * A_{1j} + ... + P_n * A_{nj}) = Sum(Q_1 * A_{1j} + ... + Q_m * A_{mj})\ ;\ for\ j = 1,.....,n$$

483. The above result represent a simultaneous equation system, comprising a total of n equations. In order to "solve" this complex equation system (i.e. to find its reduced form), we will use matrix algebra.[102]

484. In matrix form, the equation system may be written:

$$P - (A^T * P) = W$$

i.e.: $$(E - A^T) * P = W$$

where:

A : the matrix of A_{ij} coefficients

A^T : the transposed A matrix, i.e. matrix of A_{ji} coefficients

P : the vector of P_j indices

W : the vector of inflated primary cost elements ($W_j = Sum(Q_1 * A_{1j} + ... + Q_m * A_{mj})$)

E : the unity matrix

485. Provided that $(E - A^T)$ is not singular, the solution is then given by:

$$P = (E - A^T)^{-1} * W$$

The overall price indices

486. The overall price indices presented in this paper are based on weights, which are based on the percentage distribution of the relevant variables, as implied by the adopted input/output table (see table 5,1 of Annex J). The various indices are described in Annex D.

[102] Alternatively, one may use an iteration procedure. This is the choice adopted for model III, because it is the more convenient method given the characteristics of the computer spreadsheet used.

Annex D

Model III : A combined and extended model

Introduction

487. In earlier annexes we have described:

- a simple framework for analysing inflation and exchange rates,
- a price formation model based on input/output technique.

We will now combine these two elements into a common framework. In so doing, the simple framework described in Annex B will be refined and expanded, and combined with the input/output structure described in Annex C. The resulting model structure is summarised below.

488. It should be emphasised that the model, being of the input/output type, is rich in structural detail, but also rigidly linear in nature. An alternative type of models, less rigidly linear but also less rich in structural detail, could of course have been adopted. In the present case, however, the input/output format has been chosen because it corresponds to the format of the MEMBOT model, to which an extended version of the current model may eventually be linked.

489. It should also be emphasised that the model is essentially static in nature. A static model may be described as a model of "perfect mobility, but no motion". It will in general spell out the implications of our assumptions, but not inform us how or when these results may be achieved. Thus, the typical static model will *not* tell us what happens at various intermediary stages before the final result is reached. Nevertheless, the present model do, to some extent, try to illustrate these stages. This is achieved by the introduction of a step-wise approach to wage-changes. These are not automatically accounted for by the model, but have to be introduced exogenously.

490. It should be noted that the model is highly "partial" in nature, concerned with the estimation of *price changes* only. It does not deal with any potential corresponding quantity changes or similar. It should also be noted that the model is solely concerned with the *relative* (percentage) value of these price changes, not with their corresponding absolute values.

491. There is therefore no need to specify the actual or absolute values of trade flows etc. within the model. The only such data relied on by the model are those given in the adopted input/output matrix, and even these are only used for the purpose of constructing relative weight structures etc.

492. The model instead specifies the magnitude of its various variables in the form of index values, measuring the relative change from an initial situation. The initial value of these variables consequently serve as index base values, i.e. they are represented by a unity value.

493. The relationship between the absolute values of the "real world" and the model's index values may be illustrated by the following simple example. Let Y be the absolute value of a given economic variable, and X its indexed representation within the model. The correspondence between the absolute value and its indexed representation, in its initial, its price-infla*ted* and its price-infla*tion* state, is then simply:

	Absolute value	Indexed model representation
Initial value:	Y^0	$X^0 = Y^0/Y^0 = 1.0$
Inflated value:	Y^1	$X^1 = Y^1/Y^0$
Inflation rate	$Y\% = (Y^1/Y^0)-1.0$	$X\% = (X^1/X^0)-1.0 = X^1-1.0$ $= (Y^1/Y^0)-1.0 = Y\%$

494. For instance, an initial absolute value of 50 Pula and an inflated value of 55 Pula, will give the following representation:

	Absolute value	Indexed model representation
Initial value:	$Y^0 = 50$	$X^0 = 50/50 = 1.00$
Inflated value:	$Y^1 = 55$	$X^1 = 55/50 = 1.10$
Inflation rate	$Y\% = (55/50)-1.0$ $= 0.1 = 10\%$	$X\% = (1.1/1.0)-1.0 = 1.1-1.0$ $= 0.1 = 10\%$

The model equations

a. Standard convention

495. The following standard convention has been used for the below presentation:

Let X represent a given model variable. The initial, price-infla*tion* and price-infla*ted* values of X will be referred to as follows:

(X^0 : the initial value)
X% : the price inflation rate affecting X^0
X : the price inflated value of X^0

The following standard relationships will apply for these variables:

($X^0 = 1.0$)[103]
$X\% = (X / X^0) - 1.0 = X - 1.0$
$X = X^0 * (1 + X\%) = (1 + X\%)$

b. General factors

i. General RSA inflation

496. The general inflation rate in the RSA market is assumed to influence local, export and import prices equally. In other words, it is assumed to decide both the increase in the Rand designated (FOB) price of Botswana imports from RSA, and the increase in the local market price faced by Botswana exports to RSA.[104]

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[103] Since X^0 is always equal to 1.0 it is unnecessary to specify it in below model description.

[104] Note that this price is not necessarily equal to the price of Botswana's exports to RSA. Rather, it is the price against which they compete in the RSA market.

497. The RSA inflation rate is one of the basic variables of the model, assumed to induce inflation into the Botswana economy. The model's rational is to investigate the extent to which this may happen when alternative assumptions are specified *inter alia* in respect of this rate. It is consequently exogenously given.

Hence: *General RSA inflation index:*
% change from base: GRI% = exogenous
Inflated index value: GRI = (1+GRI%)

ii. Exchange rate changes

498. The RSA inflation rate is not imported directly into Botswana; it is first "filtered" through the Rand/Pula exchange rate. Changes in the Rand/Pula rate may therefore be used by the Botswana authorities to modify (or magnify) the RSA inflation impulse. As such it is crucial to the present model. The change in the Rand/Pula exchange rate is therefore treated as a basic (exogenously specified) action parameter. The change in the Rand/$ exchange rate is also given exogenously. It is not an action parameter, but a basic factor underlying the model simulations.

Hence: *Rand/$ exchange rate index:*
% change from base: EXRD% = exogenous
Inflated index value: EXRD = (1+EXRD%)
Rand/Pula exchange rate index:
% change from base: EXRP% = exogenous
Inflated index value: EXRP = (1+EXRP%)
Pula/$ exchange rate index:
Inflated index value: EXPD = EXRD/EXRP
% change from base: EXPD% = EXPD - 1.0

iii. CIF-cost inflation

499. The CIF-costs refer to the cost of transport, insurance etc. incurred on Botswana's trade with RSA.[105] They apply to both imports and exports, and are treated as if they were payable in Rand, and subject to the general RSA inflation rate.[106]

Hence: *CIF-cost inflation index:*
% change from base: CCI% = GRI%
Inflated index value: CCI = (1+CCI%)

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[105] CIF-costs do of course also arise on Botswana's traditional exports to the rest of the world, but these exports are treated differently from the trade with the RSA. The above specified CIF-costs only apply to trade with the RSA.

[106] The adopted treatment of CIF-cost represents a simplification of the actual facts. According to information received Botswana has negotiated a sharing of transport and insurance opportunities on its trade with RSA. Even so, the model treats the CIF-services as if they were all supplied by RSA firms, because this has a significant technical advantage in terms of modelling, while the implied error is quite marginal to the overall results.

c. *Botswana imports*

i. Changes in the Rand designated border price of imports

500. The Rand designated border price of imports to Botswana refers to the full CIF-value of these imports, which equals the sum of the RSA export price (at FOB value), plus the CIF cost element. The latter is assumed equal to a given percentage (cf) of the FOB value. The value of the cf-ratio remains unchanged (at 5%) throughout the current analysis. The inflation factor for the Rand designated border price may then be calculated as the weighted average of the corresponding inflation factors for the two cost elements, with weights equal to: 1/(1+cf) and cf/(1+cf).

Hence: *Rand border price index for imports:*
Inflated index value: RBI = (1*GRI + cf*CCI) / (1+cf)
% change from base: RBI% = RBI - 1.0

ii. Changes in the Pula designated border price of imports

501. The Pula designated border price of imports to Botswana refers to the above price, as directly converted to Pula.

Hence: *Pula border price index for imports:*
Inflated index value: PBI = RBI / EXRP
% change from base: PBI% = PBI - 1.0

iii. Changes in the local market price of imports

502. The local market price of imports refers to the Pula designated tax-inclusive price of imports from RSA. The latter is equal to the Pula designated border price, plus the cost of the tax element.[107] The tax element is assumed equal to a given percentage (dt) of the Pula designated border value of the imports. dt remains unchanged throughout this analysis. Since the tax element represents a constant ad valorem mark-up on the border price, it must increase 100% pro-rata with the border price. The inflation factor for the local market price, which is the weighted average of the two cost elements, must consequently also equal the inflation factors for the border price (irrespective of the value of dt).

Hence: *Market price index for imports:*
Inflated index value: MPI = {(1*PBI + dt*PBI) / (1+dt)} = PBI
% change from base: MPI% = MPI - 1.0

d. *Domestic production*

i. Changes in domestic factor price for labour

503. The average wage rate increase is given as an exogenous variable. Each wage increase represents the assumed outcome of wage negotiations held in response to prior cost of living increases etc. The model only allows for one wage increase variable, affecting all sectors.

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[107] The tax element covers the price rising effect of import related taxes, not the general sales tax applicable to all products sold in the local market. The latter is the same for imports and local products, and is therefore left out of the present model. Note that there is at present no import duty payable on imports from the RSA. This section of the model is therefore not relevant to the present simplified analysis. It is introduced in preparation for an extended analysis, taking into account imports from outside the Common Customs Area.

Hence: *Average wage rate index:*
% change from base: WAG% = exogenous[108]
Inflated index value: WAG = (1+WAG%)

ii. Changes in domestic factor price for capital

504. The Gross Operating Surplus (GOS) of individual production sectors is used to represent their return to capital. GOS is estimated within the model, through the input/output based price functions. The "cost-plus" ratios: CPR(i) are essential to these calculations. They represent the degree to which the producers increase their own sales prices when faced with given cost increases.[109]

Hence: *Gross Operating Surplus indices: (for production sectors: i = 1,..,16)*
Inflated index value: GOS(i) = IO(DPP(i), MPI, WAG, CPR(i))[110]
% change from base: GOS(i)% = GOS(i) - 1.0

iii. Changes in individual domestic product prices

505. All individual domestic sector prices, *exclusive* of the prices of traditional exports, are estimated within the model, using the type of input/output based price functions described in Annex C.

Hence: *Domestic sector price indices: (for production sectors: i = 1,..,16)*
Inflated index value: DPP(i) = IO(DPP(i), MPI, WAG, GOS(i))[111]
% change from base: DPP(i)% = DPP(i) - 1.0

e. Non-traditional exports

i. Changes in the local FOB price of non-traditional exports

506. The local FOB price of Botswana's non-traditional exports refers to their average (Pula designated) producer price. This price is calculated as the weighted average of the domestic product prices (DPP(i)), with weights equal to the sector distribution of non-traditional exports (as given in the adopted 1992/93 input/output table).

Hence: *Pula designated producer price index for non-traditional export:*
Inflated index value: PPE = IO(DPP(i))
% change from base: PPE% = PPE - 1.0

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[108] The fact that we have specified WAG% as an exogenous variable implies that we have to calculate the full wage impact using a step-by-step procedure. This may seem unnecessarily cumbersome compared to the alternative of "endogenising" the wage increase, i.e. of treating it as an endogenous function of the cost of living increase, given an exogenously specified compensation coefficient. However, we have deliberately refrained from doing so, in order to be able to study the step-by-step effects of wage compensation. We may interpret this as an attempt to "dynamise" the static model framework.

[109] The value of the "cost-plus" ratios may be altered at will, but present results all reflect a ratio of 100%.

[110] IO(...) is here used to indicate a functional relationship through the structure of the input/output matrix. The equation: A = IO(B) consequently implies that variable A is a function of variable B via the input/output structure. Hence, the equation implies that GOS(i) is calculated as a function of all local market price indices for domestic and imported products, the wage rate index, and the "cost-plus" ratios, *given* the structure of the adopted input/output matrix.

[111] DPP(i) is calculated as an IO-function of all price indices, including DPP(i) itself, and of the GOS indices, who in their turn are dependent upon the DPP indices. The DPP and GOS indices are therefore calculated simultaneously, in an iterative process.

ii. Changes in the Rand designated FOB price of non-traditional exports

507. The Rand designated FOB price of Botswana's non-traditional exports refers to the above average Pula price, as converted to Rand.

Hence: *Rand designated producer price index for non-traditional exports:*
Inflated index value: RPE = PPE * EXRP
% change from base: RPE% = RPE - 1.0

iii. Changes in the Rand designated border price of non-traditional exports

508. The Rand designated border price of Botswana's non-traditional exports to RSA refers to their full CIF-value, i.e. to the above (Rand designated) export price at FOB value plus the CIF cost element. The latter is assumed equal to a given percentage (cf) of the FOB value. The cf-ratio is the same as already introduced for imports; it is consequently assumed to remain unchanged throughout the current analysis. The inflation factor for the Rand designated border price may then be calculated as the weighted average of the corresponding inflation factors for the two cost elements, with weights equal to: 1/(1+cf) and cf/(1+cf).

Hence: *Rand designated border price index for non-traditional exports:*
Inflated index value: RBE = (1*RPE + cf*CCI) / (1+cf)
% change from base: RBE% = RBE - 1.0

iv. Changes in the RSA market price of non-traditional exports

509. The RSA market price for Botswana's non-traditional exports refers to the average (Rand designated) duty-inclusive price. This is equal to the Rand designated border price, plus the cost of the RSA import duty.[112] The duty element is assumed equal to a given percentage (dt) of the Rand designated border value of the exports. dt remains unchanged throughout this analysis. Since the duty element represents a constant ad valorem mark-up on the border price, it must increase 100% pro-rata with the border price. The inflation factor for the local market price, which is the weighted average of the two cost elements, must consequently also equal the inflation factors for the border price (irrespective of the value of dt).

Hence: *Market price index for non-traditional exports:*
Inflated index value: RME = RBE
% change from base: RME% = RME - 1.0

f. Traditional exports

i. Changes in the $-designated border price of traditional exports

510. Botswana's traditional exporters are assumed to be price-receivers in the international market; i.e. the $ designated prices obtained on such exports are assumed given by the world market or similar.[113] This being the case, these prices, or their average movement, can not be

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[112] There is in fact no duty payable on these exports. See the prior note about Botswana import taxes.

[113] Strictly speaking, a "world market" price is not a Botswana border price. For instance, the export price for beef is typically decided by the market price for beef in Europe. However, the transport charges etc. for the traditional exports are assumed provided by foreign firms, reflecting prices that are outside Botswana's control. The only prices relevant to our present analysis are those actually earned by the Botswana exporters. We may therefore, for the sake of simplicity, "net out" the price effect of these costs in our exogenous price data, concentrating our attention directly on the border price that is actually earned by the Botswana exporters.

derived within the model; exogenous specification is required.

Hence: $-designated border price index for traditional exports:
% change from base: DBE% = exogenous
Inflated index value: DBE = (1+DBE%)

ii. Changes in the Pula-designated border price of traditional exports

511. The Pula designated border price of traditional exports refers to the above price, as directly converted to Pula.

Hence: *Pula-designated border price index for traditional exports:*
Inflated index value: PBE = DBE * EXPD
% change from base: PBE% = PBE - 1.0

g. Overall indices

i. Changes in the Cost of Living index

512. The Cost of Living index (COL) is calculated from above market prices of domestic products (DPP(i)) and imports (MPI), using weights representing the private consumption expenditures (as given in the adopted 1992/93 input/output table).[114]

Hence: *Cost of Living index:*
Inflated index value: COL = IO(DPP(i), MPI)
% change from base: COL% = COL - 1.0

ii. Changes in the Gross Output price index for local price-setter products

513. The price index for local price-setter products refers to the Gross Output price of domestic production, excluding traditional exports. It is calculated as the weighted average of the domestic product prices (DPP(i)), with weights equal to each production sector's total production *net of* traditional export sales[115] (as given in the adopted 1992/93 input/output table).

Hence: *Gross Output price index for local price-setter products:*
Inflated index value: TGO = IO(DPP(i))
% change from base: TGO% = TGO - 1.0

iii. Changes in the production price index for tradables sold in home market

514. The production price index for tradables sold in home market is calculated as the weighted average of the domestic product prices (DPP(i)), with weights equal to each production sector's total local sale of tradable products. The latter reflects the sector's total local sales (as given in the 1992/93 input/output table), and the assumed tradable share hereof (as given in Annex C).

Hence: *Production price index for tradables sold in home market:*
Inflated index value: PPH = IO(DPP(i))
% change from base: PPH% = PPH - 1.0

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[114] The Cost of Living (COL) index should in principle be equivalent to the Consumer Price Index (CPI) of the Central Statistics Office, but the adopted weight structures of the two may in practice differ slightly.

[115] Also the traditional exporter sectors may have *some* local sales. For instance: BMC is selling beef to the home market. The sectors in question are treated as price-setters with respect to such sales.

h. Some measures of overall price gains

i. Profitability gains, earned by Botswana's traditional exporters

515. The profitability gains earned by Botswana's traditional exporters measure the percentage increases in the total Gross Operating Surplus (GOS) of the mining and beef sectors. These increases, which may be positive, nil or negative in value, are expressed both in nominal and real terms.

516. A GOS-increase is measured relative to its initial value; i.e. it measures the relative increase in the sector's GOS resulting from a change in its (Pula term) sales incomes and operating cost outlays. These changes are themselves functions of underlying changes in exchange and inflation rates, relative to the initial situation.

517. A positive profitability gain implies an improvement in the profitability situation, and a negative a deterioration. It does not, however, follow that a positive profitability gain necessarily implies a comfortable overall profitability situation, or a negative gain an uncomfortable situation. This will depend on the profitability status of the producers concerned in the initial situation.

518. The profitability gains are calculated as follows:

- in nominal terms: PROFITN% = (GOS2 / GOS1) - 1.0
- in real terms: PROFITR% = {(GOS2/TDUD) / GOS1} - 1.0

where:

GOS1 = The initial value of total Gross Operating Surplus in traditional export sectors (*before* the introduction of inflation and exchange rate changes).

GOS2 = The subsequent value of total Gross Operating Surplus in traditional export sectors (*after* the introduction of inflation and exchange rate changes).

TDUD = Total Domestic Use Deflator, calculated as the ratio: TDU2/TDU1, where TDU2 is the inflated value of Botswana's total domestic use of goods and services *after* the introduction of inflation and exchange rate changes, and TDU1 the corresponding value *before* the introduction of these changes.

GOS1, GOS2 and TDUD are all calculated using the input/output estimates.

ii. Competitive gains, earned by Botswana's producers of non-traditional tradable products

519. A competitive gain may refer to the home or export market. The gain secured in a given market reflects the average *price advantage* gained by Botswana products, over the competing RSA products, in that particular market. The price advantage, which may be positive, nil or negative, reflects the difference in the *price increase* on products from Botswana and RSA.

520. The price advantage is expressed as a percent of the new (inflated) RSA price. For instance, a 2% gain imply that the new (inflated) price of Botswana products are 2% below the new (inflated) price of RSA products.

521. The model's basic price data are all given as price indices, with the price level of the initial situation as the index base. Hence, the price data are all relative to the initial price-

situation. The gain implied by these price data must therefore also be relative to the initial situation.

522. A positive gain consequently implies a positive *change* in the competitive situation of the Botswana producers, i.e. an improvement in their competitive situation. But it does not follow that the competitive situation itself, although improved, is necessarily a secure or comfortable one. This will depend on the absolute competitive strength of the Botswana producers in the initial situation.

523. The competitive gain earned in the Botswana *home market* reflects the average price advantage earned by local tradable products over imports in this market. The price advantage reflects the difference in the price increase of local Botswana products versus imports from the RSA, expressed as a percentage of the RSA import price. All prices are measured in the currency of the local market, i.e. in Pula. Botswana's competitive gain in the home market is calculated as: BCGHM% = (MPI% - PPH%) / MPI

524. The competitive gain earned in the *export market* reflects the average price advantage gained by Botswana (non-traditional) exports over local RSA products in the RSA market. The price advantage reflects the difference in the price increase of Botswana exports versus local RSA products, expressed as a percentage of the local RSA price. All prices are expressed in Rand. Botswana's competitive gain in the export market is calculated as:

BCGEX% = (GRI% - RME%) / GRI

Annex E

Alternative treatment of non-traditional producers

Introduction

525. In the main part of this paper all Botswana producers of non-traditional tradable products are treated as price-setters. The price-setter assumption represents a fairly standard input/output assumption, corresponding for instance to the price formation functions of the MEMBOT model. The essential rational of the assumption is to allow producers to be treated as "cost-pushers", i.e. to calculate inflated sales prices on the assumption that producers faced with cost increases will typically push the added costs on to their own customers in the form of higher prices. It is a fairly rough and "mechanical" assumption, admittedly paying more attention to mathematical convenience than to any proper "theory of producer behaviour" reflecting for instance profit maximisation under conditions of given demand functions.

526. The price-setter assumption may be challenged. Thus, a counter argument holds that all producers of Botswana tradable products, both traditional and non-traditional, and both exports and local sales, ought to be treated as price-receivers. If so, one have to accept that the Botswana producers of tradable products are faced with readily recognisable prices of corresponding RSA products, and that they adopt the changes in these prices as their own, without any attempt at deviating from it, in much the same way as the non-traditional exporters are restricted to accept the "world market" price in the present analysis. Also this amounts to a fairly rough and "mechanical" assumption. It nevertheless has considerable merits, and is for that reason briefly analysed below.

527. The analysis is given in terms of scenarios directly comparable to those presented in the main text. For ease of reference, we refer to the scenarios specified in the main text as "the original scenarios", while the comparable scenarios, in which all producers of tradable products are treated as price-accepters, are referred to as "the alternative scenarios".

528. Tables E,1 to E,6 of Annex J summarise the results obtained for these scenarios, and allow for easy comparison with the corresponding results obtained in the original scenario specification. The latter are given in section B of the tables, and the alternative results in section C.

529. Note that the alternative results (section C of each table) contain no competitive gain estimates. Such gains do not apply in the alternative scenario specification, because price competition is ruled out by the assumption that all producers of tradable products are price-accepters. Events that result in competitive gains when producers are treated as price-setters, therefore show up as profitability gains when they are treated as price-accepters.

530. Section C of these tables also specifies the profitability gains of the local non-tradable producers. These gains were ignored in original scenario. The price setting behaviour of these producers were then in line with other sectors supplying the local market, and their price movements largely in line with the overall local inflation trend. In the alternative

scenario specification this correspondence no longer applies. It may therefore be of some interest to include also these sectors in the analysis.

Alternative scenario no: 1

531. The basic assumptions of the alternative version of scenario 1 are:

- All RSA prices increase by a uniform 10%.
- All nominal exchange rates remain unchanged.
- The price of traditional exports, as measured in $, remains constant.
- All Botswana producers of non-traditional tradable products are price-accepters, adopting the market prices of their RSA counterparts. All other producers are specified as in the original scenario. Hence, the producers of traditional exports are price-accepters, accepting prices set by the world market or similar, while the producers of non-tradable products are price-setters, inflating their sales prices 100% pro-rata with their cost increases.

a. Alternative scenario results

532. Table E,1 (Annex J) summarises the results for this scenario. The price of imports into Botswana, as measured in supplier's price (i.e. in Rand-prices), increases by 10%. Since the Rand/Pula exchange rate remains constant, this will translate directly into a 10% price increase in the receiver's price (i.e. in the Pula-prices). This price increase is assumed to apply also to comparable local products. The result is significant local inflation. Given the adopted input/output structure of the economy, and assumed "cost-plus" reaction of local non-tradable producers, these price effects imply a 7.5% increase in the Cost of Living (COL) of Botswana households. This is considerable above the 5.4% initial COL effect obtaining in the original scenario. (See: table E,1; col.1A).

533. The Botswana work force is consequently faced with an inflation rate of 7.5%, for which it will want wage compensations. Below, we will study the effects of the following alternatives: no compensation (0%), full compensation (100%), and partial compensation (50%).

*i. Alternative scenario 1, assuming **no** wage compensation*

534. If no wage compensation is given, the economy will face no further inflationary pressure resulting from the initial import price increase. The average Botswana producer of non-traditional tradable products will as a result earn a significant profitability gain, equal to 37.3% in nominal terms, and 28.4% in real. These gains compares to the 5.0% competitive gain resulting in the original scenario.[116]

535. The losers in this process are the Botswana employees, the traditional exporters, and the producers of non-tradables. Thus:

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[116] Note that these results do not distinguish between the home and export market. The presented estimates refer to the total of these markets.

i) The employees lose 7.0% of their income in real terms, due to the cost of living increase of 7.5%.[117]

ii) The operating surplus of the traditional exporters is squeezed between increased operating costs and constant sales prices. Given, however, that their operating costs are on average fairly small compared to their total sales incomes, they will only face a modest profitability loss of 0.3% in nominal terms. Inflation has however deteriorated the real value of their total operating surplus; the modest nominal loss therefore corresponds to a 6.8% profitability loss in real terms. The significant real term profitability loss recorded for these exporters consequently results from general inflationary factors, deteriorating the purchasing value of their earnings, rather than from increases in operating costs.

iii) The producers of non-tradables are also hurt by inflation. Under current assumptions, they do increase their prices in reaction to cost increases, but since these cost increases are lower than the general inflation trend, they do not increase their prices sufficiently to safeguard the real value of their operating surplus.[118]

*ii. Alternative scenario 1, assuming **full** wage compensation*

536. If the wage rate of the Botswana work force is increased by 7.5%, this immediately increases the operating costs of the Botswana producers. In the present alternative, the producers of tradable products can not compensate for these cost increases by rising their sales prices. Instead they have to finance them out of their operating surplus. Increased wages therefore generate no further COL inflation from these producers, only profitability gain reductions. The producers of non-tradable products are however assumed to react to cost increases by increasing their sales prices 100% pro-rata with the operating costs. Additional inflation is therefore generated throughout the economy, but relatively less than in the original scenario.[119] Thus, the rate of COL inflation rises 9.4% (see: table E,1; col.1A(1)). If wages are again increased to compensate for the additional inflation, further inflation results (see: table E,1; col.1A(2), (3), (4) etc.).

537. If this process is brought to its logical end, domestic inflation and wage increases will balance out at 10% (see: table E,1; col.1B), i.e. at the same rate as the original import price-

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[117] The relevant indices have changed as follows due to the introduction of the changes in prices etc.:

	I: Before	II: After	III: Change (II-I)
A: Nominal wage index	1.000	1.000	0.000
B: COL price index	1.000	1.075	0.075
C: Real wage index (C=A/B)	1.000	0.930	-0.070 = -7.0%

(NB: I = Initial situation; II = Situation after changes; III = Change from initial situation (III=II-I)).

[118] This may seem to suggest that these producers ought to be assumed to increase their prices by the overall inflation factor, rather than by their own cost inflator. If so, the above described loss would disappear, and the COL increase would rise above 7.5%. A large part of this production is however government production, and do not appear to follow market trends too closely or quickly. On the whole it seems uncertain exactly how, when and to what extent government will inflate their own prices in reaction to inflation. Given this uncertainty, and the fact that the loss is erased in subsequent inflation rounds (see col. 1B), no attempt has been made to refine the assumptions for these sectors.

[119] In the original scenario, the first round of wage increases changes the COL inflation rate from 5.4% to 7.9% (see section B of table E,1; col.: 1A and 1A(1)). This represents a 46% increase in the inflation rate [(7.9 - 5.4) / 5.4 = 0.46]. The corresponding increase in the alternative scenario, specified in section C of the table, is 25% [(9.4 - 7.5) / 7.5 = 0.25].

impetus. These price increases will translate into operating cost increases, which exactly offset the initial profitability gains of the producers of non-traditional tradable products. These producers will consequently end up being no better or worse off than in the initial situation. The same applies for the producers of non-tradable products. The traditional exporters, however, will lose heavily as a result of the inflated cost level. In real terms, their operating surplus will fall by 10.9%.

*iii. Alternative scenario 1, assuming a **partial** wage compensation*

538. Repeated 50% wage compensations will eventually result in a 4.3% wage increase, and a 8.6% increase in the cost of living index (see: table E,1; col.1C). This allows the domestic producers of tradables to reap a permanent profitability gain of 16.0% in real terms. The traditional exporters are again facing profitability losses, as a result of the inflated price level. In nominal terms, their operating surplus will fall by 1.1%, which translates into a 8.6% loss in real terms. Also the producers of non-tradable products are facing reverses; under present assumptions they will increase their operating profits by 6.6% in nominal terms, which is below the general inflation rate.

b. Similarities and differences

539. The above results are seen to support the basic conclusions drawn from the original version of this scenario. Thus:

i) Pegging the Pula to the Rand gives local inflation, the greater the higher the degree of wage compensation is.

ii) Full wage compensation will eventually results in a no-gain no-loss situation for the Botswana producers, except for the producers engaged in traditional exports.

iii) Partial or no wage compensation will bring the Botswana producers of tradables lasting benefits, except for the producers of traditional exports.

iv) The traditional exporters will be loser, partly because their operating surplus is squeezed between increased operating costs and constant sales incomes, but mostly because the real value of their operating surplus is undermined by inflation.

540. But there are also some noteworthy differences between the original and the alternative scenario. Thus:

i) The alternative scenario accelerates the inflation process. The initial inflation impact amounts to 75% of the imported inflation impact in the price-receiver alternative, versus 54% in the price-setter alternative. Moreover, under conditions of full wage compensations, the former alternative implies that 94% of the total (10%) COL effect is accounted for after the first round of wage increases, and 98% after the second, versus 79% and 90% in the original scenario.

ii) The initial profitability losses of the traditional exporters are slightly different from their values in the original scenario. The real loss is slightly higher, because the local inflation rate is higher, while the nominal loss is slightly lower.[120] The end results, given full wage compensations, are however the same as in the original scenario.

Alternative scenarios no: 2 to 6

541. Tables E,2 to E,6 of Annex J summarise the results obtained for scenarios 2 to 6. The nature of these results is quite similar to the nature of the results detailed above. A detailed discussion of tables E,2 to E,6 is therefore not required. Instead we shall summarise our general findings as follows:

i. Inflation

542. The immediate effect of changing from a price-setter to a price-accepter assumption (with respect to the non-traditional producers of tradable products) is to accelerate the inflation process. Thus, the initial inflation impact of the alternative (price-accepter) scenarios always exceeds the corresponding impact in the original (price-setter) scenarios; i.e. it is always higher in the case of a positive impact, and lower in the case of a negative. If full wage compensation is given, the final inflation impact will however always be the same under the two scenario specifications.

ii. Non-traditional producers of tradable products

543. The initial competitive gains earned by the non-traditional tradable producers in the original scenario specification, translate into parallel initial profitability gains in the alternative scenario specification. A positive competitive gain translates into a positive profitability gain. The larger the competitive gain is, the larger the parallel profitability gain will be. Similarly, a zero or negative competitive gain translates into a zero or negative profitability gain. Irrespective of scenario specification, the initial gains will eventually be erased if full wage compensations are granted.

iii. Traditional exporters

544. Also the initial profitability gains of the traditional exporters follow each other in the two scenario specification. If the gain is positive in the original scenario specification, it will also be positive in the alternative scenario specification; and similarly for zero and negative gains.

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[120] One might perhaps have expected that also the nominal profitability loss would have been larger than in the original scenario specification, given that the operating costs have increased more as a result of the higher inflation rate. However, the estimated profitability effect refers to the entire mining and beef industry, which includes some minor activities additional to the production of traditional exports. In the original scenario specification these activities are treated as price-setters, i.e. the profits earned on them are inflated by the same percentage as the costs (i.e. roughly by 4%). In the alternative scenario specification, the cost-plus formula is only applied to the non-tradable part of these products. The rest are price inflated by the full 10% "prescribed" by the import price increase. Hence, the average price increase on these products are significantly higher than in the original scenario specification. This implies a partial gain, which more than offsets the partial loss resulting from the additional increase in operating costs within the sector.

545. This rule applies for the direction of the gains, not to their value. The value of the gains will in general differ somewhat in the two cases, because the local inflation rate differs. In the majority of cases analysed in tables E,1 to E,6 the alternative scenario specification is seen to yield gains exceeding those of the original scenario specification, but the opposite is also observed.

546. This reflects the combination of inflation and exchange rates specified for the scenario in question. Thus:

i) If a given combination of inflation and exchange rates is advantageous to the non-traditional producers of tradable products , i.e. if it brings them competitive gains, it will *ceteris paribus* be detrimental to the traditional exporters, i.e. it will give them reduced profitability gains, or increased losses.

ii) Similarly, a combination of inflation and exchange rates detrimental to the non-traditional producers (i.e. giving them competitive losses), will *ceteris paribus* be advantageous to the traditional exporters, giving them increased profitability gains, or reduces losses.

547. The above rules apply to the immediate gains, not to the final gains. Irrespective of scenario specification, any initial gain difference will eventually be erased if full wage compensations are granted.

Annex F

Gain targeting

Introduction

548. In model I (see Annex B) we found that Botswana may maintain "price parity" vis-à-vis RSA by adjusting the Rand/Pula exchange rate according to the following formula:

$$(1+ER\%) = (1+R\%) / (1+P\%)$$

where : ER%: the percentage change in the Rand/Pula rate required to maintain price equality in the face of inflation.
: P%: Botswana's inflation rate (affecting local sales and exports alike)
: R%: RSA's inflation rate (affecting local sales and exports alike)

549. If Botswana wants to maintain price parity vis-à-vis RSA, it should consequently react to the new price situation by adjusting the exchange rate according to the *relative difference* in the inflation rates. Thus:

- If the two inflation rates are equal, the Rand/Pula exchange rate should be kept constant.
- If the RSA inflation rate is *higher* than the Botswana inflation rate, the Rand/Pula exchange rate should be *increased*, i.e. the Pula should be *revalued* against the Rand.
- If the RSA inflation rate is *lower* than the Botswana inflation rate, the Rand/Pula exchange rate should be *decreased*, i.e. the Pula should be *devalued* against the Rand.

550. Does a similar relationship apply also in model III? To investigate above question we must first rearrange the equations of Annex D somewhat.

Equations

551. From Annex D we note that:

$$CCI\% = GRI\%$$
$$\text{and:} \quad CCI = (1+CCI\%)$$
$$\text{Hence:} \quad CCI = (1+GRI\%) = GRI$$

$$\text{Furthermore:} \quad MPI = PBI$$
$$\text{and:} \quad PBI = RBI / EXRP$$
$$\text{and:} \quad RBI = (1*GRI + cf*CCI) / (1+cf)$$
$$= (1*GRI + cf*GRI) / (1+cf) = GRI$$
$$\text{Hence:} \quad MPI = GRI / EXRP$$

Furthermore: RME = RBE
and: RBE = (1*RPE + cf*CCI) / (1+cf)
= (RPE + cf*GRI) / (1+cf)
and: RPE = PPE * EXRP
Hence: RME = (PPE*EXRP + cf*GRI) / (1+cf)

552. Therefore: BCGHM% = (MPI% - PPH%) / MPI
= {(1+MPI%) - (1+PPH%)}/MPI
= (MPI-PPH) / MPI = 1.0 - (PPH / MPI)
= 1.0 - PPH / (GRI / EXRP)
= 1.0 - (EXRP * PPH) / GRI
Hence: (1 - BCGHM%) = EXRP * PPH / GRI
and: EXRP = (1 - BCGHN%) * (GRI / PPH)
and: EXRP% = (1 - BCGHN%) * (GRI / PPH) - 1.0

553. Furthermore: BCGEX% = (GRI% - RME%) / GRI
= {(1+GRI%) - (1+RME%)} / GRI
= (GRI - RME) / GRI = 1.0 - (RME / GRI)
= 1.0 - {(PPE*EXRP + cf*GRI)/(1+cf)} /RI
= 1.0 - (PPE*EXRP + cf*GRI) / (GRI*(1+cf))
= 1.0 - (PPE*EXRP) / (GRI*(1+cf)) - cf/(1+cf)
= 1/(1+cf) - (EXRP*PPE) / (GRI*(1+cf))
Hence: {1/(1+cf) - BCGEX%} = (EXRP*PPE) / (GRI*(1+cf))
i.e.: {1/(1+cf) - BCGEX%}*(1+cf) = (EXRP*PPE) / GRI (Since: cf > 0.0)
i.e.: {1-(1+cf)*BCGEX%} = (EXRP*PPE) / GRI
and: EXRP = {1-(1+cf)*BCGEX%} * (GRI/PPE)
and: EXRP% = {1-(1+cf)*BCGEX%} * (GRI/PPE) - 1.0

The home market

a. Conditions for status quo

554. From above we have the following reformulated model III equation relating to the Botswana home market for tradable products:

BCGHM% = 1.0 - EXRP * PPH / GRI
i.e.: EXRP = (1 - BCGHN%) * (GRI/PPH)
where: BCGHM% : Botswana's competitive gain in the home market
EXRP : Rand/Pula exchange rate index
PPH : Average production price index for tradables sold in the home market
GRI : General RSA inflation index

555. The formula: EXRP = (1-BCGHN%)*(GRI/PPH) is seen to resemble the corresponding formula from model I, the only obvious difference being that it allows for an element representing the competitive gain (BCGHN%). This variable is however zero if we assume that the goal is price-parity with the initial situation, as was the case in model I.

556. Given price-parity we consequently get the following equation, directly corresponding to the model I equation:

$$EXRP = GRI / PPH \quad \text{i.e. } (1+EXRP\%) = (1+GRI\%) / (1+PPH\%).$$

557. There is nevertheless a fundamental difference between the above formula and the corresponding formula of model I. In model I we assumed that RSA and Botswana inflation rates were exogenously given, i.e. they were treated as if they were independent of each other, and of the exchange rate. In model III in contrast, the Botswana inflation rate (PPH%) is derived as a function of both the RSA inflation rate and the exchange rate.

558. This has implications for how these formulas might be translated into practical actions. If the relevant economic relationships were as simple as described in model I, the Botswana authorities could achieve their goal by adjusting the Rand/Pula exchange rate in "one go". Given that the reality is more complex than described in model I, however, this is not a practical option. The Botswana authorities can not rely on above formula to adjust the exchange rate in "one go" because any change in the exchange rate relating to present inflation rates will cause the Botswana inflation rate to change. Instead they may use the formula as a guideline for adjusting the exchange rate in an iterative process, approaching the goal by degree.

b. Conditions for given types of gains

559. Above we have studied the conditions for maintaining a competitive status quo situation in the face of price changes. But what if the Botswana authorities want to secure a given level of gain, or want to know what kind of gain will result from a given de/revaluation? To answer these questions, we return to the formula: BCGHM% = 1.0 - EXRP*PPH/GRI

560. The general condition for obtaining a positive, nil or negative competitive gain is consequently: BCGHM% $>=<$ 0.0 [121]

if, and only if: {1.0 - EXRP * PPH / GRI} $>=<$ 0.0
i.e.: if: 1.0 $>=<$ EXRP * PPH / GRI
i.e.: if: GRI / PPH $>=<$ EXRP (since: GRI > 0.0 and PPH > 0.0)
i.e.: if: EXRP $<=>$ GRI / PPH
i.e.: if: (1+EXRP%) $<=>$ (1+GRI%) / (1+PPH%).

i. Single factor analysis

561. We shall first look at the *ceteris paribus* conditions for achieving a given competitive gain, allowing for manipulations of the exchange rate only. Or, alternatively, we shall analyse the gain effect of re/devaluing the Pula, concentrating our attention solely upon the effects of the re/devaluation itself.

562. In doing so, we are disregarding any price movements prior to the de/revaluation. We may do so mathematically by setting the price changes of the above formula to zero, i.e. by assuming, for the purpose of the present analysis, that: GRI% = PPH% = 0.0.

Doing so, we get: BCGHM% $>=<$ 0
if, and only if: (1+EXRP%) $<=>$ (1+GRI%) / (1+PPH%) = (1+0)/(1+0) = 1

[121] A $>=<$ B reads: A is greater, equal or less than B. Similarly: C $<=>$ D reads: C is less, equal or greater than D.

563. Hence, we have found the standard textbook results:

- A devaluation of the Pula against the Rand will *ceteris paribus* result in an improved competitive situation (BCGHM% > 0 if EXRP% < 0).
- A constant Rand/Pula exchange rate will *ceteris paribus* result in a status quo situation (BCGHM% = 0 if EXRP% = 0).
- A revaluation of the Pula against the Rand will *ceteris paribus* result in a deteriorated competitive situation (BCGHM% < 0 if EXRP% > 0).

564. The magnitude of the gain or loss is directly proportional to the degree of Pula *de*-valuation. For instance, a 5% devaluation (EXRP% = -5%) produces a 5% competitive gain, while a 5% revaluation (i.e. a -5% devaluation) produces a 5% competitive loss, as seen from the formula:

$$BCGHM\% = 1 - \{EXRP / (GRI/PPH)\} = 1 - \{(1+EXRP\%) / [(1+0)/(1+0)]\}$$
$$\text{i.e. } BCGHM\% = - EXRP\%$$

565. Note, however, that these effects are the immediate, short term ones. They do not take into account the effect of subsequent price changes *arising* from the exchange rate change. They therefore only hold true as long, and to the degree, that local prices do not react to the re/devaluation, which they presumably will start doing fairly quickly.[122] When this happens, the local price changes will start to modify the above effects. Thus, as shown in chapter 6,3, roughly half of the immediate effect will quickly be lost due to the local price changes induced by the changes in the import costs.[123]

ii. Two factor analysis

566. Above we studied the conditions for gains irrespective of past price changes. We may extend the scope of the analysis by taking into account these price changes, i.e. by studying how Botswana may de/revalue the Pula in response to given price changes, if it wants to secure a certain competitive gain.

567. The above formulas again applies, i.e. the condition for obtaining a positive, nil or negative competitive gain is:

$$BCGHM\% \; > = < 0$$
$$\text{if, and only if:} \quad EXRP \; < = > \; GRI / PPH$$
$$\text{i.e. if, and only if:} \quad (1+EXRP\%) < = > (1+GRI\%) / (1+PPH\%)$$

568. Consequently, if the Botswana authorities wants secure a positive, nil or negative competitive gain (BCGHM%) in the face of given price changes (GRI% and PPH%), they may do so[124] by changing the Rand/Pula exchange rate by EXRP%, where the value of EXRP% is such that the exchange rate index (EXRP) becomes smaller, equal or larger than the ratio between the RSA and the Botswana inflation rates (GRI/PPH). The direction of gain changes for various combinations of EXRP and (GRI/PPH) values is illustrated in table AnxF,1.

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[122] This may be especially true in the case of a devaluation, fuelling inflation.

[123] This refers to the first round of local price effects, i.e. before any wage reactions are allowed for.

[124] Subject to the earlier noted "uncertainty" in respect of the immediate, interim effects.

Table AnxF,1 : Direction of gain changes for various combinations of EXRP and (GRI/PPH) values

	GRI > PPH i.e. GRI/PPH > 1	GRI = PPH i.e. GRI/PPH = 1	GRI < PPH i.e. GRI/PPH < 1
EXRP > 1 i.e. EXRP% > 0	BCGHM% > = < 0 if, and only if: EXRP < = > GRI/PPH	BCGHM% < 0	BCGHM% < 0
EXRP = 1 i.e. EXRP% = 0	BCGHM% > 0	BCGHM% = 0	BCGHM% < 0
EXRP < 1 i.e. EXRP% < 0	BCGHM% > 0	BCGHM% > 0	BCGHM% > = < 0 if, and only if: EXRP < = > GRI/PPH

569. The interpretation of the various cells in the above table is as follows:

i) If the RSA inflation rate is *higher* than Botswana's:

a) A revaluation of the Pula[125] may give a negative, nil or positive competitive gain, depending on its strength compared to the inflation rate relative. A negative gain results if the degree of revaluation is larger than the inflation rate relative (i.e. if EXRP > GRI/PPH). A zero gain results if the two are equal (i.e. if: EXRP = GRI/PPH), and a positive gain results if the degree of revaluation is smaller than the inflation rate relative (i.e. if: EXRP < GRI/PPH).

b) A constant Rand/Pula exchange rate will bring a positive competitive gain.

c) A devaluation of the Pula will bring a positive competitive gain, larger than in the above case.

ii) If the two inflation rates are equal:

a) A revaluation of the Pula will result in a negative competitive gain.

b) A constant Rand/Pula exchange rate will secure a status quo situation.

c) A devaluation of the Pula will bring a positive competitive gain.

iii) If the RSA inflation rate is *lower* than Botswana's:

a) A revaluation of the Pula will result in a negative competitive gain.

b) A constant Rand/Pula exchange rate will bring a negative competitive gain, but smaller than the revaluation.

c) A devaluation of the Pula may also bring a negative competitive gain, provided that it is small[126] enough (i.e. if: EXRP > GRI/PPH, when GRI/PPH < 1.0). Otherwise, it will bring a zero gain (when: EXRP = GRI/PPH), or a positive gain (when: EXRP < GRI/PPH).

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[125] Note that the re- and devaluations of the Pula here discussed are against the Rand. A revaluation consequently implies an increase in the Rand/Pula rate, while a devaluation implies a decrease in the same rate.

[126] It may seem that this should read *large* rather than *small*, given that EXRP must be *larger* than GRI/PPH. However, the value of EXRP and GRI/PPH are in this case below unity, and their percentage increase negative. EXRP will therefore be *larger* than GRI/PPH when its percentage decrease is *smaller* than the corresponding decrease in GRI/PPH.

570. Thus, taking into account the price movements prior to the exchange rate change, a devaluation will in many cases bring a (positive) competitive gain, and a revaluation a competitive loss. But this is not always the case; depending on the strength of the exchange rate change compared to the inflation relative, the results may also be the opposite.

571. In general:

i) The immediate outcome of a devaluation of the Pula against the Rand:
   a) in excess of the inflation relative, is an increase in the competitive strength of the Botswana producers;
   b) equal to the inflation relative, is the maintenance of a status quo situation;
   c) within the limit of the inflation relative, is decreased competitive strength for the Botswana producers, the degree of devaluation being insufficient to fully offset the detrimental effect of the higher Botswana inflation rate.

ii) Similarly, the immediate outcome of a revaluation of the Pula against the Rand:
   a) in excess of the inflation relative, is a decrease in the competitive strength;
   b) equal to the inflation relative, is the maintenance of a status quo situation;
   c) within the limit of the inflation relative, is increased competitive strength;

iii) Finally, the immediate outcome of keeping the Pula pegged to the Rand is:
   a) an improved competitive status, if the inflation relative exceeds unity; i.e. if the RSA inflation rate exceeds the Botswana inflation rate;
   b) status quo, if the inflation relative equals unity; i.e. if the inflation rates of RSA and Botswana are equal;
   c) a deteriorated competitive status, if the inflation relative is below unity; i.e. if the Botswana inflation rate exceeds the RSA inflation rate.

572. The value of the competitive gains earned or lost depends upon the relative magnitude of EXRP, GRI and PPH. Table AnxF,2 gives some representative estimates, calculated from the formula: $BCGHM\% = 1.0 - EXRP / (GRI/PPH)$

573. Note that the estimates of table AnxF,2 represent the temporary gains and losses arising immediately after a re/devaluations. They do take into account price changes prior to the re/devaluation, but not subsequent changes in local prices arising from the exchange rate shift itself. They do therefore not correspond to the direct effects given for the various scenarios analysed in the main text of this paper, because the latter include the direct "initial round" inflation effects induced by the re/devaluation. As indicated in chapter 6,3, these directly induced price effects will cut the above estimates roughly in half, even in the absence of any wage changes.

574. Note also the above formula gives extreme results for extreme combinations of EXRP and GRI/PPH values. For instance, an EXRP value of 1.5 combined with a GRI/PPH value of 0.5 will give a BCGHM% estimate of -200%, which is a rather absurd result. However, a 33% revaluation of the Pula in response to a 50% price increase differential in RSA's favour, making Botswana products three times as expensive as their RSA substitutes, is equally

absurd. The model is *not* intended for the analysis of such extreme changes in relative prices.[127]

Table AnxF,2 : The magnitude of BCGHM% for various combinations of EXRP and GRI/PPH)

		GRI / PPH RSA's inflation rate relative to Botswana's inflation rate										
		1.5	**1.4**	**1.3**	**1.2**	**1.1**	**1.0**	**0.9**	**0.8**	**0.7**	**0.6**	**0.5**
EXRP Pula/Rand exchange rate index	**1.5**	0.0	-7%	-15%	-25%							
	1.4	+7%	0.0	-8%	-17%	-27%						
	1.3	+13%	0%	0.0	-8%	-18%	-30%					
	1.2	+20%	-5%	+8%	0.0	-9%	-20%	-33%				
	1.1		-10%	+15%	+8%	0.0	-10%	-22%	-38%			
	1.0		-15%	+23%	+17%	+9%	0.0	-11%	-25%	-43%		
	0.9				+25%	+18%	+10%	0.0	-13%	-29%	-50%	
	0.8					+27%	+20%	+11%	0.0	-14%	-33%	-60%
	0.7						+30%	+22%	+13%	0.0	-17%	-40%
	0.6							+33%	+25%	+14%	0.0	-20%
	0.5								+38%	+29%	+17%	0.0

The non-traditional export market

a. Conditions for status quo

575. The case of the non-traditional export market is parallel to the case of the home market. Thus, from above we have the following reformulated model III equation relating to the Botswana exports to the RSA market:

$$BCGEX\% = 1/(1+cf) - (EXRP*PPE) / (GRI*(1+cf))$$

i.e.: $EXRP = (1-(1+cf)*BCGEX\%) * (GRI/PPE)$

where: BCGEX% : Botswana's competitive gain in the RSA export market
cf : CIF-cost element as a ratio of the corresponding FOB-value.
EXRP : Rand/Pula exchange rate index
PPE : Pula designated producer price index for non-traditional export
GRI : General RSA inflation index

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[127] A competitive loss of 200% may seem not only extreme, but even impossible. It is recalled, however, that the competitive loss is measured relative to the RSA price level, not to the level of competitive strength itself. If the difference in price increase between Botswana and RSA products is extreme, losses in excess of 100% may therefore result. Thus, from above we have the formula: BCGHM% = (MPI%-PPH%)/MPI = (MPI-PPH)/MPI = 1-(PPH/MPI). A loss of more than 100% will therefore occur if: BCGHM% < -1, i.e. if: 1-(PPH/MPI) < -1, i.e. if: (PPH/MPI) > 2 , i.e. if: (1+PPH%) > 2*(1+MPI%), i.e. if: PPH% > 1+2*MPI%. Hence, a loss in excess of 100% may occur if for instance the price increase on the RSA product is 10% and the corresponding price increase on Botswana product (PPH%) is more than 120%, something that is rather unlikely to happen in reality.

576. The formula: EXRP = (1-(1+cf)*BCGEX%)*(GRI/PPE) is seen to resemble the parallel formula from model I, the only obvious difference being that it allows for an element representing the CIF-costs (cf) and the competitive gain (BCGEX%). The latter variable is however zero if we assume that the goal is price-parity with the initial situation, as was the case in model I.

577. Given price-parity we consequently get the following direct parallel to the model I equation: EXRP = GRI/PPE i.e. (1+EXRP%) = (1+GRI%) / (1+PPE%).

578. The fundamental difference between the formulas of model I and III that was noted above applies also in the present case. In model I we implicitly assumed that RSA and Botswana inflation rates were independent variables, whereas the above inflation rate (PPE%) is derived as a function of both the RSA inflation rate and the exchange rate. The implication of this difference is as already discussed earlier.

b. Conditions for given types of gains

579. In the above we have studied the conditions for maintaining a competitive status quo situation in the face of price changes. To study the alternative question of securing a given level of gain, we return to the formula: BCGEX% = 1/(1+cf) - (EXRP*PPE) / (GRI*(1+cf))

580. The conditions under which positive, nil or negative competitive gains result from this equation are: BCGEX% >=< 0.0

if, and only if: 1/(1+cf) - (EXRP*PPE) / (GRI*(1+cf)) >=< 0.0
i.e.: if: 1.0 - EXRP * PPE / GRI >=< 0.0 (since: cf & (1+cf) > 0.0)
i.e.: if: 1.0 >=< EXRP * PPE / GRI
i.e.: if: GRI / PPE >=< EXRP (since: GRI > 0.0 and PPE > 0.0)
i.e.: if: EXRP <=> GRI / PPE
i.e.: if: (1+EXRP%) <=> (1+GRI%) / (1+PPE%).

i. Single factor analysis

581. We may again study the *ceteris paribus* conditions for achieving a given competitive gain, allowing for manipulations of the exchange rate only. Disregarding any price movements prior to the de/revaluation (i.e. setting the value of GRI% and PPE% to zero), we get:

BCGEX% >=< 0
if, and only if: (1+EXRP%) <=> (1+GRI%) / (1+PPE%) = 1
i.e. if, and only if: EXRP% <=> 0

582. Hence, we have found the same general results as above:

i) A devaluation of the Pula against the Rand will *ceteris paribus* result in a positive competitive gain (BCGEX% > 0 if EXRP% < 0).

ii) A constant Rand/Pula exchange rate will *ceteris paribus* result in a status quo situation (BCGEX% = 0 if EXRP% = 0).

iii) A revaluation of the Pula against the Rand will *ceteris paribus* result in a negative competitive gain (BCGEX% < 0 if EXRP% > 0).

583. The magnitude of the gain is proportional to the degree of Pula *de*valuation. For instance, a 5% devaluation produces roughly a 5% competitive gain, while a -5% devaluation (i.e. a 5% revaluation) produces roughly a 5% competitive loss, as seen from the formula:

$$\begin{aligned} BCGEX\% &= 1/(1+cf) - (EXRP*PPE) / (GRI*(1+cf)) \\ &= \{1/(1+cf)\}*\{1 - (1+EXRP\%)\} \\ &= \{1/(1+cf)\}*\{- EXRP\%\} \end{aligned}$$

ii. Two factor analysis

584. Taking into account the price changes prior to the de/revaluation, the conditions under which positive, nil or negative competitive gains result are:

$$\begin{aligned} & BCGEX\% >=< 0.0 \\ \text{if, and only if: } & EXRP <=> GRI / PPE \\ \text{i.e.: if: } & (1+EXRP\%) <=> (1+GRI\%) / (1+PPE\%). \end{aligned}$$

585. Consequently, if the Botswana authorities wants secure a positive, nil or negative competitive gain (BCGEX%) in the face of given price changes (GRI% and PPE%), they may do so by changing the Rand/Pula exchange rate by EXRP%, where the value of EXRP% is such that the exchange rate index (EXRP) becomes smaller, equal or larger than the relative difference in the RSA and Botswana inflation rates (GRI/PPE). The direction of gain changes for various combinations of EXRP and (GRI/PPE) values is illustrated in table AnxF,3.[128]

Table AnxF,3 : Direction of gain changes for various combinations of EXRP and (GRI/PPE) values

	GRI > PPE i.e. GRI/PPE > 1	GRI = PPE i.e. GRI/PPE =1	GRI < PPE i.e. GRI/PPE <1
EXRP > 1 i.e. EXRP% > 0	BCGEX% > = < 0 if, and only if: EXRP < = > GRI/PPE	BCGEX% < 0	BCGEX% < 0
EXRP = 1 i.e. EXRP% = 0	BCGEX% > 0	BCGEX% = 0	BCGEX% < 0
EXRP < 1 i.e. EXRP% < 0	BCGEX% > 0	BCGEX% > 0	BCGEX% > = < 0 if, and only if: EXRP < = > GRI/PPE

586. It may be noted that table AnxF,3 illustrates the same general conclusion as earlier found with respect to the home market. The magnitude of the exchange rate change required to secure a given level of gain is however *not* in general the same, because the Botswana inflation index applied is not the same in the two cases. Thus, in the formula applicable to the export market, the price index relates directly to the non-traditional exports, while in the in the formula applicable to the local market the price index relates directly to the local sales of tradables. However, since both these indices refer to the prices of Botswana's tradable products, although via different weight structures, they are in general likely to follow each other fairly closely.

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[128] The interpretation of table AnxF,3 is not given. It is in line with the interpretation of table AnxF,1.

587. A calculation example may illustrate the magnitudes involved. Assume that RSA has 10% inflation and that Botswana, having failed to restrict local wages and costs, has ended up with the same inflation rate. Assume furthermore that in this situation the Botswana authorities decide to devalue the Pula against the Rand in order to secure a 5% competitive gain for its producers. As seen from table F,1 of Annex J (columns II and III) a gain of this magnitude may be secured by devaluing the Pula by approx. 9%. The exact rate of devaluation will however depend upon the specific type of gain considered. A devaluation of 8.9% will suffice for a 5% gain in the home market, while a devaluation of 9.2% is required for a similar gain in the non-traditional export market. Consequently, there *is* a difference between the devaluations required in the two markets, but the difference is unlikely to be of any practical concern.

588. The devaluation effects described above are of course the *immediate ceteris paribus* ones. As always, there may, and probably will, be secondary effects, modifying the immediate ones. A devaluation will make imports to Botswana more expensive in Pula terms, and thus increase the cost of living, while a revaluation will give the opposite effect. If these cost signals are met by price and wage adjustments, the initial effects will be augmented. This may in the end erode the value of the gains initially won or lost. At the end of the day, therefore, the final outcome of a devaluation may be high inflation and little competitive gain, while a revaluation may result in low inflation and little competitive loss.

Annex G

The statistical evidence

Model results versus statistical observations

589. In this annex we shall examine the statistical evidence pertaining to inflation and exchange rates. A word of caution is in order before proceeding to do so. Due restraint should be exercised in comparing statistical data to model results; the available statistical evidence does not necessarily apply directly to the model estimates at hand. Their relationship to one another is essentially circumstantial and indirect.

590. Thus, it should be understood from the outset that the numerical estimates calculated from the present model (i.e. model III) are not necessarily easily "observable" in practice. The numerical estimates for any given *set of assumptions* may not correspond directly to the statistics that we are in practice able to observe for any given *period*, and vice versa.

591. In other words: our static model illustrates the full *theoretical* implications of our various assumptions *irrespective* of time frame, not the full *actual* effects that may in practice be observed within a *given* time frame. To clarify this point further, let us assume that the direct and indirect price effects of a re/devaluation work themselves out over a number of periods. The observed inflation statistics for any given period of time will then measure the sum of all partial price effects originating from every re/devaluation spreading its price effects into that period. The static model, in contrast, will estimate the full price effect of a single re/devaluation irrespective of time horizon.

592. Testing hypothetical model results against actual observations is therefore no straight forward matter. Assume, for instance, that a given combination of external inflation and exchange rate movements apply for a given period, and that the total inflation effect generated by these movements is insignificant according to the model. The observed Botswana inflation rate for the period is however significant, so that there appears to be a serious inconsistency between model "prediction" and actual observation.

593. However, this does not prove the model "prediction" wrong, or even that it is in disagreement with the observation. If we accept the dictum that "inflation is like a train, once set in motion it will keep on rolling even after the locomotive has stopped pulling," the observed actual may in fact be consistent with the model result, in so far as it may merely represent the inflation over-hang from previous periods.

594. It is therefore worth re-emphasising that it is not the standard annual or monthly inflation rates that the model illustrates, but the total multi-period inflation *impact* arising from a given inflation impetus.

595. This fact may possibly be seen to beg the conclusion that the model is a theoretical irrelevancy, without practical benefits to the study of the inflation phenomenon. But if so, we overlook the fact that a statistical *observation* of a given phenomenon does not in itself

amount to an *explanation* of the phenomenon. If we want to explain the causes and nature of inflation, as opposed to merely measuring it, we need to understand the fundamental processes *behind* the observed inflation rates. It is in this light that the present model should be seen. It should therefore be judged primarily by its fundamental logical relevance for the problem at hand, its internal consistency etc., rather than by its direct "testability" in terms of statistical data that by their very nature relate to a different dimension of the problem under study.

596. This is of course not to deny that the statistical evidence may be crucial in evaluating the realism of a given model, *provided* that the model in question is aiming at capturing the statistically observed dimensions of the phenomenon under study. Assume, for instance, that we revised or extended the present model, in an effort to construct a model aimed at capturing the observable (annual or monthly) inflation rates.[129] Testing the estimates produced by such a model against the parallel actual observations would be both appropriate and necessary.

597. However, as repeatedly stated, the current model is not of this nature. Why, then, do we bother to study the statistical evidence at all? Basically, because the statistical data, although they do not have a *direct* bearing on the model variables, nevertheless do have an *indirect* bearing on them. Thus:

i) Firstly, we may study the trends and relationships evident in the statistical material for their own sake, i.e. with a view to learn *as much as possible* about the inflation phenomenon, hoping that this may indirectly shed some light on the process described by the model.

ii) Secondly, we may use the overall statistical picture as a basis for broad comparison with overall model conclusions. In so doing, however, we will not be able to apply any stringent scientific method, but have to make do with an "appear to correspond" technique, as exemplified in chapter 7.

Exchange rate movements

598. The backdrop to the present paper is the question of whether or not it has been wise for Botswana to let the Pula follow the Rand, in a situation when the value of the latter has declined significantly against most major currencies. But before we base our analyses on these premises, we have better study the statistical evidence. Has the Rand in fact been heavily devalued in recent years, and has the Pula been effectively pegged to the Rand in the face of these events?

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[129] If we accept the present model's explanation of the inflationary process, one way of going about such a task might be to use the structure of the present static model as "building-blocks" for a new model. This might for instance be done by representing the inflationary process as a series of consecutive (discrete) events, each giving rise to a set of multi-period and period-specific incremental inflation impacts. The sum of all impacts spreading into a given period, (when summed "across" the events, and for that particular period), will represent the total inflation rate for the period. Each single event might be analysed largely as in model III, but the impacts would have to be specified in terms of a definite time frame. The latter might typically imply the specification of how quickly given price changes effect the economy, i.e. how quickly the cost of living index reacts, how often wage increases occur etc.

599. Looking at the data of table G,1 in Annex J it is evident that the value of the Rand has indeed dropped significantly against the US$ during the last few years, and that this has been in line with a long term trend which has seen even larger devaluations of the Rand in the past.

600. The Pula has largely followed the Rand in these devaluations against the US$, although somewhat less so; the Pula have on the whole been revalued somewhat against the Rand in the process. Thus, from 1980, when the Rand/Pula exchange rate equalled 1.00, it gradually increased until 1990, when it reached 1.39. After 1990 this process has been reversed; the Pula has been slightly devalued against the Rand, bringing the Rand/Pula exchange rate down to 1.29 at the end of 1996.

601. These devaluations have occurred fairly gradually over the period. With the exception of 1993, which saw a small revaluation of the Pula against the Rand, there have been small annual devaluations of the Pula ever since 1990. If we concentrate on the last two or three years, it is therefore not absolutely correct to say that the Pula has been pegged to the Rand; the Pula has in fact been devalued steadily against the Rand during this period. These devaluations have however been quite small. It is therefore roughly correct to say that the Pula has been pegged to the Rand.

Wage Rate Inflation

602. No wage rate index as such exists for Botswana. The closest substitute we can get is statistics on the average monthly wage incomes of Botswana employees. Such data, referring to the months of March and September, are at present available for the period 1987 to 1994. Table G,2 in Annex J summarises the data in question.

603. It should be noted from the outset that these data do *not* amount to a proper wage rate index of the type needed for the current exercise, i.e. an index measuring the increase in average nominal wage rates net of all non-price factors. Rather, the available statistics reflect the combined effect of both price and non-price factors. The rate of pure wage inflation is probably the most prominent of these, but other factors are also at play. Thus, the available wage averages are affected by the changes in the composition of the work force (with respect to average individual skill and payment level), by the changes in the average number of hours worked per month, by the changes in the general productivity of labour etc.

604. The data may, of course, also reflect considerable statistical errors and omissions. Studying the underlying data, there are a number of estimates that look suspiciously like statistical outliers. Table G,4 of Annex J may serve to illustrate the above points. The table compares the wage data for the central government sector with the wage increases officially declared for the sector. The 1987 wage data is seen to be vastly out of scale; it appears to reflect an error, an outlier, or a subsequent change in statistical coverage or definitions. The data for subsequent periods look more reasonable, but they bear but little resemblance to the officially declared wage increases. Admittedly, the sector is affected by wage "creep",[130] but even if we allow for this, we are left with the impression that the data are unrepresentative of

[130] The "creep" is a reflection of wage increases additional to the officially declared wage adjustments, for instance through automatic wage increases due to seniority or length of service.

the real situation, that they reflect very considerable changes in the composition of the work force, or similar.

605. Inspecting table G,2 (Annex J) it is seen that the average wage income of *all* employees in Botswana increased by 158% between March 1987 and Sept. 1994, while the average wage income of *citizen* employees increased by 166%. The Consumer Price Index (CPI) increased by 133% over the same period. Over this particular period, therefore, the average wage income outgrew the CPI significantly, implying a significant growth in real wages. The growth was not evenly distributed over the period; real wages (measured by the nominal wage index divided by the CPI index), reached a maximum in March 1991, when the wage index was 180 and the CPI 150.

606. The above conclusions reflect the base value against which we compare. The choice of the latter has important implications; if another base value is chosen, we will in general get a different result. Ideally we ought to compare to a "typical or representative" wage level, but it is in practice difficult to pinpoint any particular base period as especially representative in this respect. In table G,3 (Annex J) we therefore analyse the data using alternative base periods. The table shows that the overall picture is again one of faster wage growth than CPI inflation, especially during the economic boom period up to 1991, with some more restraint thereafter. If we base the comparison on the relatively high wage level reached around 1991, less than full wage compensation was given in (some) later years. The general long term picture is nevertheless one of wage growth in excess or quite close to the CPI inflation.[131]

607. The relationship between inflation and wage rates has been investigated by regression analysis, for alternative lag structures:

i) In the first alternative, no lag between wage and CPI increases is allowed. This may be seen as a crude representation of a situation of fairly rapidly occurring CPI-driven wage compensations, and/or fairly rapidly occurring wage-driven CPI effects. The regression produces an R^2 values of 0.06[132] when the CPI rate is matched against the total wage increase, and an even lower R^2 value when matched against the citizen wage increase.

ii) In the second alternative, the CPI rate is moved back one period. This may be seen as a crude representation of a situation of fairly slowly occurring wage compensations, i.e. a situation when inflation does not result in wage increases until the next period. This alternative produces an R^2 value close to nil. Adding another lagged CPI variable only brings the R^2 value to 0.02.

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[131] The only base period that tells a really different story is the one for March 1991, when the wage index had outgrown the CPI index the most in relative terms. But, being a maximum of this type, it is not a typical or representative observation, and thus unsuited as a base-line for wage increase comparisons.

[132] R^2 is the coefficient of determination for the regression. Assume that we have a set of observations for two variables: X and Y, that we have postulated the following relationship between these variables: $Y = f(X) = a + b*X$, and that we use regression technique to fit this equation to the observations. R^2 is then the proportion of the total variation in Y that is explained by the regression of Y on X. Thus, R^2 is a measure of the explanatory power of the regression; i.e. a measure of how well the model-estimated Y-values fit the observed Y-values. For instance, a R^2 value of 0.9 indicates that 90% of the total variation in the Y-observations are explained by the variation in the corresponding Y-estimates, with 10% left unexplained. For further reference, see for instance: M. D. Intriligator: Econometric Models, Techniques, & Applications.

iii) In the third alternative, the CPI rate is moved forward one period. This may be seen as a crude representation of a situation characterised by fairly slowly occurring CPI reactions to wage increases, i.e. a situation when wage increases do not result in inflation until the next period. The result is an R^2 value of 0.03.

608. The results of these efforts are consequently discouraging. Although it seems fairly obvious that wage increases do reflect inflation, and that inflation reacts to wage increases, we find little evidence of any unambiguous correspondence between these variables for any kind of lag structure. No clear picture has therefore emerged in terms of their precise functional relationship, suggesting that the adopted data, relationship and lag structures are much too crude to capture these effects.

609. In principle, the failure to capture the relationship between wage and inflation increases may of course imply that no such relationships do in reality exist; but this is extremely unlikely to be the case. The more likely reason is that these relationships are of a more complex and stochastic nature than allowed for in this paper, and/or that the present wage data make a poor substitute for our desired wage rate index. Both factors are probably true, and if so, merely illustrate the obvious facts that:

i) Our price and wage formation assumptions represent no more than a simplification of the real situation, concentrating as they do solely on direct inflation-to-wage and wage-to-inflation links within a static framework, and ignoring for instance the possible effects of inflation-overhang from earlier periods, and the time aspect in general, as well as a host of other factors that may be at work.

ii) Our adopted price data are not ideal for the current purpose; they may not even be reasonable substitutes for the type of wage inflation data required.

iii) Moreover, even if they had been good substitutes, they would still not relate directly to the functional relationship put forward in our model. As explained earlier, the model does not postulate a functional relationship between inflation and wage rate increases as observed within any given time frame. Its concern is the *full* inflationary effects irrespective of time frame. The available wage data can therefore not serve directly as wage index estimates relevant to our simple, static model. Without a properly specified link between the static model variables and their dynamic manifestations in terms of observable statistics, the latter can not directly substitute for the former; neither are they capable of supporting or rejecting the model itself.

610. A proper investigation of exactly how wage increases induce inflation, how inflation induces wage increases, and how this may translate into observable annual data, would require a separate, and probably extensive, effort. This is not the place for any such attempt. Instead we will have to postulate our model relationships, admitting that we are unable to support them by any formal statistical proof of validity.

611. However, despite this unresolved question, our simple investigation of the available statistical evidence has indicated one important fact: the average wage rate does on the whole appear to have grown at least as rapidly as the CPI. Assuming that the pure wage inflation element has been the major factor underlying this process, it therefore seems that local wages have tended to be fully inflation adjusted, although not necessarily immediately or directly.

Product price inflation

612. Table G,5 in Annex J gives quarterly data pertaining to product price inflation during the period 1980 to 1996. The three first data-columns of the table contain the basic statistics; i.e. the RSA and Botswana price indices, and the Rand/Pula exchange rate. It may be noted that the adopted price indices are far from ideal for our purpose. Thus, as discussed elsewhere, they are not directly comparable to the corresponding price indices of the model, because they measure the total of all inflation effects occurring within a give period rather than the full inflation effects of a given price event. Furthermore, the price indices ideally required ought to focus on products that are, or may be, traded between Botswana and RSA. Specific price indices of this nature are not readily available.[133] Rather than try to construct such index series, we will therefore make do with the RSA Wholesale Price Index (WPI) and the Botswana Consumer Price Index (CPI).

613. The WPI is adopted in preference to the South African CPI because the latter refers to household consumption, and as such is inclusive of a host of non-tradable product prices, such as rents of dwellings etc. The WPI has the advantage that it is exclusive of most of these non-tradable products. On the other hand, being a wholesale index, it also excludes all tradable services (since services are not normally traded through the wholesale sector). The WPI consequently covers the wholesale price of goods produced in RSA, not the export or import prices of products typically traded with Botswana.

614. The Botswana CPI has of course limitations similar to those of the South African CPI; i.e. it refers to the structure of household consumption rather than the structure of production, and it is inclusive of a host of non-tradable product prices. Even so, it is adopted for the present purpose, due to the lack of readily available alternatives already noted above.

615. Columns 4 and 5 of table G,5 (Annex J) give the WPI and CPI indices re-based to the first quarter of 1980, while column 6 gives the corresponding Botswana Import Price Index (IPI). The latter is calculated directly by converting the WPI into Pula terms, i.e. by dividing the Rand based WPI data by the Rand/Pula exchange rate. It is seen that the South African WPI index increased by 569% during the period 1980-1996, while the Botswana CPI increased by 489% and the IPI by 437%.

616. The RSA inflation rate was consequently on average 12.6% pa over the period. The full impact of this inflation rate was however not felt in Botswana. The gradual revaluation of the Pula against the Rand brought the average rate of imported inflation down to 11.1% pa. The corresponding CPI inflation rate was slightly higher, at 11.7% pa, suggesting that imported inflation has been an important factor in the local inflation process, but local price factors have also been at play.

617. Columns 7 and 8 contain some rough measures of quarterly deviation between the various inflation rates. Column 7 gives the difference between the WPI and the CPI, relative

[133] The CSO does in fact provide a tradability breakdown of the Botswana CPI, but apparently only for the 1990s. An attempt was made to extend this breakdown to the full period covered in this paper, by excluding the non-tradable elements from the CPI. This could however only be done in a very crude way, by excluding all subgroups representing services. The result was inflation estimates fairly similar to those of the All Items CPI itself, with roughly the same regression properties etc. Rather than introducing a new hybrid index series of uncertain quality and benefit, the standard All Items CPI index was therefore adopted for the present discussion.

to the value of the latter. The data suggest that the magnitude of this difference varies with the Rand/Pula exchange rate. Thus, the differences were relatively small during the period 1980 to 1984, and so were the changes in the exchange rate. During 1985 to 1990 both of these variables increased rapidly, and they both decreased again after 1990.

618. Column 8 gives the differences between the CPI and the IPI, again relative to the value of the CPI. The magnitude of this difference has oscillated over time, but it has never been very large. This suggests that the CPI has largely, but not completely, followed the IPI; local inflation factors have also been active. During the last four or five years the difference has been positive, suggesting that the local factors have on the whole acted to fuel local inflation.

619. If we postulate that the Botswana CPI is a function of the import price index, as seems likely from above discussion, and run a regression against the index values of columns 5 and 6, we will get a near perfect fit, with an R^2 of 0.99. This may perhaps seem conclusive evidence that the Botswana inflation rate is decided by the movement in the import prices. In reality, however, a high R^2 for a regression of such price *index* values is no proof that the underlying inflation *rates* are equally correlated.[134] The distinction between index-value and inflation-rate is essential; inflation is fundamentally a question of relative price *changes*, not absolute price *levels*. Consequently, if we want to study the relationship between local and imported inflation, we should analyse the relevant inflation rates, not the corresponding index values.

620. Columns 9 and 10 of table G,5 (Annex J) give the percentage increase in the Botswana CPI and IPI over the previous quarter. If we postulate that the Botswana CPI inflation rate is a function of the IPI inflation rate, and run a regression against the data of columns 7 and 8, we will get an R^2 of approx. nil, showing that the two set of data are not correlated. This may seem a strange result, there being ample reason to suspect a fairly strong relationship of this nature. In the present case, however, the result may be assumed to reflect the fact that we have allowed for no time-lag; i.e. we have fitted the CPI rates of each period directly to the import price increases of the same period.

621. Recalling that the latter reflects price movements in the RSA, and assuming that it takes some time for these to filter through to the Botswana consumers, "today's" CPI rates ought obviously to be linked to "yesterday's" import price increases. Doing so, by linking the CPI rate to the previous period's IPI rate, we get an R^2 of 0.21.[135] But this is as high as the R^2 will go (given the present data). The addition of IPI rates with alternative time lags into the regression brings only insignificant increases in the R^2. Thus, our data indicate a period of around 3 months for the RSA price inflation to filter through to the Botswana CPI.[136]

622. The above regression links local inflation to import inflation. In theory, local inflation is linked also to other variables, for instance local wage costs. Columns 11 and 12 of table

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[134] In general, a high R^2 value tends to result when using time series data, if both dependent and explanatory variables reflect certain underlying time trends, even though the trend factors themselves may be uncorrelated.

[135] The huge difference between this value ($R^2 = 0.21$) and the parallel value for the regression of index values ($R^2 = 0.99$) may serve to illustrate the truth of the earlier statement about value regressions being quite unsuitable as indications of inflation rate correlation.

[136] Note that this conclusion reflects the quarterly format of our data. Preferably, monthly data should have been used. These would probably give a somewhat different lag, and a better fit.

G,5 (Annex J) give some tentative estimates of the quarterly increases in these costs. The wage estimates are presented in two alternatives, both very rough. The first is based on average monthly wages, as recorded by the CSO, and the second on the officially declared wage increase in the government sector, plus a 2.5% pa increase representing the "creep" factor (i.e. automatic seniority rises etc.). Adding these wage variables to the above regression, however, makes no difference. There seems to be no relationship whatsoever between the wage increases reported in our data, and CPI inflation increases.

623. We are therefore left with only one explanatory variable of any value: the previous quarter's IPI rate, giving an R^2 value of 0.21. A coefficient of determination of this magnitude is fairly low, implying that almost 80% of the variation in the CPI rate remains unexplained. This is probably due to fact that we are using fairly rough and limited data, and possibly also because the relationship assumed between them is too simple. Hence, even with perfect data we might not get a perfect fit for the presently adopted relationship; and even with a perfectly specified functional relationship we would not get a very good fit with the existing data.

624. However, even in the absence of proper wage and profit data, we might attempt to represent their inflationary effect indirectly. Thus, assuming that present wage and profit increases are functionally linked to past inflation rates, (just as present inflation rates are linked to past wage and profit increases), we may try to link present inflation rates to past ones, where the latter indirectly represent the effect of wage and profit changes.

625. Adding a variable representing the CPI rate of the previous period to the above regression gives an R^2 of 0.23, i.e. a very modest increase over the previous result. Assuming, however, that especially the wage adjustment process takes considerably longer than 3 months, we may add further variables to the regression, representing the CPI rates of still earlier periods. If we add three such lagged CPI variables, corresponding to the inflation rates over the preceding 9 months, we get an R^2 of 0.27. Adding another two quarters, representing a further 6 months, brings the R^2 to 0.37. If we go on adding further lagged variables, we get an R^2 value of 0.54 for lags up to 2.5 years, an R^2 value of 0.61 for lags up to 3 years, and an R^2 value of 0.68 for lags up to four years.

626. It may be tempting to see this as a evidence that local inflation factors, and perhaps especially wages, are functionally linked to the inflation rates experienced over the last few years. This would seem to support our earlier discussion of model results, where we have demonstrated that even in the case of full wage compensation for inflation, a number of wage increase rounds are required before the effects have work themselves out completely. No conclusion to this effect should however be drawn. Adding explanatory variables to a regression will in general tend to increase the R^2. This is especially so in the present case, where we have fairly steady quarterly inflation rates around 2-4% throughout much of the period. We may consequently find harmony of movements between present and past CPI rates, without necessarily explaining anything. The precise relationship between inflation, wages and profits therefore remains elusive.

Annex H

Alternative degrees of profit compensation

627. The inflationary process depicted in this study is ignited by an initial price increase on imports, fuelling subsequent rounds of internal inflation through compensatory wage and profit increases. The effects of alternative degrees of wage compensation have already been studied under the various scenarios. Not so the effects of alternative degrees of profit compensation. These effects are the subject of the present annex.

628. The simulation results earlier presented all reflect the standard assumption that local producers safeguard their income (i.e. Gross Operating Surplus) by increasing their sales price in step with the overall cost-increase faced. In other words: if a local producer faces a given percentage increase in his operating costs, he will react by increasing also his own sales price by this percentage.

629. For the present purpose we may generalise this cost-push prescription in the following way: when faced with a cost-increase of X %, the producer will react by increasing his own sales price by Y %, where X and Y are functionally linked as follows: $Y = gf * X$.

630. The gf-factor represents the degree by which the producer boosts his sales price in reaction to given cost increases, i.e. the degree by which he accelerates or decelerates the cost impulses. In the following we shall refer to gf as the *gearing factor*.

631. The gearing factor may in principle vary over time, in response to changes in the producers' market outlook and expectations. For the present purpose we shall however simplify matters by assuming that it remains constant within each scenario analysed.

632. In our earlier presented scenarios the gearing factor was always assumed equal to unity. This reflects a standard assumption for the type of input/output analysis undertake. The model is however not technically restricted to this particular gearing factor; it does equally allow the specification of alternative factors. In the following we shall illustrate the effect of doing so, with a view to learn whether or not our previously presented results are crucially dependent upon the assumed unity value.

633. In doing so we shall initially allow ourselves to investigate the model's reaction to a wide spectrum of gf-values. In doing so, we inevitably run the risk of including alternatives which may subsequently be deemed unlikely to occur in practice, if reasonable assumptions about producer behaviour, market conditions etc. are made. The below presentation of results does therefore *not* imply that they are all regarded likely to occur, just that the analysis is not a priori restricted to a narrow band of gf-values.

634. Table H,1 of Annex J illustrates the immediate effects of alternative gearing factors. A 10% RSA inflation rate is assumed throughout the table, while wage and exchange rates are kept constant. The value of the gearing factor, which describes the producers' general reaction to the implied cost increase, is varied between 0.0 and 2.0. It is seen that a modest reduction in the gearing factor, from 1.0 to 0.9, will result in a modest reduction in the immediate (COL) inflation effect, from 5.4% to 5.3%. Similarly, a modest increase in the gearing

factor, from 1.0 to 1.1, will result in a modest increase in the inflation effect, from 5.4% to 5.5%.

635. As may be expected, larger changes in the gearing factor will bring larger changes in the (COL) inflation effect. Thus:

- a gearing factor of 0.00 will reduce the immediate inflation effect to 4.6%,
- a gearing factor of 0.50 will reduce the immediate inflation effect to 4.9%,
- a gearing factor of 0.75 will reduce the immediate inflation effect to 5.1%,
- a gearing factor of 1.25 will increase the immediate inflation effect to 5.7%,
- a gearing factor of 1.50 will increase the immediate inflation effect to 6.3%,
- a gearing factor of 2.00 will increase the immediate inflation effect to 8.7%.

636. Above estimates account for the immediate inflation effects only. As in our previous analyses, we may suspect that these immediate cost effects will generate local wage increases, thus fuelling further inflation. Table H,2 of Annex J illustrates the final results if full wage compensations are given. It is seen that a modest reduction in the gearing factor, from 1.0 to 0.9, will again result in a relatively modest reduction in the total inflation effect, in this case from 10.0% to 9.4%. Similarly, a modest increase in the gearing factor, from 1.0 to 1.1, will result in a fairly modest increase in the total inflation effect, from 10.0% to 10.7%.

637. Larger changes in the gearing factor will again bring larger changes in the inflation effect. Thus:

- a gearing factor of 0.00 will reduce the total inflation effect to 6.8%,
- a gearing factor of 0.50 will reduce the total inflation effect to 7.8%,
- a gearing factor of 0.75 will reduce the total inflation effect to 8.7%,
- a gearing factor of 1.25 will increase the total inflation effect to 12.3%,
- a gearing factor of 1.50 will increase the total inflation effect to 17.3%,
- a gearing factor of 1.75 will increase the total inflation effect to 37.4%,
- a gearing factor of 2.00 will produce run-away inflation.

638. For high gearing factors, the input/output based price model gives rapidly accelerating inflation rates. Thus, if we increase the gearing factor from 1.25 through 1.50 to 1.75, the COL inflation effect will accelerate from 12.3% through 17.3% to 37.4%.[137] For gearing factors in excess of 1.90 the system is no longer able to generate an equilibrium solution. Wages will then never be able to keep up with inflation; irrespective of the wage increases given, they will only serve to fuel even larger COL increases. A very high gearing factor is therefore a recipe for run-away hyper inflation.

639. The gearing factor also influences the "speed" of the inflationary process. Table H,3 of Annex J illustrates, for alternative gearing factors, the progress from the initial situation, through the various rounds of full wage compensations, to the final equilibrium situation. The main results are summarised in table AnxH,1. It is evident that the higher the gearing factor, the lower the initial impact as a percentage of the total impact, and the slower the

[137] Note that the input/output based model is not well suited to analysing cases of considerable price changes, at least not to the extent that they significantly alter the relative prices.

adjustment process toward the full impact, and vice versa. Thus, the initial impact accounts for 63% of the total impact if the gearing factor is 0.5, but only for 36% if the gearing factor is 1.5. In the former case, moreover, 95% of the total effects are accounted for after two rounds of wage increases, while six are required in the latter case. The similar logic applies for gearing factors 0.9 and 1.1, but the differences are fairly modest in this case.

Table AnxH,1 : Total (cumulative) COL effects obtaining after various wage-increase rounds, expressed in % of the total final impact 1)

	Cumulative impact after wage-increase round no.:								
Gearing factor	0	1	2	3	4	5	6	7	8
0.5	63%	86%	95%	98%	99%	100%	100%	100%	100%
0.9	56%	81%	92%	96%	98%	99%	100%	100%	100%
1.0	54%	79%	90%	96%	98%	99%	100%	100%	100%
1.1	51%	76%	88%	94%	97%	99%	99%	100%	100%
1.5	36%	59%	74%	84%	90%	93%	96%	97%	98%

1) Source: table 5,2 (Annex J) for gearing factor 1.0, and table H,3 (Annex J) for all other.

640. The earlier presented results are therefore *potentially* quite sensitive to changes in the gearing factor. They are not particularly sensitive to *limited* changes in the general gearing factor, i.e. to changes that do not result in gearing factors significantly above or below the unity value, but the model does give significantly different results in the case of very low gearing factors, and reacts violently to very high ones.

641. The question of whether or not the model may, on the whole, be described as sensitive to changes in the gearing factor, therefore boils down to the question of whether or not a gearing factor substantially above or below the unity value is a likely, or even a possible, economic phenomenon.

642. The national economy consists of numerous independent producers, each trying to accomplish some overall objective like profit maximisation or similar, according to their perception of the prevailing market conditions. In doing so, they are unlikely to think in terms of gearing factors or similar "coefficients". Even so, the outcome of their actions may, for the present purpose, be expressed in terms of gearing factors.

643. The gearing factor used in the present model represents the economy-wide average of all the individual gearing factors. The unity gearing factor assumed for the model simulations therefore implies that producers typically adopt gearing factors equal to, or around, this value; i.e. that the typical producer follows the prevailing inflation trend quite closely in his price setting behaviour. Similarly, a particularly high or low gearing factor implies that the typical producer deviates considerably from the prevailing inflation trend in his price setting behaviour. Barring collusion or special circumstances, it seems highly unlikely that a majority of producers should act in this way.

644. For instance, if the gearing factor is kept consistently and significantly below the unity value, the average producer will (*ceteris paribus*) see his profits shrink considerably in real terms. Unless he is able to compensate for this loss by significantly increasing his total sales, reducing total costs, or similar, this will eventually drive him out of business, the quicker the

lower the gearing factor is.[138] Such a policy is therefore unlikely to be a viable option, except in the short term and/or under special circumstances.

645. If, on the other hand, the gearing factor is kept consistently and significantly higher than unity, the average producer will (*ceteris paribus*) see his profits increase considerably. But he will only be able to earn such increased profits if the market is willing to accept the inflated price (i.e. if he does not lose more profits trough the reduced sales, than he earns through increased profits on the remaining sales). Thus, unless other producer, and especially the direct competitors, behave in much the same way, he may eventually price himself out of the market, the quicker the higher he has set his gearing factor.

646. What then, are the conditions for other producers' following suite by also adopting high gearing factors? If faced with a general situation of run-away inflation, such behaviour may not be hard to imagine. The producers will then face a market with chaotic price signals, they may anticipate accelerating inflation etc., and they will probably act accordingly. But under more normal circumstances, and in the absence of monopoly tendencies or collusion, it seems hard to imagine that producers in general should start to inflate their prices out of proportion to the prevailing inflation rate, and equally hard to imagine that they should succeed in doing so without pricing themselves out of the market. Such a policy is therefore unlikely to be a viable option, except in the short term and/or under special circumstances.

647. It therefore seems fair to conclude:

- The model is quite sensitive to changes in the gearing factor from a purely *mechanical* point of view.
- From an *economic* point of view, however, keeping within the limits of realistic and typical producer behaviour, it does not appear particular sensitive to changes in the gearing factor.

[138] Note that an individual producer may possibly, depending on price elasticities etc., be able to compensate for a reduced profit margin by an increased sale volume. But even though this may *ceteris paribus* be theoretically possible for an individual producer, it seems unlikely to apply for the body of producers as a whole, when they all act in the same way. The case of a high gearing factor is parallel.

Annex I

Relationship between GAIN% and Real Exchange Rate

Introduction

648. In chapter 7 of this paper we have used the GAIN% variable to illustrate the competitive fortunes of the Botswana producers. An alternative variable, often employed for the purpose of illustrating the development of a country's competitive situation, is the real exchange rate.

649. Table 7.1 of Annex J gives parallel estimates for GAIN% and real exchange rate variables. It is readily apparent that they differ significantly from one another. Even so, there is a close relationship between them, as explained below.

The real exchange rate

650. Roughly speaking, the real exchange rate equals the nominal exchange rate adjusted for the difference in the price trends affecting competing local and foreign products. Thus, using an approach set forth by Dornbusch and Helmers, the real exchange rate may be expressed by the following formula:[139]

$$RER = [En / Pd] / [1 / Pw]$$

where: RER : the real exchange rate of the country in question;
En : the nominal exchange rate of the country in question;
Pd : the appropriate price deflator for the domestic currency;
Pw : the appropriate price deflator for the foreign currency.

651. As expressed more directly in terms of Botswana's situation vis-à-vis South Africa, i.e. in terms of the Pula/Rand exchange rate, this formula may be written:

$$RER(p/r) = [NER(p/r) / P(b)]) / [1/P(z)]$$

where: RER(p/r) : the real Pula/Rand exchange rate;
NER(p/r) : the nominal Pula/Rand exchange rate;
P(b) : the appropriate Botswana price deflator;
P(z) : the appropriate South African price deflator.

652. The exchange rate between Pula and Rand is however most often expressed in terms of the Rand/Pula rate, i.e. the inverse of the above Pula/Rand rate. This is the format of the official Bank of Botswana exchange rate statistics, and also the standard adopted in the present paper.

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[139] The Dornbusch Helmers reference and formula is copied from a Discussion Paper by J. S. Salkin, entitled: Real Exchange Rates and Macro Policy in Botswana, issued by the Macro Unit, Div. of Economic Affairs, Ministry of Finance and Development Planning, July 1989.

653. To conform with this format we reformulate the above formula as follows:

$$RER(p/r) = [NER(p/r) / P(b)] / [1 / P(z)] = NER(p/r) * P(z) / P(b)$$
$$= [1 / NER(r/p)]* [1 / \{P(b) / P(z)\}]$$
$$= 1 / [NER(r/p) * P(b) / P(z)] = 1 / RER(r/p)$$

where: NER(r/p) : the nominal Rand/Pula exchange rate;
RER(r/p) : the real Rand/Pula exchange rate, which is calculated by the formula: $RER(r/p) = NER(r/p) * P(b) / P(z)$.

654. The price deflators ought ideally to reflect the price of tradable products. In practise Consumer Price Indices (CPI) are often used, in the absence of more appropriate deflators. Thus, the Bank of Botswana has employed the following formula for estimating the real Rand/Pula exchange rate index:

$$REXRP_t = EXRP_t * CPI(b)_t / CPI(z)_t$$

where: $REXRP_t$: the real Rand/Pula exchange rate index (for period: t);
$EXRP_t$: the nominal Rand/Pula exchange rate index (for period: t);
$CPI(b)_t$: the Botswana CPI index (for period: t);
$CPI(z)_t$: the South African CPI index (for period: t).

655. Adopting this formula, but with the difference that we substitute the South African Consumer Price Index by the Wholesale Price Index, we may express the real Rand/Pula exchange rate index in terms of the variables used to calculate the GAIN% variable:

$$REXRP_t = EXRP_t * CPI_t / WPI_t$$

where: $REXRP_t$: the real Rand/Pula exchange rate index (for period: t);
$EXRP_t$: the nominal Rand/Pula exchange rate index (for period: t);
CPI_t : the Botswana Consumer Price Index (for period: t);
WPI_t : the South African Wholesale Price Index (for period: t).

The GAIN% variable

656. The GAIN% variable is defined as follows (see chapter 7.1):

$$GAIN\% = 1.0 - EXRP' * CPI' / WPI'$$

where: GAIN% : Percentage competitive gain earned or lost during the period, i.e. relative to the situation in the previous period.
EXRP' : Rand/Pula exchange rate during current period, divided by the same during the previous period; i.e. $EXRP' = EXRP_t/EXRP_{t-1}$.
CPI' : Botswana Consumer Price Index during current period, divided by the same during the previous period; i.e. $CPI' = CPI_t/CPI_{t-1}$.
WPI' : RSA Wholesale Price Index during current period, divided by the same during the previous period; i.e. $WPI' = WPI_t/WPI_{t-1}$.

657. The GAIN% variable may therefore be directly linked to the real exchange rate as follows:

$$GAIN\%_t = 1.0 - (EXRP_t/EXRP_{t-1})*(CPI_t/CPI_{t-1}) / (WPI_t/WPI_{t-1})$$
$$= 1.0 - (EXRP_t*CPI_t / WPI_t) / (EXRP_{t-1}*CPI_{t-1} / WPI_{t-1})$$
$$= 1.0 - REXRP_t / REXRP_{t-1}$$
$$= - (REXRP_t - REXRP_{t-1}) / REXRP_{t-1}$$

658. Alternatively, recalling from above that: RER(p/r) = 1/RER(r/p), we have:

$$\begin{aligned} GAIN\%_t &= 1.0 - REXRP_t / REXRP_{t-1} \\ &= 1.0 - (1/REXPR_t) / (1/REXPR_{t-1}) \\ &= 1.0 - REXPR_{t-1} / REXPR_t \\ &= (REXPR_t - REXPR_{t-1}) / REXPR_t \end{aligned}$$

659. We have consequently found the following correspondence between the GAIN% and real exchange rate variables:

- GAIN% is equal the *decrease* in the real *Rand/Pula* exchange rate (relative to the corresponding rate in the previous period); i.e. it is equal to the decrease in the real purchasing power of the Rand (relative to the Pula).
- Or, alternatively: GAIN% is equal to the percentage *increase* in the real *Pula/Rand* exchange rate (relative to the corresponding rate in the present period); i.e. it is equal to the increase in the real purchasing power of the Pula (relative to the Rand).

Annex J

Table annex

Table: 2,1
Botswana exports and imports. Direction of trade
Goods only. P'million

Exports (fob)					*CCA in %*
	CCA 1)	Zimb'we	All other	Total	*of total*
1980	25.9	12.0	352.5	390.4	*6.6%*
1981	55.1	19.6	257.6	332.3	*16.6%*
1982	53.0	45.9	368.6	467.5	*11.3%*
1983	57.7	50.9	588.1	696.7	*8.3%*
1984	75.6	31.9	749.6	857.1	*8.8%*
1985	77.6	40.9	1,265.8	1,384.3	*5.6%*
1986	90.9	84.5	1,443.9	1,619.3	*5.6%*
1987	110.6	102.8	2,451.3	2,664.7	*4.2%*
1988	144.6	185.0	2,348.7	2,678.3	*5.4%*
1989	184.1	253.9	3,304.6	3,742.6	*4.9%*
1990	157.3	226.0	2,935.8	3,319.1	*4.7%*
1991	186.5	255.6	3,296.9	3,739.0	*5.0%*
1992	255.3	116.5	3,303.2	3,675.0	*6.9%*
1993	379.5	135.2	3,797.4	4,312.1	*8.8%*
1994	691.4	134.1	4,139.5	4,965.0	*13.9%*
1995	1,274.8	164.6	4,479.4	5,918.8	*21.5%*
1996,I	784.8	101.2	2,818.6	3,704.6	*21.2%*

Imports (cif, inclusive of duty)					*CCA in %*
	CCA 1)	Zimb'we	All other	Total	*of total*
1980	467.8	35.3	34.7	537.8	*87.0%*
1981	581.3	40.4	42.2	663.9	*87.6%*
1982	608.8	42.9	52.2	703.9	*86.5%*
1983	669.9	56.1	79.9	805.9	*83.1%*
1984	698.1	76.8	120.4	895.3	*78.0%*
1985	814.3	78.8	202.1	1,095.2	*74.4%*
1986	1,021.5	98.5	211.4	1,331.4	*76.7%*
1987	1,251.0	117.7	203.8	1,572.5	*79.6%*
1988	1,689.0	139.3	343.9	2,172.2	*77.8%*
1989	2,444.6	172.3	402.7	3,019.6	*81.0%*
1990	2,979.7	183.5	456.3	3,619.5	*82.3%*
1991	3,291.9	207.5	428.3	3,927.7	*83.8%*
1992	3,373.9	193.2	403.0	3,970.1	*85.0%*
1993	3,541.0	196.2	547.8	4,285.0	*82.6%*
1994	3,437.4	258.9	711.0	4,407.3	*78.0%*
1995	3,923.0	293.0	1,089.2	5,305.2	*73.9%*
1996,I	1,984.9	162.2	390.0	2,537.1	*78.2%*

Note:
1) CCA = Common Customs Area. NB: almost all trade with CCA is with RSA.
Source: Ministry of Finance and Development Planning, Annual Economic Report, 1997
NB: 1996 data are for first six months only.

Table: 2,2
Botswana and RSA trade flows

I : Botswana's exports and imports 1)						
Measured in US$'million	1990	1991	1992	1993	1994	1995
Global trade totals (goods only)						
Exports (fob)	1,774	1,804	1,628	1,681	1,827	2,098
Imports (cif, inc. duty)	1,934	1,895	1,759	1,671	1,622	1,880
Exports and imports to/from RSA (goods only) 2)						
Exports (fob)	84	90	113	148	254	452
Imports (cif, inc. duty)	1,592	1,588	1,495	1,381	1,265	1,390
RSA trade share, in % of Botswana's total trade (goods only)						
Exports (fob)	4.7%	5.0%	6.9%	8.8%	13.9%	21.5%
Imports (cif, inc. duty)	82.3%	83.8%	85.0%	82.6%	78.0%	73.9%
Memo: trade totals measured in P'million 3)						
Global trade totals (goods only)						
Exports (fob)	3,319	3,739	3,675	4,312	4,965	5,919
Imports (cif, inc. duty)	3,620	3,928	3,970	4,285	4,407	5,305
Exports and imports to/from RSA (goods only)						
Exports (fob)	157	187	255	380	691	1,275
Imports (cif, inc. duty)	2,980	3,292	3,374	3,541	3,437	3,923
Memo: US$/Pula exch. rate	0.5344	0.4825	0.4431	0.3899	0.3680	0.3544

II : South Africa's exports and Imports 4)							
Measured in US$'million		1990	1991	1992	1993	1994	1995
Global trade totals							
Exports	Goods (fob)	23,560	23,289	23,645	24,068	24,654	27,879
	Services	3,559	3,474	3,611	3,571	3,989	4,516
	Total	27,119	26,763	27,256	27,639	28,643	32,395
Imports	Goods (fob)	16,778	17,156	18,216	18,287	21,452	27,132
	Services	4,239	4,238	4,833	5,101	5,483	5,970
	Total	21,017	21,394	23,049	23,388	26,935	33,102
Exports and imports to/from Botswana (goods only)							
Exports 5)		2,980	3,292	3,374	3,541	3,437	3,923
Imports 6)		157	187	255	380	691	1,275
Botswana trade share, in % of RSA's total trade (goods only)							
Exports 5)		12.6%	14.1%	14.3%	14.7%	13.9%	14.1%
Imports 6)		0.9%	1.1%	1.4%	2.1%	3.2%	4.7%

Notes: 1) The data cover trade in goods only. These will have to serve as indications of the pattern of total goods plus service trade, trade in services being relatively minor, and its country breakdown unknown. (Botswana's service imports amounted to 10% of total goods imports (cif), and service exports to 9 % of total goods export (fob), according to SAM92/93.)
2) In reality, trade with the Common Customs Area.
3) Based on table 2,1.
4) Totals from: IMF, International Financial Statistics. Botswana data from part I of table.
5) Exports at import cif+duty value.
6) Imports at export fob value.

Table: 2,3

Botswana exports, by main commodity and market

Goods only. P'million

	Exports (fob) by principal type of commodity 1)				
	Total goods exports	of which: Tradit'nl exports	Non-trad. exports		Traditional in % of total
1980	390.4	349.1	41.3	1980	89%
1981	332.3	279.6	52.7	1981	84%
1982	467.5	394.3	73.2	1982	84%
1983	696.7	614.4	82.3	1983	88%
1984	857.1	757.8	99.3	1984	88%
1985	1,384.3	1,277.3	107.0	1985	92%
1986	1,619.3	1,453.8	165.5	1986	90%
1987	2,664.7	2,460.6	204.1	1987	92%
1988	2,678.3	2,474.2	204.1	1988	92%
1989	3,742.6	3,481.5	261.1	1989	93%
1990	3,319.1	3,010.2	308.9	1990	91%
1991	3,739.0	3,402.0	337.0	1991	91%
1992	3,675.0	3,357.7	317.3	1992	91%
1993	4,312.1	3,791.4	520.7	1993	88%
1994	4,965.0	4,283.4	681.6	1994	86%
1995	5,918.8	4,536.9	1,381.9	1995	77%
1996,I	3,704.6	2,838.5	866.1	1996,I	77%

Breakdown of traditional exports:			Breakdown of non-traditional exports:				
Min. 2)	Beef 3)		Live animals	Textiles	Vehicles & parts	Other goods	Sub-total exc.veh.
317.9	31.2	1980	0.1	15.6	0.0	25.6	41.3
214.5	65.1	1981	0.1	16.0	0.0	36.6	52.7
307.7	86.6	1982	0.2	27.4	0.0	45.6	73.2
529.6	84.8	1983	0.2	33.0	0.0	49.1	82.3
684.2	73.6	1984	0.1	41.3	0.0	57.9	99.3
1,168.1	109.2	1985	0.3	28.9	0.0	77.8	107.0
1,323.5	130.3	1986	0.3	43.2	0.0	122.0	165.5
2,369.7	90.9	1987	0.8	59.2	0.0	144.1	204.1
2,350.3	123.9	1988	0.5	60.3	0.0	143.3	204.1
3,332.7	148.8	1989	0.7	79.8	0.0	180.6	261.1
2,884.7	125.5	1990	0.4	111.7	0.0	196.8	308.9
3,260.8	141.2	1991	0.6	123.0	0.0	213.4	337.0
3,208.0	149.7	1992	1.1	76.5	0.0	239.7	317.3
3,610.4	181.0	1993	0.7	95.0	91.0	334.0	429.7
4,073.3	210.1	1994	2.3	117.4	300.6	261.3	381.0
4,321.1	215.8	1995	2.2	146.3	946.8	286.6	435.1
2,741.9	96.6	1996,I	0.8	86.3	623.2	155.8	242.9

Notes:

1) Source: Ministry of Finance and Development Planning, Annual Economic Report, 1997

NB: 1996 data are for first six months only.

2) Minerals: Diamonds, Cu/Ni, soda ash etc

3) Beef and other cattle products (hides, cornbeef etc)

Table: 2,4
Botswana's 1993 exports of goods, by market and type 1)
Goods only. P'million

	Total exports	of which: Trad.	Non-trad.
A : By type of product	100.0%	91.2%	8.8%
B : By market			
RSA	8.8%	2.2%	78.0%
Zimbabwe	3.2%	2.4%	10.6%
Other Africa	0.4%	0.0%	3.6%
Europe	87.0%	94.9%	4.7%
All Other	0.6%	0.4%	3.2%
Total	100.0%	100.0%	100.0%

	Breakdown of traditional exports		
	Diamonds	Ot.min.2)	Beef 3)
A : By type of product	87.6%	7.5%	4.9%
B : By market			
RSA	0.0%	17.4%	18.2%
Zimbabwe	0.0%	31.5%	2.0%
Other Africa	0.0%	0.5%	0.2%
Europe 4)	99.7%	50.5%	76.6%
All Other	0.3%	0.1%	2.9%
Total	100.0%	100.0%	100.0%

Memo: Goods exports to RSA:

Traditional exports in % of all goods export:	22.7%
Traditional exports in % of non-traditional export:	29.4%

Notes: 1) Source: Botswana 1993 Trade Report data.
2) Other minerals: Cu/Ni, soda ash, salt, gold etc
3) Beef and other cattle products (hides, cornbeef etc)
4) Including Reunion

Table: 5,1
Input/Output Table (1992/93)
Valued in current prices (P'mill)

	Receiving Production sector:																Total Intermed. Uses	Private Cons-umption	Public Cons-umption	Export	Grs.Fix. Capital Format.	Incr. in Stocks	Total Uses
Delivering Production sector:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16							
1 Cattle	32.4	1.2	0.8	137.5	32.7	0.0	0.0	0.1	11.8	0.0	0.0	0.2	0.0	1.0	0.5	7.8	225.8	195.5	0.0	1.0	0.0	(40.7)	381.6
2 Other agriculture	1.6	2.8	1.2	2.4	34.2	0.0	0.0	0.0	8.1	0.0	0.0	0.0	0.0	4.2	1.8	27.0	83.1	144.6	0.0	3.5	1.8	0.0	232.9
3 Mining	0.1	0.1	61.0	0.3	2.0	0.1	43.6	53.6	4.7	0.2	1.9	4.7	0.0	0.8	0.6	4.5	178.1	18.8	0.0	3,127.0	23.6	10.0	3,370.6
4 Meat & meat prod.	0.0	0.3	2.2	0.0	0.1	0.0	0.0	0.3	4.5	0.0	0.0	0.2	0.0	4.8	0.0	0.6	13.0	142.9	0.0	132.3	0.0	10.0	316.4
5 Other manufacturing	4.1	22.8	7.6	4.3	190.9	7.1	1.6	36.7	25.5	2.5	11.0	17.0	0.0	16.1	4.4	38.8	390.2	741.6	1.3	299.1	78.6	3.0	1,510.9
6 Water	0.4	0.3	11.0	5.0	8.1	0.0	1.3	4.4	5.1	0.8	2.4	2.2	0.0	4.8	1.2	12.9	59.9	49.9	2.8	0.3	0.4	0.0	113.4
7 Electricity	0.7	0.3	58.2	5.7	41.2	2.3	3.6	10.4	9.1	2.0	4.0	3.8	0.0	7.2	1.9	19.8	170.3	48.6	4.1	1.0	0.0	28.2	224.0
8 Construction	0.8	9.9	4.2	3.2	130.5	5.8	1.9	631.6	7.4	2.6	17.6	36.3	0.0	17.0	5.4	160.8	1,035.1	35.9	2.5	5.7	924.4	0.0	2,003.6
9 Trade & hotels	1.4	0.3	5.7	0.4	121.8	0.5	1.3	27.9	10.6	1.3	15.9	8.9	0.0	9.1	4.1	15.1	224.3	378.6	2.1	147.3	96.5	0.0	848.8
10 Rail transport	0.1	0.3	13.1	0.3	10.9	0.0	0.1	2.5	4.3	8.7	0.8	0.1	0.0	0.1	0.6	2.4	44.3	9.1	0.0	51.5	0.0	0.0	104.9
11 Other transport	1.9	2.8	18.6	13.9	59.3	2.6	4.0	41.8	53.3	1.6	65.8	28.8	0.0	13.6	11.1	52.7	371.8	82.5	0.0	62.9	0.0	0.0	517.2
12 Financial services	1.9	3.2	22.8	4.3	60.3	4.0	2.5	71.8	68.7	7.2	27.0	41.4	0.0	24.5	14.1	257.4	611.1	404.9	1.8	45.8	44.1	0.0	1,107.8
13 Domestic services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.1	0.0	0.0	0.0	0.0	59.1
14 Oth. pers. services	1.4	3.2	4.3	0.8	21.8	1.3	0.5	10.9	14.8	1.8	18.5	10.6	0.0	8.7	4.7	14.1	117.4	203.1	180.4	24.6	0.0	0.0	525.5
15 Local government	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	250.1	0.0	0.0	0.0	256.3
16 Central government	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	6.3	89.6	2,253.1	0.0	0.0	0.0	2,349.0
Imports: Goods (cif) & services	34.1	21.4	99.2	73.6	318.0	11.1	27.6	411.6	112.1	14.4	80.3	76.1	0.0	50.8	24.8	295.2	1,650.4	747.1	48.2	0.0	994.8	0.0	3,444.3
Duties & taxes 1)	9.7	6.9	26.5	20.3	107.7	3.0	8.4	125.0	27.7	2.9	18.3	18.6	0.0	15.9	5.3	76.5	473.0	247.6	0.0	0.0	366.4	0.0	1,086.9
Total Intermediate Inputs	99.3	75.7	336.4	272.2	1,139.5	37.8	96.2	1,428.7	367.6	46.1	263.5	252.8	0.0	178.5	80.4	985.7	5,660.4	3,599.4	2,746.5	3,902.0	2,530.6	3.9	18,453.3
Wages 1 Professional - Local	8.7	0.0	36.7	8.5	21.0	14.4	7.1	19.2	53.5	5.2	34.3	80.1	0.0	64.5	47.6	306.0	706.8						
Wages 2 Professional - Expat.	5.4	0.0	44.8	2.4	40.2	1.8	7.2	78.9	38.4	1.0	15.5	67.3	0.0	78.0	5.6	87.4	473.9						
Wages 3 Skilled - Local	8.8	0.0	198.9	18.3	80.8	14.3	19.3	129.6	116.7	24.0	41.4	116.6	0.0	32.5	61.6	341.0	1,203.8						
Wages 4 Skilled - Expatriate	0.4	0.0	24.1	0.0	16.3	0.7	0.4	48.4	7.3	0.1	5.0	1.2	0.0	1.5	0.0	0.0	105.4						
Wages 5 Unskilled	18.4	0.0	40.7	4.7	35.8	5.6	3.8	82.4	27.3	6.6	17.5	15.6	40.9	14.9	25.2	139.9	479.3						
Wages 6 Self-employed	262.1	69.8	0.0	0.0	52.6	0.0	0.0	0.0	0.0	0.0	0.0	153.3	11.7	0.0	0.0	0.0	549.5						
Gross Operating Surplus	(16.9)	87.4	2,668.0	20.0	138.6	41.9	90.0	217.5	237.1	19.5	138.2	426.5	6.5	153.3	35.9	489.0	4,772.5						
Gross Dom. Prod. (factor cost)	286.9	157.2	3,033.3	53.9	385.3	78.7	127.8	576.0	480.3	56.4	251.9	860.6	59.1	344.6	175.9	1,363.3	8,291.2						
Gross Output (factor cost)	386.2	232.9	3,369.7	326.1	1,524.9	116.5	224.0	2,004.7	847.8	102.5	515.4	1,113.4	59.1	523.1	256.3	2,349.0	13,951.6						
Indirect Taxes (net)	(4.6)	0.0	0.9	(9.7)	(14.0)	(3.1)	0.0	(1.1)	0.9	2.4	1.8	(5.6)	0.0	2.4	0.0	0.0	(29.5)						
Grs. Dom. Prod. (market price)	282.3	157.2	3,034.2	44.2	371.4	75.6	127.8	574.9	481.2	58.8	253.7	855.0	59.1	347.0	175.9	1,363.3	8,261.7						
Gross Output (market price)	381.6	232.9	3,370.6	316.4	1,510.9	113.4	224.0	2,003.6	848.8	104.9	517.2	1,107.8	59.1	525.5	256.3	2,349.0	13,922.1						

NB: The following reexports have been netted out of imports and exports:

		Exports
Imports -	Goods, cif	180.6
	Import Duty	0.0
	Services	0.0
	Total	180.6

Note: 1) The recorded value of duties and taxes exceeds the amount actually collected. Imports from the Common Customs Area (CCA) enter Botswana duty-free. Import duty is nevertheless imputed for these imports, measuring the price-rising effect of the tariff protection enjoyed within the CCA.

Based on: Social Accounting Matrix 1992/93, Central Statistics Office

Table: 5,2

Summary of model estimates. Input/Output based price formation model

NB: All estimates are presented in terms of percentage changes from the initial situation.

		A : Assuming 0% wage- & profit-compensation	C : Assuming 50% wage- & 100% profit-compensation					
			Wage increase "round" no:					
Total cummulative changes in:			**0**	**1**	**2**	**3**	**4**	**5**
RSA : General price-index	Assumed	10.0%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
BOT: Wage-rate index	Assumed	0.0%	0.00%	2.69%	3.32%	3.46%	3.49%	3.50%
: Cost of Living index	Derived	4.6%	5.38%	6.63%	6.91%	6.98%	7.00%	7.00%
Average price-index for:								
: All prod., exc.tradit'al exp. 1)	Derived	2.6%	3.62%	5.34%	5.74%	5.83%	5.85%	5.85%
: All home m'rkt tradeables 2)	Derived	3.4%	4.35%	5.87%	6.22%	6.30%	6.32%	6.33%
: All non-trad. exports; FOB 3)		3.1%	4.30%	5.83%	6.19%	6.27%	6.29%	6.29%
: All non-trad.exp.; mrkt-prc 4)	Derived	3.5%	4.57%	6.03%	6.37%	6.45%	6.47%	6.47%
Incremental changes in:								
RSA : General price-index	Derived		10.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BOT: Wage-rate index	Derived		0.00%	2.69%	0.63%	0.14%	0.03%	0.01%
: Cost of Living index	Derived		5.38%	1.24%	0.29%	0.08%	0.02%	0.00%
Memo: Cum. COL, in % of final impact			76.9%	94.7%	98.8%	99.7%	99.9%	100.0%

B : Assuming 100% wage & profit compensation

	Type of	Wage increase "round" no:										
Total cummulative changes in:	data	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
RSA : General price-index	Assumed	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
BOT: Wage-rate index	Assumed	0.00%	5.38%	7.87%	9.02%	9.55%	9.79%	9.90%	9.95%	9.98%	9.99%	10.00%
: Cost of Living index	Derived	5.38%	7.87%	9.02%	9.55%	9.79%	9.90%	9.95%	9.98%	9.99%	10.00%	10.00%
Average price-index for:												
: All prod., exc.tradit'al exp. 1)	Derived	3.62%	7.05%	8.64%	9.37%	9.71%	9.87%	9.94%	9.97%	9.99%	9.99%	10.00%
: All home m'rkt tradeables 2)	Derived	4.35%	7.39%	8.80%	9.45%	9.75%	9.88%	9.94%	9.97%	9.99%	9.99%	10.00%
: All non-trad. exports; FOB 3)	Derived	4.30%	7.37%	8.79%	9.44%	9.74%	9.88%	9.94%	9.97%	9.99%	9.99%	10.00%
: All non-trad.exp.; mrkt-prc 4)	Derived	4.57%	7.49%	8.84%	9.47%	9.76%	9.89%	9.95%	9.97%	9.99%	9.99%	10.00%
Incremental changes in:												
RSA : General price-index	Derived	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
BOT: Wage-rate index	Derived	0.00%	5.38%	2.49%	1.15%	0.53%	0.24%	0.11%	0.05%	0.03%	0.01%	0.01%
: Cost of Living index	Derived	5.38%	2.48%	1.15%	0.53%	0.24%	0.11%	0.05%	0.02%	0.01%	0.00%	0.00%
Memo: Cum. COL, in % of final impact	Derived	53.8%	78.7%	90.2%	95.5%	97.9%	99.0%	99.5%	99.8%	99.9%	100.0%	100.0%

Notes: 1) Average production price index for all local produced products, excl. traditional exports.
2) Market price index for local tradeable products sold in the home market, (valued in Pula).
3) Border price index for non-traditional exports, (measured in Pula, at FOB value).
4) Market price index for non-traditional exports, (measured in Rand, inc. of transport costs).

TABLE: 6,1

Summary of assumptions and results. Model III. Scenario: 1

NB: All estimates are presented in terms of percentage changes from the initial situation.

	Ref:	Type of	Scenario ref.: 1A	1A(1)	1A(2)	1A(3)	1A(4)	1A(5)	1A(6)	1B (1A(7))	1C
Total (cumm.) changes in:	Annex D	data	Data report:								
RSA : General price-index	GRI%	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	WAG%	Assumed	0.0%	5.4%	7.9%	9.0%	9.6%	9.8%	9.9%	10.0%	3.5%
: Cost of Living index	COL%	Derived	5.4%	7.9%	9.0%	9.5%	9.8%	9.9%	10.0%	10.0%	7.0%
Average prod. price-index for:											
: All prod., exc.tradit'al exp. 1)	TGO%	Derived	3.6%	7.1%	8.6%	9.4%	9.7%	9.9%	9.9%	10.0%	5.9%
: All home m'rkt tradeables 2)	PPH%	Derived	4.4%	7.4%	8.8%	9.4%	9.7%	9.9%	9.9%	10.0%	6.3%
: All non-trad. exports; FOB 3)	PPE%	Derived	4.3%	7.4%	8.8%	9.4%	9.7%	9.9%	9.9%	10.0%	6.3%
: All non-trad.exp.; mrkt-prc 4)	RME%	Derived	4.6%	7.5%	8.8%	9.5%	9.8%	9.9%	9.9%	10.0%	6.5%
Changes in Exchange Rates:											
Rand/US$ exchange rate	EXRD%	Assumed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rand/Pula exchange rate	EXRP%	Assumed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pula/US$ exchange rate	EXPD%	Derived	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Competitive and profitability gains:											
Com.gain in the home market 5)	BCGHM%	Derived	5.1%	2.4%	1.1%	0.5%	0.2%	0.1%	0.1%	0.0%	3.3%
Com.gain in the non-trd. exp.mrk. 6)	BCGEX%	Derived	4.9%	2.3%	1.1%	0.5%	0.2%	0.1%	0.0%	0.0%	3.2%
Profit.gain in tradit.export sectors 7)											
Nominal 8)	PROFITN%	Derived	-0.7%	-1.4%	-1.7%	-1.9%	-2.0%	-2.0%	-2.0%	-2.0%	-1.1%
Real 9)	PROFITR%	Derived	-6.0%	-8.7%	-9.9%	-10.5%	-10.7%	-10.8%	-10.9%	-10.9%	-7.8%

Notes:

1) Average production price index for all local products excl. traditional exports.

2) Average production price index for all local tradeable products supplied to the home market, (valued at local (Pula) market prices).

3) Average production price index for all non-traditional exports, (valued at (Pula) FOB price).

4) Average production price index for all non-traditional exports, (valued at foreign market price, i.e. at Rand, inc. transport costs).

5) Botswana's competitive gain in the home market (tradeable products only).

6) Botswana's competitive gain in the non-traditional export market.

7) Botswana's profitability gain; measuring the nominal and real change in the value of the Gross Operating Surplus (GOS) earned by the traditional export sectors, expressed as a % of the initial GOS value.

8) Percentage increase in GOS, as measured in current prices.

9) Percentage increase in GOS, as measured by deflated prices; (i.e when the "new" GOS value is deflated by a price index for Total Domestic Uses).

TABLE: 6,2

Summary of assumptions and results. Model III. Scenario: 2

NB: All estimates are presented in terms of percentage changes from the initial situation.

	Ref:	Type of	Scenario ref.:				
			2A1	2A2	2B	2C1	2C2
Total (cumm.) changes in:	Annex D	data	Data report:				
RSA : General price-index	GRI%	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	WAG%	Assumed	0.0%	10.0%	0.0%	0.0%	4.8%
: Cost of Living index	COL%	Derived	5.4%	10.0%	-0.0%	2.6%	4.8%
Average prod. price-index for:							
: All prod., exc.tradit'al exp. 1)	TGO%	Derived	3.6%	10.0%	-0.0%	1.7%	4.8%
: All home m'rkt tradeables 2)	PPH%	Derived	4.4%	10.0%	-0.0%	2.1%	4.8%
: All non-trad. exports; FOB 3)	PPE%		4.3%	10.0%	-0.0%	2.0%	4.8%
: All non-trad.exp.; mrkt-prc 4)	RME%	Derived	4.6%	10.0%	10.0%	7.3%	10.0%
Changes in Exchange Rates:							
Rand/US$ exchange rate	EXRD%	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/Pula exchange rate	EXRP%	Assumed	0.0%	0.0%	10.0%	5.0%	5.0%
Pula/US$ exchange rate	EXPD%	Derived	10.0%	10.0%	0.0%	4.8%	4.8%
Competitive and profitability gains:							
Com.gain in the home market 5)	BCGHM%	Derived	5.1%	0.0%	0.0%	2.6%	-0.0%
Com.gain in the non-trd. exp.mrk. 6)	BCGEX%	Derived	4.9%	0.0%	0.0%	2.5%	-0.0%
Profit.gain in tradit.export sectors 7)							
Nominal 8)	PROFITN%	Derived	11.4%	10.0%	0.0%	5.4%	4.8%
Real 9)	PROFITR%	Derived	5.4%	-0.0%	-0.0%	2.6%	-0.0%

Notes:

1) Average production price index for all local products excl. traditional exports.

2) Average production price index for all local tradeable products supplied to the home market, (valued at local (Pula) market prices).

3) Average production price index for all non-traditional exports, (valued at (Pula) FOB price).

4) Average production price index for all non-traditional exports, (valued at foreign market price, i.e. at Rand, inc. transport costs).

5) Botswana's competitive gain in the home market (tradeable products only).

6) Botswana's competitive gain in the non-traditional export market.

7) Botswana's profitability gain; measuring the nominal and real change in the value of the Gross Operating Surplus (GOS) earned by the traditional export sectors, expressed as a % of the initial GOS value.

8) Percentage increase in GOS, as measured in current prices.

9) Percentage increase in GOS, as measured by deflated prices; (i.e when the "new" GOS value is deflated by a price index for Total Domestic Uses).

TABLE: 6.3

Summary of assumptions and results. Model III. Scenario: 3

NB: All estimates are presented in terms of percentage changes from the initial situation.

			Scenario ref.:								
	Ref:	Type of	3A1	3A2	3B1	3B2	3C	3D	3E	3F1	3F2
Total (cumm.) changes in:	Annex D	data	Data report:								
RSA : General price-index	GRI%	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	WAG%	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	-12.0%
: Cost of Living index	COL%	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	-2.3%	-4.5%	-6.5%	-12.0%
Average prod. price-index for:											
: All prod., exc.tradit'al exp. 1)	TGO%	Derived	3.6%	10.0%	1.7%	4.8%	-0.0%	-1.6%	-3.0%	-4.3%	-12.0%
: All home m'rkt tradeables 2)	PPH%	Derived	4.4%	10.0%	2.1%	4.8%	-0.0%	-1.9%	-3.6%	-5.2%	-12.0%
: All non-trad. exports; FOB 3)	PPE%	Derived	4.3%	10.0%	2.0%	4.8%	-0.0%	-1.9%	-3.6%	-5.2%	-12.0%
: All non-trad.exp.; mrkt-prc 4)	RME%	Derived	4.6%	10.0%	7.3%	10.0%	10.0%	12.7%	15.4%	18.1%	10.0%
Changes in Exchange Rates:											
Rand/US$ exchange rate	EXRD%	Assumed	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Rand/Pula exchange rate	EXRP%	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	15.0%	20.0%	25.0%	25.0%
Pula/US$ exchange rate	EXPD%	Derived	20.0%	20.0%	14.3%	14.3%	9.1%	4.3%	0.0%	-4.0%	-4.0%
Competitive and profitability gains:											
Com.gain in the home market 5)	BCGHM%	Derived	5.1%	0.0%	2.6%	-0.0%	0.0%	-2.6%	-5.1%	-7.7%	0.0%
Com.gain in the non-trd. exp.mrk. 6)	BCGEX%	Derived	4.9%	0.0%	2.5%	-0.0%	0.0%	-2.5%	-4.9%	-7.4%	0.0%
Profit.gain in tradit.export sectors 7)											
Nominal 8)	PROFITN%	Derived	23.4%	22.0%	16.9%	16.2%	10.9%	5.5%	0.5%	-4.0%	-2.4%
Real 9)	PROFITR%	Derived	16.7%	10.9%	13.8%	10.9%	10.9%	8.2%	5.6%	3.0%	10.9%

Notes:

1) Average production price index for all local products excl. traditional exports.
2) Average production price index for all local tradeable products supplied to the home market, (valued at local (Pula) market prices).
3) Average production price index for all non-traditional exports, (valued at (Pula) FOB price).
4) Average production price index for all non-traditional exports, (valued at foreign market price, i.e. at Rand, inc. transport costs).
5) Botswana's competitive gain in the home market (tradeable products only).
6) Botswana's competitive gain in the non-traditional export market.
7) Botswana's profitability gain; measuring the nominal and real change in the value of the Gross Operating Surplus (GOS) earned by the traditional export sectors, expressed as a % of the initial GOS value.
8) Percentage increase in GOS, as measured in current prices.
9) Percentage increase in GOS, as measured by deflated prices; (i.e when the "new" GOS value is deflated by a price index for Total Domestic Uses).

TABLE: 6,4

Summary of assumptions and results. Model III. Scenario: 4

NB: All estimates are presented in terms of percentage changes from the initial situation.

	Ref:	Type of	Scenario ref.: 4A1	4A2	4B1	4B2	4C	4D1	4D2	4E1	4E2
Total (cumm.) changes in:	Annex D	data	Data report:								
RSA : General price-index	GRI%	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	WAG%	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.3%
: Cost of Living index	COL%	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	8.5%	15.8%	-2.3%	-4.3%
Average price-index for:											
: All prod., exc.tradit'al exp. 1)	TGO%	Derived	3.6%	10.0%	1.7%	4.8%	-0.0%	5.7%	15.8%	-1.6%	-4.3%
: All home m'rkt tradeables 2)	PPH%	Derived	4.4%	10.0%	2.1%	4.8%	-0.0%	6.9%	15.8%	-1.9%	-4.3%
: All non-trad. exports; FOB 3)	PPE%	Derived	4.3%	10.0%	2.0%	4.8%	-0.0%	6.8%	15.8%	-1.9%	-4.3%
: All non-trad.exp.; mrkt-prc 4)	RME%	Derived	4.6%	10.0%	7.3%	10.0%	10.0%	1.9%	10.0%	12.7%	10.0%
Changes in Exchange Rates:											
Rand/US$ exchange rate	EXRD%	Assumed	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Rand/Pula exchange rate	EXRP%	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	-5.0%	-5.0%	15.0%	15.0%
Pula/US$ exchange rate	EXPD%	Derived	5.0%	5.0%	0.0%	0.0%	-4.5%	10.5%	10.5%	-8.7%	-8.7%
Competitive and profitability gains:											
Com.gain in the home market 5)	BCGHM%	Derived	5.1%	0.0%	2.6%	-0.0%	0.0%	7.7%	-0.0%	-2.6%	-0.0%
Com.gain in the non-trd. exp.mrk. 6)	BCGEX%	Derived	4.9%	0.0%	2.5%	-0.0%	0.0%	7.4%	-0.0%	-2.5%	-0.0%
Profit.gain in tradit.export sectors 7)											
Nominal 8)	PROFITN%	Derived	5.4%	4.0%	-0.3%	-1.0%	-5.5%	11.6%	9.5%	-10.2%	-9.6%
Real 9)	PROFITR%	Derived	-0.3%	-5.5%	-3.0%	-5.5%	-5.5%	2.4%	-5.5%	-7.9%	-5.5%

Notes:

1) Average production price index for all local products excl. traditional exports.

2) Average production price index for all local tradeable products supplied to the home market, (valued at local (Pula) market prices).

3) Average production price index for all non-traditional exports, (valued at (Pula) FOB price).

4) Average production price index for all non-traditional exports, (valued at foreign market price, i.e. at Rand, inc. transport costs).

5) Botswana's competitive gain in the home market (tradeable products only).

6) Botswana's competitive gain in the non-traditional export market.

7) Botswana's profitability gain; measuring the nominal and real change in the value of the Gross Operating Surplus (GOS) earned by the traditional export sectors, expressed as a % of the initial GOS value.

8) Percentage increase in GOS, as measured in current prices.

9) Percentage increase in GOS, as measured by deflated prices; (i.e when the "new" GOS value is deflated by a price index for Total Domestic Uses).

TABLE: 6,5

Summary of assumptions and results. Model III. Scenario: 5

NB: All estimates are presented in terms of percentage changes from the initial situation.

	Ref:	Type of	Scenario ref.: 5A1	5A2	5B1	5B2	5C	5D1	5D2	5E1	5E2
Total (cumm.) changes in:	Annex D	data	Data report:								
RSA : General price-index	GRI%	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	WAG%	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.3%
: Cost of Living index	COL%	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	8.5%	15.8%	-2.3%	-4.3%
Average price-index for:											
: All prod., exc.tradit'al exp. 1)	TGO%	Derived	3.6%	10.0%	1.7%	4.8%	-0.0%	5.7%	15.8%	-1.6%	-4.3%
: All home m'rkt tradeables 2)	PPH%	Derived	4.4%	10.0%	2.1%	4.8%	-0.0%	6.9%	15.8%	-1.9%	-4.3%
: All non-trad. exports; FOB 3)	PPE%	Derived	4.3%	10.0%	2.0%	4.8%	-0.0%	6.8%	15.8%	-1.9%	-4.3%
: All non-trad.exp.; mrkt-prc 4)	RME%	Derived	4.6%	10.0%	7.3%	10.0%	10.0%	1.9%	10.0%	12.7%	10.0%
Changes in Exchange Rates:											
Rand/US$ exchange rate	EXRD%	Assumed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rand/Pula exchange rate	EXRP%	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	-5.0%	-5.0%	15.0%	15.0%
Pula/US$ exchange rate	EXPD%	Derived	0.0%	0.0%	-4.8%	-4.8%	-9.1%	5.3%	5.3%	-13.0%	-13.0%
Competitive and profitability gains:											
Com.gain in the home market 5)	BCGHM%	Derived	5.1%	0.0%	2.6%	-0.0%	0.0%	7.7%	-0.0%	-2.6%	-0.0%
Com.gain in the non-trd. exp.mrk. 6)	BCGEX%	Derived	4.9%	0.0%	2.5%	-0.0%	0.0%	7.4%	-0.0%	-2.5%	-0.0%
Profit.gain in tradit.export sectors 7)											
Nominal 8)	PROFITN%	Derived	-0.7%	-2.0%	-6.0%	-6.7%	-10.9%	5.3%	3.1%	-15.4%	-14.8%
Real 9)	PROFITR%	Derived	-6.0%	-10.9%	-8.5%	-10.9%	-10.9%	-3.4%	-10.9%	-13.3%	-10.9%

Notes:

1) Average production price index for all local products excl. traditional exports.

2) Average production price index for all local tradeable products supplied to the home market, (valued at local (Pula) market prices).

3) Average production price index for all non-traditional exports, (valued at (Pula) FOB price).

4) Average production price index for all non-traditional exports, (valued at foreign market price, i.e. at Rand, inc. transport costs).

5) Botswana's competitive gain in the home market (tradeable products only).

6) Botswana's competitive gain in the non-traditional export market.

7) Botswana's profitability gain; measuring the nominal and real change in the value of the Gross Operating Surplus (GOS) earned by the traditional export sectors, expressed as a % of the initial GOS value.

8) Percentage increase in GOS, as measured in current prices.

9) Percentage increase in GOS, as measured by deflated prices; (i.e when the "new" GOS value is deflated by a price index for Total Domestic Uses).

TABLE: 6,6

Summary of assumptions and results. Model III. Scenario: 6

NB: All estimates are presented in terms of percentage changes from the initial situation.

	Ref:	Type of	Scenario ref.: 6A1	6A2	6B1	6B2	6C	6D1	6D2	6E1	6E2
Total (cumm.) changes in:	Annex D	data	Data report:								
RSA : General price-index	GRI%	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	WAG%	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.3%
: Cost of Living index	COL%	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	8.5%	15.8%	-2.3%	-4.3%
Average price-index for:											
: All prod., exc.tradit'al exp. 1)	TGO%	Derived	3.6%	10.0%	1.7%	4.8%	-0.0%	5.7%	15.8%	-1.6%	-4.3%
: All home m'rkt tradeables 2)	PPH%	Derived	4.4%	10.0%	2.1%	4.8%	-0.0%	6.9%	15.8%	-1.9%	-4.3%
: All non-trad. exports; FOB 3)	PPE%	Derived	4.3%	10.0%	2.0%	4.8%	-0.0%	6.8%	15.8%	-1.9%	-4.3%
: All non-trad.exp.; mrkt-prc 4)	RME%	Derived	4.6%	10.0%	7.3%	10.0%	10.0%	1.9%	10.0%	12.7%	10.0%
Changes in Exchange Rates:											
Rand/US$ exchange rate	EXRD%	Assumed	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%
Rand/Pula exchange rate	EXRP%	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	-5.0%	-5.0%	15.0%	15.0%
Pula/US$ exchange rate	EXPD%	Derived	-5.0%	-5.0%	-9.5%	-9.5%	-13.6%	0.0%	0.0%	-17.4%	-17.4%
Competitive and profitability gains:											
Com.gain in the home market 5)	BCGHM%	Derived	5.1%	0.0%	2.6%	-0.0%	0.0%	7.7%	-0.0%	-2.6%	-0.0%
Com.gain in the non-trd. exp.mrk. 6)	BCGEX%	Derived	4.9%	0.0%	2.5%	-0.0%	0.0%	7.4%	-0.0%	-2.5%	-0.0%
Profit.gain in tradit.export sectors 7)											
Nominal 8)	PROFITN%	Derived	-6.7%	-8.1%	-11.8%	-12.4%	-16.4%	-1.0%	-3.2%	-20.6%	-20.0%
Real 9)	PROFITR%	Derived	-11.7%	-16.4%	-14.1%	-16.4%	-16.4%	-9.2%	-16.4%	-18.6%	-16.4%

Notes:

1) Average production price index for all local products excl. traditional exports.
2) Average production price index for all local tradeable products supplied to the home market, (valued at local (Pula) market prices).
3) Average production price index for all non-traditional exports, (valued at (Pula) FOB price).
4) Average production price index for all non-traditional exports, (valued at foreign market price, i.e. at Rand, inc. transport costs).
5) Botswana's competitive gain in the home market (tradeable products only).
6) Botswana's competitive gain in the non-traditional export market.
7) Botswana's profitability gain; measuring the nominal and real change in the value of the Gross Operating Surplus (GOS) earned by the traditional export sectors, expressed as a % of the initial GOS value.
8) Percentage increase in GOS, as measured in current prices.
9) Percentage increase in GOS, as measured by deflated prices; (i.e when the "new" GOS value is deflated by a price index for Total Domestic Uses).

Table: 6,7
Comparison of misc. scenario results

Group I: Change in Rand/Pula rate: 0%; change in Pula/$ rate: various

	A: Wage-compensation: 0%					B: Wage-compensation: 100%				
	Scenario ref.:					Scenario ref.:				
Total (cumm.) changes in:	**6A1**	**5A1**	**4A1**	**2A1**	**3A1**	**6A2**	**5A2**	**4A2**	**2A2**	**3A2**
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	10.0%	10.0%	10.0%	10.0%
: Cost of Living index	5.4%	5.4%	5.4%	5.4%	5.4%	10.0%	10.0%	10.0%	10.0%	10.0%
Average price-index for:										
: All prod., exc.tradit'al exp.	3.6%	3.6%	3.6%	3.6%	3.6%	10.0%	10.0%	10.0%	10.0%	10.0%
: All home m'rkt tradeables	4.4%	4.4%	4.4%	4.4%	4.4%	10.0%	10.0%	10.0%	10.0%	10.0%
: All non-trad. exports; FOB	4.3%	4.3%	4.3%	4.3%	4.3%	10.0%	10.0%	10.0%	10.0%	10.0%
: All non-trad.exp.; mrkt-price	4.6%	4.6%	4.6%	4.6%	4.6%	10.0%	10.0%	10.0%	10.0%	10.0%
Changes in Exchange Rates:										
Rand/US$ exchange rate	-5.0%	0.0%	5.0%	10.0%	20.0%	-5.0%	0.0%	5.0%	10.0%	20.0%
Rand/Pula exchange rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pula/US$ exchange rate	-5.0%	0.0%	5.0%	10.0%	20.0%	-5.0%	0.0%	5.0%	10.0%	20.0%
Competitive and profitability gains:										
Com.gain in the home market	5.1%	5.1%	5.1%	5.1%	5.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Com.gain in the non-trd. exp.mrk.	4.9%	4.9%	4.9%	4.9%	4.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Profit.gain in tradit.export sectors										
Nominal	-6.7%	-0.7%	5.4%	11.4%	23.4%	-8.1%	-2.0%	4.0%	10.0%	22.0%
Real	-11.7%	-6.0%	-0.3%	5.4%	16.7%	-16.4%	-10.9%	-5.5%	-0.0%	10.9%

Group II: Change in Rand/Pula rate: 5%; change in Pula/$ rate: various

	A: Wage-compensation: 0%					B: Wage-compensation: 100%				
	Scenario ref.:					Scenario ref.:				
Total (cumm.) changes in:	**6B1**	**5B1**	**4B1**	**2C1**	**3B1**	**6B2**	**5B2**	**4B2**	**2C2**	**3B2**
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	4.8%	4.8%	4.8%	4.8%
: Cost of Living index	2.6%	2.6%	2.6%	2.6%	2.6%	4.8%	4.8%	4.8%	4.8%	4.8%
Average price-index for:										
: All prod., exc.tradit'al exp.	1.7%	1.7%	1.7%	1.7%	1.7%	4.8%	4.8%	4.8%	4.8%	4.8%
: All home m'rkt tradeables	2.1%	2.1%	2.1%	2.1%	2.1%	4.8%	4.8%	4.8%	4.8%	4.8%
: All non-trad. exports; FOB	2.0%	2.0%	2.0%	2.0%	2.0%	4.8%	4.8%	4.8%	4.8%	4.8%
: All non-trad.exp.; mrkt-price	7.3%	7.3%	7.3%	7.3%	7.3%	10.0%	10.0%	10.0%	10.0%	10.0%
Changes in Exchange Rates:										
Rand/US$ exchange rate	-5.0%	0.0%	5.0%	10.0%	20.0%	-5.0%	0.0%	5.0%	10.0%	20.0%
Rand/Pula exchange rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Pula/US$ exchange rate	-9.5%	-4.8%	0.0%	4.8%	14.3%	-9.5%	-4.8%	0.0%	4.8%	14.3%
Competitive and profitability gains:										
Com.gain in the home market	2.6%	2.6%	2.6%	2.6%	2.6%	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%
Com.gain in the non-trd. exp.mrk.	2.5%	2.5%	2.5%	2.5%	2.5%	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%
Profit.gain in tradit.export sectors										
Nominal	-11.8%	-6.0%	-0.3%	5.4%	16.9%	-12.4%	-6.7%	-1.0%	4.8%	16.2%
Real	-14.1%	-8.5%	-3.0%	2.6%	13.8%	-16.4%	-10.9%	-5.5%	-0.0%	10.9%

Group III: Change in Rand/Pula rate: 10%; change in Pula/$ rate: various

	Wage-compensation: NA				
	Scenario ref.:				
Total (cumm.) changes in:	**6C**	**5C**	**4C**	**2B**	**3C**
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	0.0%	0.0%	0.0%	0.0%
: Cost of Living index	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%
Average price-index for:					
: All prod., exc.tradit'al exp.	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%
: All home m'rkt tradeables	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%
: All non-trad. exports; FOB	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%
: All non-trad.exp.; mrkt-price	10.0%	10.0%	10.0%	10.0%	10.0%
Changes in Exchange Rates:					
Rand/US$ exchange rate	-5.0%	0.0%	5.0%	10.0%	20.0%
Rand/Pula exchange rate	10.0%	10.0%	10.0%	10.0%	10.0%
Pula/US$ exchange rate	-13.6%	-9.1%	-4.5%	0.0%	9.1%
Competitive and profitability gains:					
Com.gain in the home market	0.0%	0.0%	0.0%	0.0%	0.0%
Com.gain in the non-trd. exp.mrk.	0.0%	0.0%	0.0%	0.0%	0.0%
Profit.gain in tradit.export sectors					
Nominal	-16.4%	-10.9%	-5.5%	0.0%	10.9%
Real	-16.4%	-10.9%	-5.5%	-0.0%	10.9%

Table: 6,7 cont.
Comparison of misc. scenario results

Group IV: Change in Rand/Pula rate: -5%; change in Pula/$ rate: various

	A: Wage-compensation: 0% Scenario ref.:			B: Wage-compensation: 100% Scenario ref.:		
Total (cumm.) changes in:	**6D1**	**4D1**	**5D1**	**6D2**	**5D2**	**4D2**
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	0.0%	0.0%	15.8%	15.8%	15.8%
: Cost of Living index	8.5%	8.5%	8.5%	15.8%	15.8%	15.8%
Average price-index for:						
: All prod., exc.tradit'al exp.	5.7%	5.7%	5.7%	15.8%	15.8%	15.8%
: All home m'rkt tradeables	6.9%	6.9%	6.9%	15.8%	15.8%	15.8%
: All non-trad. exports; FOB	6.8%	6.8%	6.8%	15.8%	15.8%	15.8%
: All non-trad.exp.; mrkt-price	1.9%	1.9%	1.9%	10.0%	10.0%	10.0%
Changes in Exchange Rates:						
Rand/US$ exchange rate	-5.0%	5.0%	0.0%	-5.0%	0.0%	5.0%
Rand/Pula exchange rate	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%
Pula/US$ exchange rate	0.0%	10.5%	5.3%	0.0%	5.3%	10.5%
Competitive and profitability gains:						
Com.gain in the home market	7.7%	7.7%	7.7%	-0.0%	-0.0%	-0.0%
Com.gain in the non-trd. exp.mrk.	7.4%	7.4%	7.4%	-0.0%	-0.0%	-0.0%
Profit.gain in tradit.export sectors						
Nominal	-1.0%	11.6%	5.3%	-3.2%	3.1%	9.5%
Real	-9.2%	2.4%	-3.4%	-16.4%	-10.9%	-5.5%

Group V: Change in Rand/Pula rate: 15%; change in Pula/$ rate: various

	A: Wage-compensation: 0% Scenario ref.:				B: Wage-compensation: 100% Scenario ref.:		
Total (cumm.) changes in:	**6E1**	**5E1**	**4E1**	**3D**	**6E2**	**5E2**	**4E2**
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	0.0%	0.0%	0.0%	-4.3%	-4.3%	-4.3%
: Cost of Living index	-2.3%	-2.3%	-2.3%	-2.3%	-4.3%	-4.3%	-4.3%
Average price-index for:							
: All prod., exc.tradit'al exp.	-1.6%	-1.6%	-1.6%	-1.6%	-4.3%	-4.3%	-4.3%
: All home m'rkt tradeables	-1.9%	-1.9%	-1.9%	-1.9%	-4.3%	-4.3%	-4.3%
: All non-trad. exports; FOB	-1.9%	-1.9%	-1.9%	-1.9%	-4.3%	-4.3%	-4.3%
: All non-trad.exp.; mrkt-pric	12.7%	12.7%	12.7%	12.7%	10.0%	10.0%	10.0%
Changes in Exchange Rates:							
Rand/US$ exchange rate	-5.0%	0.0%	5.0%	20.0%	-5.0%	0.0%	5.0%
Rand/Pula exchange rate	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Pula/US$ exchange rate	-17.4%	-13.0%	-8.7%	4.3%	-17.4%	-13.0%	-8.7%
Competitive and profitability gains:							
Com.gain in the home market	-2.6%	-2.6%	-2.6%	-2.6%	-0.0%	-0.0%	-0.0%
Com.gain in the non-trd. exp.mrk.	-2.5%	-2.5%	-2.5%	-2.5%	-0.0%	-0.0%	-0.0%
Profit.gain in tradit.export sectors							
Nominal	-20.6%	-15.4%	-10.2%	5.5%	-20.0%	-14.8%	-9.6%
Real	-18.6%	-13.3%	-7.9%	8.2%	-16.4%	-10.9%	-5.5%

Table: 6,8
Scenario 1,A results, given alternative initial inflation overhangs 1)

A : Initial inflation overhang = 0.0%

	Wage increase round no:							
Total (cumm.) changes in:	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	5.4%	7.9%	9.0%	9.6%	9.8%	9.9%	10.0%
BOT: Cost of Living index								
Partial inflation effect 2)	5.4%	7.9%	9.0%	9.5%	9.8%	9.9%	10.0%	10.0%
Initial inflation overhang 3)	0.0%	NA	NA	NA	NA	NA	NA	NA
Total inflation effect 4)	5.4%	7.9%	9.0%	9.5%	9.8%	9.9%	10.0%	10.0%
Competitive and profitability gains: 5)								
Com.gain in the home market	5.1%	2.4%	1.1%	0.5%	0.2%	0.1%	0.1%	0.0%
Com.gain in the non-trd. exp.mrk.	4.9%	2.3%	1.1%	0.5%	0.2%	0.1%	0.0%	0.0%
Profit.gain in tradit.export sectors								
Nominal	-0.7%	-1.4%	-1.7%	-1.9%	-2.0%	-2.0%	-2.0%	-2.0%
Real	-6.0%	-8.7%	-9.9%	-10.5%	-10.7%	-10.8%	-10.9%	-10.9%

B : Initial inflation overhang = 2.5%

Total (cumm.) changes in:	**0**	**1**	**2**	**3**	**4**	**5**	**6**
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	7.9%	9.0%	9.6%	9.8%	9.9%	10.0%
BOT: Cost of Living index							
Partial inflation effect 2)	5.4%	9.0%	9.5%	9.8%	9.9%	10.0%	10.0%
Initial inflation overhang 3)	2.5%	NA	NA	NA	NA	NA	NA
Total inflation effect 4)	7.9%	9.0%	9.5%	9.8%	9.9%	10.0%	10.0%
Competitive and profitability gains: 5)							
Com.gain in the home market	5.1%	1.1%	0.5%	0.2%	0.1%	0.1%	0.0%
Com.gain in the non-trd. exp.mrk.	4.9%	1.0%	0.5%	0.2%	0.1%	0.0%	0.0%
Profit.gain in tradit.export sectors							
Nominal	-0.7%	-1.7%	-1.9%	-2.0%	-2.0%	-2.0%	-2.0%
Real	-6.0%	-9.9%	-10.5%	-10.7%	-10.8%	-10.9%	-10.9%

C : Initial inflation overhang = 4.6%

Total (cumm.) changes in:	**0**	**1**
RSA : General price-index	10.0%	10.0%
BOT: Wage-rate index	0.0%	10.0%
BOT: Cost of Living index		
Partial inflation effect 2)	5.4%	10.0%
Initial inflation overhang 3)	4.6%	NA
Total inflation effect 4)	10.0%	10.0%
Competitive and profitability gains: 5)		
Com.gain in the home market	5.1%	0.0%
Com.gain in the non-trd. exp.mrk.	4.9%	0.0%
Profit.gain in tradit.export sectors		
Nominal	-0.7%	-2.0%
Real	-6.0%	-10.9%

D : Initial inflation overhang = 6.5%

Total (cumm.) changes in:	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	11.9%	10.9%	10.4%	10.2%	10.1%	10.0%	10.0%
BOT: Cost of Living index								
Partial inflation effect 2)	5.4%	10.9%	10.4%	10.2%	10.1%	10.0%	10.0%	10.0%
Initial inflation overhang 3)	6.5%	NA	NA	NA	NA	NA	NA	NA
Total inflation effect 4)	11.9%	10.9%	10.4%	10.2%	10.1%	10.0%	10.0%	10.0%
Competitive and profitability gains: 5)								
Com.gain in the home market	5.1%	-1.0%	-0.4%	-0.2%	-0.1%	-0.0%	-0.0%	0.0%
Com.gain in the non-trd. exp.mrk.	4.9%	-0.9%	-0.4%	-0.2%	-0.1%	-0.0%	-0.0%	0.0%
Profit.gain in tradit.export sectors								
Nominal	-0.7%	-2.3%	-2.2%	-2.1%	-2.1%	-2.0%	-2.0%	-2.0%
Real	-6.0%	-11.8%	-11.4%	-11.1%	-11.0%	-11.0%	-11.0%	-10.9%

Notes:

1) These results all refer to scenario 1,A. Thus, all results are based on a 10% RSA inflation rate, constant exchange rates, 100% wage compensation, and a GOS gearing factor of 1.00. The difference from the results of the original scenario specification is found in the first round of wage adjustments, which takes into account the inflation overhang from the previous period.

2) The partial inflation effects correspond to the COL effects calculated within the model. Thus, the initial effects (before any wage increases are granted) are those derived from the specified RSA inflation and exchange rate changes only, i.e. excluding the initial inflation overhang. The overhang is however assumed to be taken into account at the first round of wage increases. The partial inflation effects therefore include the overhang effects for this, and all subsequent, rounds.

3) The initial inflation effects represent the lagged effects of previous periods' inflation. As explained above, these are assumed to be taken on board in the first round of wage increases.

4) The total inflation effects are the sum of the partial inflation effect and the inflation overhang. Except for the initial situation (before the first round of wage increases), total and partial inflation effects are the same.

5) The nature of the competitive and profitability gains is as described elswhere; see for instance table 6,6.

Table: 6,9

Scenario based on:

1) average of actual developments (1994-96)

2) alternative policy of pegging the Pula to the $

1 : Average of actual developments (1994-96)

Common assumptions : Rand/US$ exchange rate change 9.2%
Rand/Pula exchange rate change -1.4%
Pula/US$ exchange rate change 10.8%

A : Initial inflation overhang = 0.0%

	Wage increase round no:							
Total (cumm.) changes in:	**0**	**1**	**2**	**3**	**4**	**5**	**....**	**Final**
RSA : General price-index	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	....	8.8%
BOT: Wage-rate index	0.0%	5.6%	8.2%	9.4%	9.9%	10.2%	....	10.4%
BOT: Cost of Living index								
Partial inflation effect 1)	5.6%	8.2%	9.3%	9.9%	10.1%	10.3%	....	10.4%
Initial inflation overhang 1)	0.0%	NA	NA	NA	NA	NA	....	NA
Total inflation effect 1)	5.6%	8.2%	9.3%	9.9%	10.1%	10.3%	....	10.4%
Competitive and profitability gains: 1)								
Com.gain in the home market	5.3%	2.4%	1.1%	0.5%	0.2%	0.1%	....	0.0%
Com.gain in the non-trd. exp.mrk.	5.1%	2.4%	1.1%	0.5%	0.2%	0.1%	....	0.0%
Profit.gain in tradit.export sectors								
Nominal	12.3%	11.5%	11.2%	11.0%	10.9%	10.9%	....	10.8%
Real	6.0%	2.9%	1.6%	1.0%	0.7%	0.5%	....	0.4%

B : Initial inflation overhang = 4.8%

Total (cumm.) changes in:	**0**	**1**
RSA : General price-index	8.8%	8.8%
BOT: Wage-rate index	0.0%	10.4%
BOT: Cost of Living index		
Partial inflation effect 1)	5.6%	10.4%
Initial inflation overhang 1)	4.8%	NA
Total inflation effect 1)	10.4%	10.4%
Competitive and profitability gains: 1)		
Com.gain in the home market	5.3%	-0.0%
Com.gain in the non-trd. exp.mrk.	5.1%	-0.0%
Profit.gain in tradit.export sectors		
Nominal	12.3%	10.8%
Real	6.0%	0.4%

2 : Alternative policy of pegging the Pula to the $

Common assumptions : Rand/US$ exchange rate change 9.2%
Rand/Pula exchange rate change 9.2%
Pula/US$ exchange rate change 0.0%

A : Initial inflation overhang = 0.0%

Total (cumm.) changes in:	**0**	**1**	**2**	**3**	**4**	**5**	**6**
RSA : General price-index	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%
BOT: Wage-rate index	0.0%	-0.2%	-0.3%	-0.3%	-0.3%	-0.4%	-0.4%
BOT: Cost of Living index							
Partial inflation effect 1)	-0.2%	-0.3%	-0.3%	-0.3%	-0.4%	-0.4%	-0.4%
Initial inflation overhang 1)	0.0%	NA	NA	NA	NA	NA	NA
Total inflation effect 1)	-0.2%	-0.3%	-0.3%	-0.3%	-0.4%	-0.4%	-0.4%
Competitive and profitability gains: 1)							
Com.gain in the home market	-0.2%	-0.1%	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%
Com.gain in the non-trd. exp.mrk.	-0.2%	-0.1%	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%
Profit.gain in tradit.export sectors							
Nominal	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
Real	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%

B : Initial inflation overhang = 4.8%

Total (cumm.) changes in:	**0**	**1**	**2**	**3**	**4**	**5**	**....**	**Final**
RSA : General price-index	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	....	8.8%
BOT: Wage-rate index	0.0%	4.6%	1.9%	0.7%	0.1%	-0.1%	....	-0.4%
BOT: Cost of Living index								
Partial inflation effect 1)	-0.2%	1.9%	0.7%	0.1%	-0.1%	-0.3%	....	-0.4%
Initial inflation overhang 1)	4.8%	NA	NA	NA	NA	NA	....	NA
Total inflation effect 1)	4.6%	1.9%	0.7%	0.1%	-0.1%	-0.3%	....	-0.4%
Competitive and profitability gains: 1)								
Com.gain in the home market	-0.2%	-2.8%	-1.3%	-0.6%	-0.3%	-0.1%	....	-0.0%
Com.gain in the non-trd. exp.mrk.	-0.2%	-2.7%	-1.2%	-0.6%	-0.3%	-0.1%	....	-0.0%
Profit.gain in tradit.export sectors								
Nominal	0.0%	-0.6%	-0.2%	-0.1%	0.0%	0.0%	....	0.1%
Real	0.2%	-2.3%	-0.9%	-0.2%	0.2%	0.3%	....	0.4%

Note: 1) See footnotes of table 6,8.

Table: 7.1
Inflation, exchange rates and competitive gains. Quarterly data 1)

	Rand/Pula exch.rate Index 2) Col: 1	RSA WPI Index 2) Col: 2	Bot. CPI Index 2) Col: 3	Bot. IPI Index 2) Col: 4	Rand/Pula exch.rate % pq 3) Col: 5	RSA WPI % pq 3) Col: 6	Bot. CPI % pq 3) Col: 7	Bot. IPI % pq 3) Col: 8	Competitive gain indications 4) % pq 3) Col: 9	Index 2) Col: 10	Real exchange rate Pula/Rand Index 2) Col: 11	Rand/Pula Index 2) Col: 12
1980 I	1.000	1.000	1.000	1.000	NA	NA	NA	NA	NA	1.000	1.000	1.000
II	0.969	1.031	1.024	1.064	-3.1%	3.1%	2.4%	6.4%	3.7%	1.037	1.039	0.963
III	0.944	1.087	1.070	1.151	-2.6%	5.4%	4.4%	8.2%	3.4%	1.073	1.076	0.930
IV	0.944	1.139	1.102	1.207	-0.1%	4.8%	3.0%	4.9%	1.8%	1.092	1.095	0.913
1981 I	0.973	1.161	1.176	1.193	3.1%	1.9%	6.8%	-1.1%	-8.0%	1.005	1.014	0.986
II	0.989	1.187	1.207	1.200	1.7%	2.3%	2.6%	0.6%	-2.0%	0.985	0.995	1.005
III	1.024	1.237	1.237	1.208	3.5%	4.2%	2.5%	0.7%	-1.8%	0.967	0.977	1.024
IV	1.052	1.277	1.266	1.214	2.7%	3.2%	2.3%	0.4%	-1.9%	0.949	0.959	1.043
1982 I	1.056	1.316	1.282	1.246	0.3%	3.1%	1.3%	2.7%	1.3%	0.962	0.972	1.029
II	1.029	1.360	1.330	1.323	-2.6%	3.4%	3.7%	6.1%	2.3%	0.984	0.995	1.005
III	1.006	1.400	1.394	1.392	-2.2%	2.9%	4.8%	5.2%	0.4%	0.988	0.999	1.001
IV	0.991	1.449	1.424	1.462	-1.5%	3.5%	2.2%	5.1%	2.7%	1.015	1.027	0.974
1983 I	0.976	1.478	1.449	1.514	-1.4%	2.0%	1.7%	3.5%	1.7%	1.032	1.045	0.957
II	0.972	1.514	1.490	1.557	-0.5%	2.4%	2.8%	2.8%	0.0%	1.033	1.045	0.957
III	0.970	1.544	1.519	1.592	-0.2%	2.0%	1.9%	2.3%	0.3%	1.036	1.049	0.954
IV	1.000	1.573	1.543	1.573	3.1%	1.9%	1.6%	-1.2%	-2.9%	1.006	1.019	0.981
1984 I	1.026	1.593	1.582	1.553	2.6%	1.3%	2.5%	-1.3%	-3.8%	0.968	0.982	1.018
II	1.044	1.635	1.618	1.566	1.8%	2.6%	2.3%	0.8%	-1.5%	0.953	0.967	1.034
III	1.110	1.672	1.655	1.507	6.3%	2.3%	2.3%	-3.8%	-6.3%	0.894	0.910	1.098
IV	1.184	1.728	1.659	1.460	6.7%	3.4%	0.2%	-3.1%	-3.4%	0.863	0.880	1.136
1985 I	1.089	1.799	1.671	1.653	-8.0%	4.1%	0.7%	13.2%	11.0%	0.958	0.989	1.011
II	1.074	1.865	1.747	1.737	-1.4%	3.7%	4.5%	5.1%	0.5%	0.963	0.995	1.005
III	1.138	1.928	1.802	1.694	6.0%	3.4%	3.2%	-2.5%	-5.8%	0.908	0.940	1.063
IV	1.202	2.032	1.822	1.691	5.6%	5.4%	1.1%	-0.2%	-1.3%	0.896	0.928	1.077
1986 I	1.162	2.123	1.866	1.828	-3.3%	4.5%	2.5%	8.1%	5.2%	0.943	0.979	1.021
II	1.189	2.207	1.916	1.857	2.3%	3.9%	2.6%	1.6%	-1.0%	0.933	0.969	1.032
III	1.183	2.308	1.962	1.952	-0.5%	4.6%	2.4%	5.1%	2.6%	0.957	0.995	1.005
IV	1.158	2.409	2.002	2.081	-2.1%	4.4%	2.0%	6.6%	4.3%	0.998	1.040	0.962
1987 I	1.166	2.491	2.050	2.137	0.7%	3.4%	2.4%	2.7%	0.3%	1.001	1.042	0.959
II	1.166	2.568	2.118	2.202	-0.0%	3.1%	3.3%	3.1%	-0.3%	0.998	1.040	0.962
III	1.170	2.642	2.158	2.259	0.3%	2.9%	1.9%	2.6%	0.7%	1.005	1.047	0.955
IV	1.176	2.722	2.179	2.314	0.6%	3.0%	1.0%	2.5%	1.5%	1.020	1.062	0.941
1988 I	1.195	2.815	2.200	2.356	1.6%	3.4%	1.0%	1.8%	0.8%	1.028	1.071	0.934
II	1.206	2.934	2.272	2.433	0.9%	4.2%	3.3%	3.3%	0.0%	1.028	1.071	0.934
III	1.200	3.010	2.343	2.509	-0.5%	2.6%	3.1%	3.1%	-0.0%	1.028	1.071	0.934
IV	1.196	3.101	2.401	2.594	-0.4%	3.0%	2.5%	3.4%	0.9%	1.037	1.081	0.925

Table: 7.1 cont.
Inflation, exchange rates and competitive gains. Quarterly data 1)

	Rand/Pula exch.rate Index 2) Col: 1	RSA WPI Index 2) Col: 2	Bot. CPI Index 2) Col: 3	Bot. IPI Index 2) Col: 4	Rand/Pula exch.rate % pq 3) Col: 5	RSA WPI % pq 3) Col: 6	Bot. CPI % pq 3) Col: 7	Bot. IPI % pq 3) Col: 8	Competitive gain indications 4) % pq 3) Col: 9	Index 2) Col: 10	Real exchange rate Pula/Rand Index 2) Col: 11	Rand/Pula Index 2) Col: 12
1989 I	1.193	3.237	2.465	2.713	-0.2%	4.4%	2.7%	4.6%	1.8%	1.055	1.100	0.909
II	1.232	3.366	2.549	2.732	3.3%	4.0%	3.4%	0.7%	-2.6%	1.028	1.072	0.933
III	1.295	3.456	2.609	2.668	5.1%	2.7%	2.4%	-2.3%	-4.8%	0.978	1.023	0.978
IV	1.303	3.555	2.658	2.728	0.6%	2.9%	1.9%	2.2%	0.4%	0.981	1.026	0.974
1990 I	1.316	3.643	2.749	2.767	1.0%	2.5%	3.4%	1.4%	-2.0%	0.962	1.007	0.994
II	1.350	3.767	2.835	2.791	2.5%	3.4%	3.1%	0.9%	-2.2%	0.941	0.984	1.016
III	1.372	3.879	2.891	2.826	1.7%	3.0%	2.0%	1.3%	-0.7%	0.934	0.978	1.023
IV	1.317	4.020	2.978	3.052	-4.0%	3.6%	3.0%	8.0%	4.6%	0.977	1.025	0.976
1991 I	1.320	4.142	3.066	3.138	0.2%	3.0%	3.0%	2.8%	-0.1%	0.976	1.023	0.977
II	1.329	4.226	3.143	3.181	0.7%	2.0%	2.5%	1.4%	-1.1%	0.965	1.012	0.988
III	1.342	4.329	3.242	3.225	1.0%	2.4%	3.1%	1.4%	-1.7%	0.948	0.995	1.005
IV	1.287	4.440	3.349	3.450	-4.1%	2.6%	3.3%	7.0%	3.4%	0.981	1.030	0.971
1992 I	1.279	4.505	3.485	3.524	-0.6%	1.5%	4.1%	2.1%	-1.9%	0.962	1.011	0.989
II	1.283	4.635	3.672	3.612	0.4%	2.9%	5.4%	2.5%	-2.8%	0.935	0.984	1.016
III	1.286	4.750	3.801	3.692	0.2%	2.5%	3.5%	2.2%	-1.3%	0.923	0.971	1.030
IV	1.300	4.811	3.910	3.700	1.1%	1.3%	2.9%	0.2%	-2.6%	0.899	0.946	1.057
1993 I	1.306	4.895	4.055	3.749	0.4%	1.7%	3.7%	1.3%	-2.4%	0.878	0.925	1.082
II	1.308	4.971	4.193	3.802	0.2%	1.6%	3.4%	1.4%	-2.0%	0.861	0.907	1.103
III	1.309	5.036	4.330	3.849	0.1%	1.3%	3.3%	1.2%	-2.0%	0.843	0.889	1.125
IV	1.293	5.109	4.420	3.952	-1.2%	1.4%	2.1%	2.7%	0.6%	0.848	0.894	1.119
1994 I	1.279	5.250	4.514	4.105	-1.1%	2.8%	2.1%	3.9%	1.7%	0.862	0.909	1.100
II	1.296	5.361	4.655	4.136	1.3%	2.1%	3.1%	0.8%	-2.3%	0.842	0.889	1.125
III	1.276	5.544	4.771	4.344	-1.5%	3.4%	2.5%	5.0%	2.4%	0.863	0.910	1.098
IV	1.261	5.640	4.852	4.471	-1.2%	1.7%	1.7%	2.9%	1.2%	0.873	0.922	1.085
1995 I	1.263	5.820	4.995	4.609	0.1%	3.2%	2.9%	3.1%	0.1%	0.874	0.923	1.084
II	1.274	5.972	5.133	4.689	0.9%	2.6%	2.8%	1.7%	-1.0%	0.865	0.913	1.095
III	1.266	6.014	5.271	4.749	-0.6%	0.7%	2.7%	1.3%	-1.4%	0.853	0.901	1.110
IV	1.252	6.160	5.369	4.919	-1.1%	2.4%	1.9%	3.6%	1.6%	0.867	0.916	1.091
1996 I	1.245	6.232	5.511	5.006	-0.6%	1.2%	2.6%	1.8%	-0.9%	0.860	0.908	1.101
II	1.255	6.328	5.661	5.043	0.8%	1.5%	2.7%	0.7%	-2.0%	0.843	0.891	1.122
III	1.247	6.500	5.798	5.210	-0.6%	2.7%	2.4%	3.3%	0.9%	0.850	0.899	1.113
IV	1.244	6.687	5.891	5.373	-0.2%	2.9%	1.6%	3.1%	1.5%	0.863	0.912	1.096

Notes: 1) Based on data from table G,5.
2) Index, with base = first quarter 1980)
3) Percentage increase over previous quarter.
4) Rough indication of competitive gain status and change.

Table: 7,2
Inflation, exchange rates and competitive gains.
Summary data for selected periods 1)

Rand/Pula Exchange Rate Index

	Avg. index	Chg. between p'rds 3)		Chg. within period 4)	
	level 2)	% (total)	% pa	% pq	% pa
1980-83	0.99	NA	NA	0.0%	0.1%
1984-86	1.13	13.7%	3.7%	1.3%	5.4%
1987-89	1.21	6.9%	2.3%	0.7%	2.9%
1990	1.34	10.8%	5.3%	0.3%	1.2%
1991-92	1.30	-2.7%	-1.8%	-0.2%	-0.6%
1993-96	1.27	-2.3%	-0.8%	-0.3%	-1.1%

South African Wholesale Index (WPI)

	Avg. index	Between periods 3)		Within period 4)	
	level 2)	% (avg)	% pa	% pq	% pa
1980-83	1.30	NA	NA	2.9%	12.0%
1984-86	1.94	49.7%	12.2%	3.6%	15.3%
1987-89	2.99	54.1%	15.5%	2.3%	9.6%
1990	3.83	27.9%	13.1%	3.1%	13.1%
1991-92	4.48	17.1%	11.1%	2.3%	9.4%
1993-96	5.72	27.7%	8.5%	2.1%	8.6%

Botswana Import Price Index (IPI)

	Avg. index	Between periods 3)		Within period 4)	
	level 2)	% (avg)	% pa	% pq	% pa
1980-83	1.31	NA	NA	2.9%	12.1%
1984-86	1.71	31.3%	8.1%	2.5%	10.3%
1987-89	2.47	44.1%	12.9%	2.3%	9.5%
1990	2.86	15.7%	7.6%	2.9%	12.1%
1991-92	3.44	20.3%	13.1%	2.5%	10.2%
1993-96	4.50	30.8%	9.4%	2.4%	9.8%

Botswana Consumer Price Index (CPI)

	Avg. index	Between periods 3)		Within period 4)	
	level 2)	% (avg)	% pa	% pq	% pa
1980-83	1.28	NA	NA	2.8%	11.5%
1984-86	1.77	38.5%	9.7%	2.2%	9.1%
1987-89	2.33	31.5%	9.5%	2.4%	9.9%
1990	2.86	22.7%	10.8%	2.9%	12.0%
1991-92	3.46	20.8%	13.4%	3.5%	14.6%
1993-96	4.96	43.5%	12.8%	2.6%	10.8%

Botswana Competitive Gain Index

	Avg. index	Between periods 3)		Within period 4)	
	level 2)	% (avg)	% pa	% pq	% pa
1980-83	1.01	NA	NA	0.1%	0.3%
1984-86	0.94	-7.3%	-2.2%	0.0%	0.2%
1987-89	0.72	-23.4%	-8.5%	-0.1%	-0.4%
1990	0.95	33.0%	15.3%	-0.1%	-0.3%
1991-92	0.95	-0.5%	-0.3%	-1.0%	-4.0%
1993-96	0.86	-9.4%	-3.3%	-0.2%	-1.0%

Notes: 1) Based on table 7,1. All indices have base: 1980 I.
2) Aritmetic average of index values during period.
3) Change between periods: rate of change between period averages. The % (avg) estimate is calculated as the percentage increase in current period's average level over the corresponding level in the previous period, and the % pa estimate as: (1+ (%(avg)))^(1/Y)) - 1, where Y = number of years between the mid-periods.
4) Change within period: typical rate of change within the period. The % pq estimate is calculated as the direct aritmetic average of the corresponding quarterly rates, and the % pa estimate as: ((1+ (% pq))^4) - 1.
NB: The expression: "A^B" reads: "A raised to the pover of B".

Table: 8,1
Growth of non-traditional goods exports. Annual data

	Textiles	Other prod.	Sub-total exc.vehic.	Vehicles	Total non-trad. exp.		
Non-traditional exports at current prices. P'mill. 1)							
1980	16	26	41	0	41		
1981	16	37	53	0	53		
1982	27	46	73	0	73		
1983	33	49	82	0	82		
1984	41	58	99	0	99		
1985	29	78	107	0	107		
1986	43	122	166	0	166		
1987	59	145	204	0	204		
1988	60	144	204	0	204		
1989	80	181	261	0	261		
1990	112	197	309	0	309		
1991	123	214	337	0	337		
1992	77	241	317	0	317		
1993	95	335	430	91	521		
1994	117	264	381	301	682		
1995	146	289	435	947	1,382		
						Memo:	***Deflator 2)***
Non-traditional exports at constant 1980 prices. P'mill						*%pa*	*Index*
1980	16	26	41	0	41	*14%*	*1.00*
1981	14	32	45	0	45	*16%*	*1.16*
1982	21	35	57	0	57	*11%*	*1.29*
1983	23	34	58	0	58	*11%*	*1.43*
1984	27	37	64	0	64	*9%*	*1.55*
1985	17	47	64	0	64	*8%*	*1.68*
1986	23	66	90	0	90	*10%*	*1.85*
1987	29	71	101	0	101	*10%*	*2.03*
1988	27	65	93	0	93	*8%*	*2.20*
1989	33	74	107	0	107	*12%*	*2.45*
1990	41	72	113	0	113	*11%*	*2.73*
1991	40	70	110	0	110	*12%*	*3.05*
1992	22	68	90	0	90	*16%*	*3.54*
1993	23	83	106	22	129	*14%*	*4.05*
1994	26	59	85	67	152	*11%*	*4.48*
1995	30	58	88	191	279	*11%*	*4.95*
Growth rates (% pa), on constant price exports							
1980	NA	NA	NA	NA	NA		
1981	-12%	23%	10%	NA	10%		
1982	54%	12%	25%	NA	25%		
1983	9%	-3%	2%	NA	2%		
1984	15%	8%	11%	NA	11%		
1985	-35%	25%	-0%	NA	-0%		
1986	36%	42%	41%	NA	41%		
1987	25%	8%	12%	NA	12%		
1988	-6%	-8%	-8%	NA	-8%		
1989	19%	13%	15%	NA	15%		
1990	26%	-2%	6%	NA	6%		
1991	-1%	-3%	-2%	NA	-2%		
1992	-46%	-3%	-19%	NA	-19%		
1993	9%	22%	18%	NA	44%		
1994	12%	-29%	-20%	199%	18%		
1995	13%	-1%	3%	185%	83%		

Notes: 1) Based on table 2,3.
2) Deflator: Consumer Price Index. Source: see table G,5.

Table: 8,2
Growth of non-traditional goods exports.
Summary data for selected periods

	Textiles	Other products	Sub-total exc. veh.	Vehicles	Total inc. veh.
Non-traditional goods exports (fob), by main commodity group 1)					
	Annual average value, at CURRENT price. P'mill.				
1980-83	23	39	62	0	62
1984-86	38	86	124	0	124
1987-89	66	157	223	0	223
1990	112	197	309	0	309
1991-92	100	227	327	0	327
1993-95	120	296	415	446	861
	Annual average value, at CONSTANT 1980 price. P'mill.				
1980-83	18	32	50	0	50
1984-86	22	50	72	0	72
1987-89	30	70	100	0	100
1990	41	72	113	0	113
1991-92	31	69	100	0	100
1993-95	26	67	93	94	187
Real growth rates.					
	Average growth rates WITHIN period; % pa 2)				
1980-83	14%	10%	12%	0%	12%
1984-86	0%	24%	16%	0%	16%
1987-89	12%	4%	6%	0%	6%
1990	26%	-2%	6%	0%	6%
1991-92	-27%	-3%	-11%	0%	-11%
1993-95	11%	-5%	-1%	104%	46%
	Average growth rates BETWEEN periods; % pa 3)				
1980-83	NA	NA	NA	NA	NA
1984-86	6%	14%	11%	NA	11%
1987-89	10%	12%	11%	NA	11%
1990	17%	1%	6%	NA	6%
1991-92	-17%	-3%	-8%	NA	-8%
1993-95	-5%	-1%	-2%	NA	23%

Notes:

1) Based on table: 8,1.

2) Change within period: typical rate of change within the period, calculated as the average of all % pa changes during the period. I.e. the average % pa estimate is calculated as: {(1+%A)*(1+%B)*...*(1+%N)}^(1/N) -1, where %A is the % pa datum for the first year of the period, %B for the second, etc. N is the total number of years covered by the period. (The expression "A^B" reads: "A raised to the pover of B".)

3) Change between periods: rate of change between period averages. A %Tot estimate is calculated as the direct percentage increase in the current period's average level over the corresponding level in the previous period. The % pa estimate is next calculated as: (1+ %Tot)^(1/Y)) - 1, where Y = number of years between the mid years of the periods in question.

Table: 8,3
Imported and local supply of goods to the Botswana market

Total supply of tradable goods, by source, at CURRENT price (P'mill)

	Imports 1)			Domestic production of manufactured goods					Total supply to the local market			Local share of total supply
				GDP	GO	Exports	Local sales					
	P'mill	% pa		2)	3)	4)	P'mill	% pa	P'mill	% pa		
1981/82	684	NA	1981/82	70	204	139	65	NA	749	NA	1981/82	8.7%
1982/83	755	10%	1982/83	77	222	163	58	-10%	813	9%	1982/83	7.2%
1983/84	851	13%	1983/84	81	227	170	57	-2%	908	12%	1983/84	6.3%
1984/85	995	17%	1984/85	87	240	194	46	-20%	1,041	15%	1984/85	4.4%
1985/86	1,213	22%	1985/86	124	339	256	84	82%	1,297	25%	1985/86	6.4%
1986/87	1,452	20%	1986/87	168	499	295	204	144%	1,656	28%	1986/87	12.3%
1987/88	1,872	29%	1987/88	192	617	311	306	50%	2,179	32%	1987/88	14.1%
1988/89	2,596	39%	1988/89	289	997	368	628	105%	3,224	48%	1988/89	19.5%
1989/90	3,320	28%	1989/90	324	1,194	422	772	23%	4,092	27%	1989/90	18.9%
1990/91	3,774	14%	1990/91	362	1,419	456	963	25%	4,737	16%	1990/91	20.3%
1991/92	3,949	5%	1991/92	412	1,711	472	1,240	29%	5,189	10%	1991/92	23.9%
1992/93	4,128	5%	1992/93	449	1,972	583	1,389	12%	5,516	6%	1992/93	25.2%
1993/94	4,346	5%	1993/94	500	2,348	795	1,552	12%	5,899	7%	1993/94	26.3%
1994/95	4,856	12%	1994/95	594	3,029	1,242	1,786	15%	6,643	13%	1994/95	26.9%
1995/96	5,190	7%	1995/96	693	3,709	1,760	1,949	9%	7,139	7%	1995/96	27.3%

Estimates of total supply of tradable goods, by source, at CONSTANT 1985/86 price (P'mill)

	Total imports					Dom. prod. of manufactured goods, const. price					Total supply to the local market			Local share of total supply
	Current	Price	Constant price			GDP	GO	Exports	Local sales					
	price 1)	defl. 5)	P'mill	% pa		2)	3)	6)	P'mill	% pa	P'mill	% pa		
1981/82	684	0.63	1,092	NA	1981/82	126	366	249	117	NA	1,209	NA	1981/82	9.7%
1982/83	755	0.70	1,072	-2%	1982/83	115	331	243	87	-25%	1,159	-4%	1982/83	7.5%
1983/84	851	0.77	1,111	4%	1983/84	120	338	253	85	-2%	1,196	3%	1983/84	7.1%
1984/85	995	0.85	1,168	5%	1984/85	96	265	214	51	-40%	1,219	2%	1984/85	4.2%
1985/86	1,213	1.00	1,213	4%	1985/86	124	339	256	84	65%	1,297	6%	1985/86	6.4%
1986/87	1,452	1.18	1,231	1%	1986/87	146	435	257	178	113%	1,409	9%	1986/87	12.6%
1987/88	1,872	1.34	1,397	13%	1987/88	190	610	307	303	70%	1,699	21%	1987/88	17.8%
1988/89	2,596	1.53	1,693	21%	1988/89	242	834	308	526	74%	2,218	31%	1988/89	23.7%
1989/90	3,320	1.74	1,909	13%	1989/90	254	934	330	604	15%	2,513	13%	1989/90	24.0%
1990/91	3,774	1.96	1,923	1%	1990/91	270	1,060	341	720	19%	2,643	5%	1990/91	27.2%
1991/92	3,949	2.16	1,828	-5%	1991/92	288	1,197	330	867	20%	2,695	2%	1991/92	32.2%
1992/93	4,128	2.34	1,762	-4%	1992/93	285	1,252	370	882	2%	2,643	-2%	1992/93	33.4%
1993/94	4,346	2.50	1,736	-1%	1993/94	281	1,321	448	874	-1%	2,610	-1%	1993/94	33.5%
1994/95	4,856	2.77	1,752	1%	1994/95	293	1,495	613	882	1%	2,634	1%	1994/95	33.5%
1995/96	5,190	2.98	1,740	-1%	1995/96	312	1,671	793	878	-0%	2,618	-1%	1995/96	33.5%

Table: 8,3 cont.
Imported and local supply of goods to the Botswana market

Memo I: National Accounts estimates

GDP in manufacturing sector 7)				
	Current price	Constant price 11)	Implicite GDP price deflator Index	% pa
1981/82	70	126	0.56	NA
1982/83	77	115	0.67	21%
1983/84	81	120	0.67	0%
1984/85	87	96	0.91	35%
1985/86	124	124	1.00	10%
1986/87	168	146	1.15	15%
1987/88	192	190	1.01	-12%
1988/89	289	242	1.20	18%
1989/90	324	254	1.28	7%
1990/91	362	270	1.34	5%
1991/92	412	288	1.43	7%
1992/93	449	285	1.58	10%
1993/94	500	281	1.78	13%
1994/95	594	293	2.03	14%
1995/96	693	312	2.22	10%

Memo II: Price Indices

	WPI 8) (for import deflat Index	% pa	CPI 9) (for reference) Index	% pa
1981/82	0.63	NA	0.69	NA
1982/83	0.70	13%	0.78	13%
1983/84	0.77	9%	0.85	9%
1984/85	0.85	11%	0.91	8%
1985/86	1.00	17%	1.00	10%
1986/87	1.18	18%	1.10	10%
1987/88	1.34	14%	1.19	8%
1988/89	1.53	14%	1.32	11%
1989/90	1.74	13%	1.47	11%
1990/91	1.96	13%	1.63	11%
1991/92	2.16	10%	1.86	14%
1992/93	2.34	8%	2.16	16%
1993/94	2.50	7%	2.42	12%
1994/95	2.77	11%	2.67	10%
1995/96	2.98	8%	2.95	10%

Memo III: Assumed GO/GDP ratios for manufact. sector 10)

SAM78/79	3.06
1979/80	3.01
1980/81	2.96
1981/82	2.91
1982/83	2.86
SAM83/84	2.82
1984/85	2.77
SAM85/86	2.73
1986/87	2.97
1987/88	3.21
1988/89	3.45
1989/90	3.68
1990/91	3.92
1991/92	4.16
SAM92/93	4.40
1993/94	4.70
1994/95	5.10
1995/96	5.35

Notes:
1) Total Botswana imports (cif, inc. duty), at current prices. Source: see table 2,1.
2) GDP in manufacturing sector, as specified in the above Memo I.
3) Rough estimate of Gross Output, base on the GO/GDP ratios specified in the above Memo III.
4) Total exports of manufactured products, i.e. beef, textiles etc. From table 2,3.
5) Price deflator for imports: RSA Wholesale Price Index (WPI), as specified in the above Memo II.
6) Current priced exports, deflated by the GDP price deflator for manufacturing, as specified in the above Memo I.
7) Source: Ministry of Finance and Development Planning, Annual Economic Report, 1997. Note that series after 1988/89 have been revised. Estimates before and after that year may therefore not be comparable.
8) South Africa's Wholesale Price Index, rebased to 1985/86. Source: see table G,5.
9) Consumer Price Index, rebased to 1985/86. Source: see table G,5. (Specified for reference only).
10) Based on various SAM matrices. Non-SAM years are extrapolated or intrapolated. Ratios for the three last years are increased slightly more than trend due to the initiation of vehicle assembly.
11) Constant 1985/86 price.

TABLE: E,1

Summary of assumptions and results for alternative model III specifications. Scenario: 1

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: **1A**	**1A(1)**	**1A(2)**	**1A(3)**	**1A(4)**	**1A(5)**	**1A(6)**	**1B**	**1C**
Total changes in:										
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pula/US$ exchange rate	Derived	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
B : Specific assumptions and results (price-setter alternative) 1)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	5.4%	7.9%	9.0%	9.6%	9.8%	9.9%	10.0%	3.5%
Cost of Living index	Derived	5.4%	7.9%	9.0%	9.5%	9.8%	9.9%	10.0%	10.0%	7.0%
Competitive and profitability gains:										
Average competitive gain 2)	Derived	5.0%	2.3%	1.1%	0.5%	0.2%	0.1%	0.1%	0.0%	3.3%
Profitability gain in traditional export sectors 3)										
Nominal	Derived	-0.7%	-1.4%	-1.7%	-1.9%	-2.0%	-2.0%	-2.0%	-2.0%	-1.1%
Real	Derived	-6.0%	-8.7%	-9.9%	-10.5%	-10.7%	-10.8%	-10.9%	-10.9%	-7.8%
C : Specific assumptions and results (price-accepter alternative) 4)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	7.5%	9.4%	9.9%	10.0%	10.0%	10.0%	10.0%	4.3%
Cost of Living index	Derived	7.5%	9.4%	9.8%	10.0%	10.0%	10.0%	10.0%	10.0%	8.6%
Profitability gains: 3)										
As measured in nominal terms										
Traditional export sectors	Derived	-0.3%	-1.6%	-1.9%	-2.0%	-2.0%	-2.0%	-2.0%	-2.0%	-1.1%
Other tradables (export & local)	Derived	37.3%	16.7%	11.7%	10.4%	10.1%	10.0%	10.0%	10.0%	25.6%
Non-tradables	Derived	4.0%	8.5%	9.6%	9.9%	10.0%	10.0%	10.0%	10.0%	6.6%
As measured in real terms										
Traditional export sectors	Derived	-6.8%	-9.9%	-10.7%	-10.9%	-10.9%	-10.9%	-10.9%	-10.9%	-8.6%
Other tradables (export & local)	Derived	28.4%	6.9%	1.7%	0.4%	0.1%	0.0%	-0.0%	-0.0%	16.0%
Non-tradables	Derived	-2.7%	-0.7%	-0.2%	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%	-1.5%

Notes: 1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.
2) Average competitive gain: average of home market and non-traditional export market gains.
3) See previous tables for definition.
4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

TABLE: E,2

Summary of assumptions and results for alternative model III specifications. Scenario: 2

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: 2A1	2A2	2B	2C1	2C2
Total changes in:						
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	10.0%	5.0%	5.0%
Pula/US$ exchange rate	Derived	10.0%	10.0%	0.0%	4.8%	4.8%
B : Specific assumptions and results (price-setter alternative) 1)						
Wages and Cost of Living						
Wage-rate index	Assumed	0.0%	10.0%	0.0%	0.0%	4.8%
Cost of Living index	Derived	5.4%	10.0%	-0.0%	2.6%	4.8%
Competitive and profitability gains:						
Average competitive gain 2)	Derived	5.0%	0.0%	0.0%	2.5%	-0.0%
Profitability gain in traditional export sectors 3)						
Nominal	Derived	11.4%	10.0%	0.0%	5.4%	4.8%
Real	Derived	5.4%	-0.0%	-0.0%	2.6%	-0.0%
C : Specific assumptions and results (price-accepter alternative) 4)						
Wages and Cost of Living						
Wage-rate index	Assumed	0.0%	10.0%	0.0%	0.0%	4.8%
Cost of Living index	Derived	7.5%	10.0%	-0.0%	3.6%	4.8%
Profitability gains: 3)						
As measured in nominal terms						
Traditional export sectors	Derived	11.7%	10.0%	-0.0%	5.6%	4.8%
Other tradables (export & local)	Derived	37.3%	10.0%	0.0%	17.8%	4.8%
Non-tradables	Derived	4.0%	10.0%	-0.0%	1.9%	4.8%
As measured in real terms						
Traditional export sectors	Derived	4.4%	-0.0%	-0.0%	2.2%	0.0%
Other tradables (export & local)	Derived	28.4%	-0.0%	-0.0%	14.0%	0.0%
Non-tradables	Derived	-2.7%	-0.0%	-0.0%	-1.3%	-0.0%

Notes:

1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.

2) Average competitive gain: average of home market and non-traditional export market gains.

3) See previous tables for definition.

4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

TABLE: E,3

Summary of assumptions and results for alternative model III specifications. Scenario: 3

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: **3A1**	**3A2**	**3B1**	**3B2**	**3C**	**3D**	**3E**	**3F1**	**3F2**
Total changes in:										
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	15.0%	20.0%	25.0%	25.0%
Pula/US$ exchange rate	Derived	20.0%	20.0%	14.3%	14.3%	9.1%	4.3%	0.0%	-4.0%	-4.0%
B : Specific assumptions and results (price-setter alternative) 1)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	-12.0%
Cost of Living index	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	-2.3%	-4.5%	-6.5%	-12.0%
Competitive and profitability gains:										
Average competitive gain 2)	Derived	5.0%	0.0%	2.5%	-0.0%	0.0%	-2.5%	-5.0%	-7.6%	0.0%
Profitability gain in traditional export sectors 3)										
Nominal	Derived	23.4%	22.0%	16.9%	16.2%	10.9%	5.5%	0.5%	-4.0%	-2.4%
Real	Derived	16.7%	10.9%	13.8%	10.9%	10.9%	8.2%	5.6%	3.0%	10.9%
C : Specific assumptions and results (price-accepter alternative) 4)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	-12.0%
Cost of Living index	Derived	7.5%	10.0%	3.6%	4.8%	-0.0%	-3.3%	-6.3%	-9.0%	-12.0%
Profitability gains: 3)										
As measured in nominal terms										
Traditional export sectors	Derived	23.7%	22.0%	17.0%	16.2%	10.9%	5.4%	0.3%	-4.4%	-2.4%
Other tradables (export & local)	Derived	37.3%	10.0%	17.8%	4.8%	0.0%	-16.2%	-31.1%	-44.8%	-12.0%
Non-tradables	Derived	4.0%	10.0%	1.9%	4.8%	-0.0%	-1.7%	-3.3%	-4.8%	-12.0%
As measured in real terms										
Traditional export sectors	Derived	15.7%	10.9%	13.3%	10.9%	10.9%	8.7%	6.4%	4.3%	10.9%
Other tradables (export & local)	Derived	28.4%	-0.0%	14.0%	0.0%	-0.0%	-13.6%	-26.9%	-39.8%	-0.0%
Non-tradables	Derived	-2.7%	-0.0%	-1.3%	-0.0%	-0.0%	1.3%	2.6%	3.8%	-0.0%

Notes: 1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.
2) Average competitive gain: average of home market and non-traditional export market gains.
3) See previous tables for definition.
4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

TABLE: E,4

Summary of assumptions and results for alternative model III specifications. Scenario: 4

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: 4A1	4A2	4B1	4B2	4C	4D1	4D2	4E1	4E2
Total changes in:										
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	-5.0%	-5.0%	15.0%	15.0%
Pula/US$ exchange rate	Derived	5.0%	5.0%	0.0%	0.0%	-4.5%	10.5%	10.5%	-8.7%	-8.7%
B : Specific assumptions and results (price-setter alternative) 1)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.3%
Cost of Living index	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	8.5%	15.8%	-2.3%	-4.3%
Competitive and profitability gains:										
Average competitive gain 2)	Derived	5.0%	0.0%	2.5%	-0.0%	0.0%	7.6%	-0.0%	-2.5%	-0.0%
Profitability gain in traditional export sectors 3)										
Nominal	Derived	5.4%	4.0%	-0.3%	-1.0%	-5.5%	11.6%	9.5%	-10.2%	-9.6%
Real	Derived	-0.3%	-5.5%	-3.0%	-5.5%	-5.5%	2.4%	-5.5%	-7.9%	-5.5%
C : Specific assumptions and results (price-accepter alternative) 4)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.4%
Cost of Living index	Derived	7.5%	10.0%	3.6%	4.8%	-0.0%	11.9%	15.8%	-3.3%	-4.3%
Profitability gains: 3)										
As measured in nominal terms										
Traditional export sectors	Derived	5.7%	4.0%	0.2%	-1.0%	-5.5%	12.1%	9.5%	-10.3%	-9.6%
Other tradables (export & local)	Derived	37.3%	10.0%	17.8%	4.8%	0.0%	58.9%	15.8%	-16.2%	-4.3%
Non-tradables	Derived	4.0%	10.0%	1.9%	4.8%	-0.0%	6.3%	15.8%	-1.7%	-4.3%
As measured in real terms										
Traditional export sectors	Derived	-1.2%	-5.5%	-3.4%	-5.5%	-5.5%	1.1%	-5.5%	-7.5%	-5.5%
Other tradables (export & local)	Derived	28.4%	-0.0%	14.0%	0.0%	-0.0%	43.2%	-0.0%	-13.6%	0.0%
Non-tradables	Derived	-2.7%	-0.0%	-1.3%	-0.0%	-0.0%	-4.2%	-0.0%	1.3%	-0.0%

Notes: 1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.

2) Average competitive gain: average of home market and non-traditional export market gains.

3) See previous tables for definition.

4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

Table: 7.1
Inflation, exchange rates and competitive gains. Quarterly data 1)

	Rand/Pula exch.rate Index 2) Col: 1	RSA WPI Index 2) Col: 2	Bot. CPI Index 2) Col: 3	Bot. IPI Index 2) Col: 4	Rand/Pula exch.rate % pq 3) Col: 5	RSA WPI % pq 3) Col: 6	Bot. CPI % pq 3) Col: 7	Bot. IPI % pq 3) Col: 8	Competitive gain indications 4) % pq 3) Col: 9	Index 2) Col: 10	Real exchange rate Pula/Rand Index 2) Col: 11	Rand/Pula Index 2) Col: 12
1980 I	1.000	1.000	1.000	1.000	NA	NA	NA	NA	NA	1.000	1.000	1.000
II	0.969	1.031	1.024	1.064	-3.1%	3.1%	2.4%	6.4%	3.7%	1.037	1.039	0.963
III	0.944	1.087	1.070	1.151	-2.6%	5.4%	4.4%	8.2%	3.4%	1.073	1.076	0.930
IV	0.944	1.139	1.102	1.207	-0.1%	4.8%	3.0%	4.9%	1.8%	1.092	1.095	0.913
1981 I	0.973	1.161	1.176	1.193	3.1%	1.9%	6.8%	-1.1%	-8.0%	1.005	1.014	0.986
II	0.989	1.187	1.207	1.200	1.7%	2.3%	2.6%	0.6%	-2.0%	0.985	0.995	1.005
III	1.024	1.237	1.237	1.208	3.5%	4.2%	2.5%	0.7%	-1.8%	0.967	0.977	1.024
IV	1.052	1.277	1.266	1.214	2.7%	3.2%	2.3%	0.4%	-1.9%	0.949	0.959	1.043
1982 I	1.056	1.316	1.282	1.246	0.3%	3.1%	1.3%	2.7%	1.3%	0.962	0.972	1.029
II	1.029	1.360	1.330	1.323	-2.6%	3.4%	3.7%	6.1%	2.3%	0.984	0.995	1.005
III	1.006	1.400	1.394	1.392	-2.2%	2.9%	4.8%	5.2%	0.4%	0.988	0.999	1.001
IV	0.991	1.449	1.424	1.462	-1.5%	3.5%	2.2%	5.1%	2.7%	1.015	1.027	0.974
1983 I	0.976	1.478	1.449	1.514	-1.4%	2.0%	1.7%	3.5%	1.7%	1.032	1.045	0.957
II	0.972	1.514	1.490	1.557	-0.5%	2.4%	2.8%	2.8%	0.0%	1.033	1.045	0.957
III	0.970	1.544	1.519	1.592	-0.2%	2.0%	1.9%	2.3%	0.3%	1.036	1.049	0.954
IV	1.000	1.573	1.543	1.573	3.1%	1.9%	1.6%	-1.2%	-2.9%	1.006	1.019	0.981
1984 I	1.026	1.593	1.582	1.553	2.6%	1.3%	2.5%	-1.3%	-3.8%	0.968	0.982	1.018
II	1.044	1.635	1.618	1.566	1.8%	2.6%	2.3%	0.8%	-1.5%	0.953	0.967	1.034
III	1.110	1.672	1.655	1.507	6.3%	2.3%	2.3%	-3.8%	-6.3%	0.894	0.910	1.098
IV	1.184	1.728	1.659	1.460	6.7%	3.4%	0.2%	-3.1%	-3.4%	0.863	0.880	1.136
1985 I	1.089	1.799	1.671	1.653	-8.0%	4.1%	0.7%	13.2%	11.0%	0.958	0.989	1.011
II	1.074	1.865	1.747	1.737	-1.4%	3.7%	4.5%	5.1%	0.5%	0.963	0.995	1.005
III	1.138	1.928	1.802	1.694	6.0%	3.4%	3.2%	-2.5%	-5.8%	0.908	0.940	1.063
IV	1.202	2.032	1.822	1.691	5.6%	5.4%	1.1%	-0.2%	-1.3%	0.896	0.928	1.077
1986 I	1.162	2.123	1.866	1.828	-3.3%	4.5%	2.5%	8.1%	5.2%	0.943	0.979	1.021
II	1.189	2.207	1.916	1.857	2.3%	3.9%	2.6%	1.6%	-1.0%	0.933	0.969	1.032
III	1.183	2.308	1.962	1.952	-0.5%	4.6%	2.4%	5.1%	2.6%	0.957	0.995	1.005
IV	1.158	2.409	2.002	2.081	-2.1%	4.4%	2.0%	6.6%	4.3%	0.998	1.040	0.962
1987 I	1.166	2.491	2.050	2.137	0.7%	3.4%	2.4%	2.7%	0.3%	1.001	1.042	0.959
II	1.166	2.568	2.118	2.202	-0.0%	3.1%	3.3%	3.1%	-0.3%	0.998	1.040	0.962
III	1.170	2.642	2.158	2.259	0.3%	2.9%	1.9%	2.6%	0.7%	1.005	1.047	0.955
IV	1.176	2.722	2.179	2.314	0.6%	3.0%	1.0%	2.5%	1.5%	1.020	1.062	0.941
1988 I	1.195	2.815	2.200	2.356	1.6%	3.4%	1.0%	1.8%	0.8%	1.028	1.071	0.934
II	1.206	2.934	2.272	2.433	0.9%	4.2%	3.3%	3.3%	0.0%	1.028	1.071	0.934
III	1.200	3.010	2.343	2.509	-0.5%	2.6%	3.1%	3.1%	-0.0%	1.028	1.071	0.934
IV	1.196	3.101	2.401	2.594	-0.4%	3.0%	2.5%	3.4%	0.9%	1.037	1.081	0.925

Table: 7.1 cont.
Inflation, exchange rates and competitive gains. Quarterly data 1)

	Rand/Pula exch.rate Index 2) Col: 1	RSA WPI Index 2) Col: 2	Bot. CPI Index 2) Col: 3	Bot. IPI Index 2) Col: 4	Rand/Pula exch.rate % pq 3) Col: 5	RSA WPI % pq 3) Col: 6	Bot. CPI % pq 3) Col: 7	Bot. IPI % pq 3) Col: 8	Competitive gain indications 4) % pq 3) Col: 9	Index 2) Col: 10	Real exchange rate Pula/Rand Index 2) Col: 11	Rand/Pula Index 2) Col: 12
1989 I	1.193	3.237	2.465	2.713	-0.2%	4.4%	2.7%	4.6%	1.8%	1.055	1.100	0.909
II	1.232	3.366	2.549	2.732	3.3%	4.0%	3.4%	0.7%	-2.6%	1.028	1.072	0.933
III	1.295	3.456	2.609	2.668	5.1%	2.7%	2.4%	-2.3%	-4.8%	0.978	1.023	0.978
IV	1.303	3.555	2.658	2.728	0.6%	2.9%	1.9%	2.2%	0.4%	0.981	1.026	0.974
1990 I	1.316	3.643	2.749	2.767	1.0%	2.5%	3.4%	1.4%	-2.0%	0.962	1.007	0.994
II	1.350	3.767	2.835	2.791	2.5%	3.4%	3.1%	0.9%	-2.2%	0.941	0.984	1.016
III	1.372	3.879	2.891	2.826	1.7%	3.0%	2.0%	1.3%	-0.7%	0.934	0.978	1.023
IV	1.317	4.020	2.978	3.052	-4.0%	3.6%	3.0%	8.0%	4.6%	0.977	1.025	0.976
1991 I	1.320	4.142	3.066	3.138	0.2%	3.0%	3.0%	2.8%	-0.1%	0.976	1.023	0.977
II	1.329	4.226	3.143	3.181	0.7%	2.0%	2.5%	1.4%	-1.1%	0.965	1.012	0.988
III	1.342	4.329	3.242	3.225	1.0%	2.4%	3.1%	1.4%	-1.7%	0.948	0.995	1.005
IV	1.287	4.440	3.349	3.450	-4.1%	2.6%	3.3%	7.0%	3.4%	0.981	1.030	0.971
1992 I	1.279	4.505	3.485	3.524	-0.6%	1.5%	4.1%	2.1%	-1.9%	0.962	1.011	0.989
II	1.283	4.635	3.672	3.612	0.4%	2.9%	5.4%	2.5%	-2.8%	0.935	0.984	1.016
III	1.286	4.750	3.801	3.692	0.2%	2.5%	3.5%	2.2%	-1.3%	0.923	0.971	1.030
IV	1.300	4.811	3.910	3.700	1.1%	1.3%	2.9%	0.2%	-2.6%	0.899	0.946	1.057
1993 I	1.306	4.895	4.055	3.749	0.4%	1.7%	3.7%	1.3%	-2.4%	0.878	0.925	1.082
II	1.308	4.971	4.193	3.802	0.2%	1.6%	3.4%	1.4%	-2.0%	0.861	0.907	1.103
III	1.309	5.036	4.330	3.849	0.1%	1.3%	3.3%	1.2%	-2.0%	0.843	0.889	1.125
IV	1.293	5.109	4.420	3.952	-1.2%	1.4%	2.1%	2.7%	0.6%	0.848	0.894	1.119
1994 I	1.279	5.250	4.514	4.105	-1.1%	2.8%	2.1%	3.9%	1.7%	0.862	0.909	1.100
II	1.296	5.361	4.655	4.136	1.3%	2.1%	3.1%	0.8%	-2.3%	0.842	0.889	1.125
III	1.276	5.544	4.771	4.344	-1.5%	3.4%	2.5%	5.0%	2.4%	0.863	0.910	1.098
IV	1.261	5.640	4.852	4.471	-1.2%	1.7%	1.7%	2.9%	1.2%	0.873	0.922	1.085
1995 I	1.263	5.820	4.995	4.609	0.1%	3.2%	2.9%	3.1%	0.1%	0.874	0.923	1.084
II	1.274	5.972	5.133	4.689	0.9%	2.6%	2.8%	1.7%	-1.0%	0.865	0.913	1.095
III	1.266	6.014	5.271	4.749	-0.6%	0.7%	2.7%	1.3%	-1.4%	0.853	0.901	1.110
IV	1.252	6.160	5.369	4.919	-1.1%	2.4%	1.9%	3.6%	1.6%	0.867	0.916	1.091
1996 I	1.245	6.232	5.511	5.006	-0.6%	1.2%	2.6%	1.8%	-0.9%	0.860	0.908	1.101
II	1.255	6.328	5.661	5.043	0.8%	1.5%	2.7%	0.7%	-2.0%	0.843	0.891	1.122
III	1.247	6.500	5.798	5.210	-0.6%	2.7%	2.4%	3.3%	0.9%	0.850	0.899	1.113
IV	1.244	6.687	5.891	5.373	-0.2%	2.9%	1.6%	3.1%	1.5%	0.863	0.912	1.096

Notes: 1) Based on data from table G,5.
2) Index, with base = first quarter 1980)
3) Percentage increase over previous quarter.
4) Rough indication of competitive gain status and change.

Table: 7,2
Inflation, exchange rates and competitive gains.
Summary data for selected periods 1)

Rand/Pula Exchange Rate Index

	Avg. index	Chg. between p'rds 3)		Chg. within period 4)	
	level 2)	% (total)	% pa	% pq	% pa
1980-83	0.99	NA	NA	0.0%	0.1%
1984-86	1.13	13.7%	3.7%	1.3%	5.4%
1987-89	1.21	6.9%	2.3%	0.7%	2.9%
1990	1.34	10.8%	5.3%	0.3%	1.2%
1991-92	1.30	-2.7%	-1.8%	-0.2%	-0.6%
1993-96	1.27	-2.3%	-0.8%	-0.3%	-1.1%

South African Wholesale Index (WPI)

	Avg. index	Between periods 3)		Within period 4)	
	level 2)	% (avg)	% pa	% pq	% pa
1980-83	1.30	NA	NA	2.9%	12.0%
1984-86	1.94	49.7%	12.2%	3.6%	15.3%
1987-89	2.99	54.1%	15.5%	2.3%	9.6%
1990	3.83	27.9%	13.1%	3.1%	13.1%
1991-92	4.48	17.1%	11.1%	2.3%	9.4%
1993-96	5.72	27.7%	8.5%	2.1%	8.6%

Botswana Import Price Index (IPI)

	Avg. index	Between periods 3)		Within period 4)	
	level 2)	% (avg)	% pa	% pq	% pa
1980-83	1.31	NA	NA	2.9%	12.1%
1984-86	1.71	31.3%	8.1%	2.5%	10.3%
1987-89	2.47	44.1%	12.9%	2.3%	9.5%
1990	2.86	15.7%	7.6%	2.9%	12.1%
1991-92	3.44	20.3%	13.1%	2.5%	10.2%
1993-96	4.50	30.8%	9.4%	2.4%	9.8%

Botswana Consumer Price Index (CPI)

	Avg. index	Between periods 3)		Within period 4)	
	level 2)	% (avg)	% pa	% pq	% pa
1980-83	1.28	NA	NA	2.8%	11.5%
1984-86	1.77	38.5%	9.7%	2.2%	9.1%
1987-89	2.33	31.5%	9.5%	2.4%	9.9%
1990	2.86	22.7%	10.8%	2.9%	12.0%
1991-92	3.46	20.8%	13.4%	3.5%	14.6%
1993-96	4.96	43.5%	12.8%	2.6%	10.8%

Botswana Competitive Gain Index

	Avg. index	Between periods 3)		Within period 4)	
	level 2)	% (avg)	% pa	% pq	% pa
1980-83	1.01	NA	NA	0.1%	0.3%
1984-86	0.94	-7.3%	-2.2%	0.0%	0.2%
1987-89	0.72	-23.4%	-8.5%	-0.1%	-0.4%
1990	0.95	33.0%	15.3%	-0.1%	-0.3%
1991-92	0.95	-0.5%	-0.3%	-1.0%	-4.0%
1993-96	0.86	-9.4%	-3.3%	-0.2%	-1.0%

Notes: 1) Based on table 7,1. All indices have base: 1980 I.
2) Aritmetic average of index values during period.
3) Change between periods: rate of change between period averages. The % (avg) estimate is calculated as the percentage increase in current period's average level over the corresponding level in the previous period, and the % pa estimate as: (1+ (%(avg)))^(1/Y)) - 1, where Y = number of years between the mid-periods.
4) Change within period: typical rate of change within the period. The % pq estimate is calculated as the direct aritmetic average of the corresponding quarterly rates, and the % pa estimate as: ((1+ (% pq))^4) - 1.
NB: The expression: "A^B" reads: "A raised to the pover of B".

Table: 8,1
Growth of non-traditional goods exports. Annual data

	Textiles	Other prod.	Sub-total exc.vehic.	Vehicles	Total non-trad. exp.		
Non-traditional exports at current prices. P'mill. 1)							
1980	16	26	41	0	41		
1981	16	37	53	0	53		
1982	27	46	73	0	73		
1983	33	49	82	0	82		
1984	41	58	99	0	99		
1985	29	78	107	0	107		
1986	43	122	166	0	166		
1987	59	145	204	0	204		
1988	60	144	204	0	204		
1989	80	181	261	0	261		
1990	112	197	309	0	309		
1991	123	214	337	0	337		
1992	77	241	317	0	317		
1993	95	335	430	91	521		
1994	117	264	381	301	682		
1995	146	289	435	947	1,382		
						Memo:	***Deflator 2)***
Non-traditional exports at constant 1980 prices. P'mill						*%pa*	*Index*
1980	16	26	41	0	41	*14%*	*1.00*
1981	14	32	45	0	45	*16%*	*1.16*
1982	21	35	57	0	57	*11%*	*1.29*
1983	23	34	58	0	58	*11%*	*1.43*
1984	27	37	64	0	64	*9%*	*1.55*
1985	17	47	64	0	64	*8%*	*1.68*
1986	23	66	90	0	90	*10%*	*1.85*
1987	29	71	101	0	101	*10%*	*2.03*
1988	27	65	93	0	93	*8%*	*2.20*
1989	33	74	107	0	107	*12%*	*2.45*
1990	41	72	113	0	113	*11%*	*2.73*
1991	40	70	110	0	110	*12%*	*3.05*
1992	22	68	90	0	90	*16%*	*3.54*
1993	23	83	106	22	129	*14%*	*4.05*
1994	26	59	85	67	152	*11%*	*4.48*
1995	30	58	88	191	279	*11%*	*4.95*
Growth rates (% pa), on constant price exports							
1980	NA	NA	NA	NA	NA		
1981	-12%	23%	10%	NA	10%		
1982	54%	12%	25%	NA	25%		
1983	9%	-3%	2%	NA	2%		
1984	15%	8%	11%	NA	11%		
1985	-35%	25%	-0%	NA	-0%		
1986	36%	42%	41%	NA	41%		
1987	25%	8%	12%	NA	12%		
1988	-6%	-8%	-8%	NA	-8%		
1989	19%	13%	15%	NA	15%		
1990	26%	-2%	6%	NA	6%		
1991	-1%	-3%	-2%	NA	-2%		
1992	-46%	-3%	-19%	NA	-19%		
1993	9%	22%	18%	NA	44%		
1994	12%	-29%	-20%	199%	18%		
1995	13%	-1%	3%	185%	83%		

Notes: 1) Based on table 2,3.
2) Deflator: Consumer Price Index. Source: see table G,5.

Table: 8,2
Growth of non-traditional goods exports.
Summary data for selected periods

	Textiles	Other products	Sub-total exc. veh.	Vehicles	Total inc. veh.
Non-traditional goods exports (fob), by main commodity group 1)					
	Annual average value, at CURRENT price. P'mill.				
1980-83	23	39	62	0	62
1984-86	38	86	124	0	124
1987-89	66	157	223	0	223
1990	112	197	309	0	309
1991-92	100	227	327	0	327
1993-95	120	296	415	446	861
	Annual average value, at CONSTANT 1980 price. P'mill.				
1980-83	18	32	50	0	50
1984-86	22	50	72	0	72
1987-89	30	70	100	0	100
1990	41	72	113	0	113
1991-92	31	69	100	0	100
1993-95	26	67	93	94	187
Real growth rates.					
	Average growth rates WITHIN period; % pa 2)				
1980-83	14%	10%	12%	0%	12%
1984-86	0%	24%	16%	0%	16%
1987-89	12%	4%	6%	0%	6%
1990	26%	-2%	6%	0%	6%
1991-92	-27%	-3%	-11%	0%	-11%
1993-95	11%	-5%	-1%	104%	46%
	Average growth rates BETWEEN periods; % pa 3)				
1980-83	NA	NA	NA	NA	NA
1984-86	6%	14%	11%	NA	11%
1987-89	10%	12%	11%	NA	11%
1990	17%	1%	6%	NA	6%
1991-92	-17%	-3%	-8%	NA	-8%
1993-95	-5%	-1%	-2%	NA	23%

Notes:

1) Based on table: 8,1.

2) Change within period: typical rate of change within the period, calculated as the average of all % pa changes during the period. I.e. the average % pa estimate is calculated as: {(1+%A)*(1+%B)*...*(1+%N)}^(1/N) -1, where %A is the % pa datum for the first year of the period, %B for the second, etc. N is the total number of years covered by the period. (The expression "A^B" reads: "A raised to the pover of B".)

3) Change between periods: rate of change between period averages. A %Tot estimate is calculated as the direct percentage increase in the current period's average level over the corresponding level in the previous period. The % pa estimate is next calculated as: (1+ %Tot)^(1/Y)) - 1, where Y = number of years between the mid years of the periods in question.

Table: 8,3
Imported and local supply of goods to the Botswana market

Total supply of tradable goods, by source, at CURRENT price (P'mill)

	Imports 1)			Domestic production of manufactured goods					Total supply to the local market			Local share of total supply
				GDP	GO	Exports	Local sales					
	P'mill	% pa		2)	3)	4)	P'mill	% pa	P'mill	% pa		
1981/82	684	NA	1981/82	70	204	139	65	NA	749	NA	1981/82	8.7%
1982/83	755	10%	1982/83	77	222	163	58	-10%	813	9%	1982/83	7.2%
1983/84	851	13%	1983/84	81	227	170	57	-2%	908	12%	1983/84	6.3%
1984/85	995	17%	1984/85	87	240	194	46	-20%	1,041	15%	1984/85	4.4%
1985/86	1,213	22%	1985/86	124	339	256	84	82%	1,297	25%	1985/86	6.4%
1986/87	1,452	20%	1986/87	168	499	295	204	144%	1,656	28%	1986/87	12.3%
1987/88	1,872	29%	1987/88	192	617	311	306	50%	2,179	32%	1987/88	14.1%
1988/89	2,596	39%	1988/89	289	997	368	628	105%	3,224	48%	1988/89	19.5%
1989/90	3,320	28%	1989/90	324	1,194	422	772	23%	4,092	27%	1989/90	18.9%
1990/91	3,774	14%	1990/91	362	1,419	456	963	25%	4,737	16%	1990/91	20.3%
1991/92	3,949	5%	1991/92	412	1,711	472	1,240	29%	5,189	10%	1991/92	23.9%
1992/93	4,128	5%	1992/93	449	1,972	583	1,389	12%	5,516	6%	1992/93	25.2%
1993/94	4,346	5%	1993/94	500	2,348	795	1,552	12%	5,899	7%	1993/94	26.3%
1994/95	4,856	12%	1994/95	594	3,029	1,242	1,786	15%	6,643	13%	1994/95	26.9%
1995/96	5,190	7%	1995/96	693	3,709	1,760	1,949	9%	7,139	7%	1995/96	27.3%

Estimates of total supply of tradable goods, by source, at CONSTANT 1985/86 price (P'mill)

	Total imports					Dom. prod. of manufactured goods, const. price					Total supply to the local market			Local share of total supply
	Current	Price	Constant price			GDP	GO	Exports	Local sales					
	price 1)	defl. 5)	P'mill	% pa		2)	3)	6)	P'mill	% pa	P'mill	% pa		
1981/82	684	0.63	1,092	NA	1981/82	126	366	249	117	NA	1,209	NA	1981/82	9.7%
1982/83	755	0.70	1,072	-2%	1982/83	115	331	243	87	-25%	1,159	-4%	1982/83	7.5%
1983/84	851	0.77	1,111	4%	1983/84	120	338	253	85	-2%	1,196	3%	1983/84	7.1%
1984/85	995	0.85	1,168	5%	1984/85	96	265	214	51	-40%	1,219	2%	1984/85	4.2%
1985/86	1,213	1.00	1,213	4%	1985/86	124	339	256	84	65%	1,297	6%	1985/86	6.4%
1986/87	1,452	1.18	1,231	1%	1986/87	146	435	257	178	113%	1,409	9%	1986/87	12.6%
1987/88	1,872	1.34	1,397	13%	1987/88	190	610	307	303	70%	1,699	21%	1987/88	17.8%
1988/89	2,596	1.53	1,693	21%	1988/89	242	834	308	526	74%	2,218	31%	1988/89	23.7%
1989/90	3,320	1.74	1,909	13%	1989/90	254	934	330	604	15%	2,513	13%	1989/90	24.0%
1990/91	3,774	1.96	1,923	1%	1990/91	270	1,060	341	720	19%	2,643	5%	1990/91	27.2%
1991/92	3,949	2.16	1,828	-5%	1991/92	288	1,197	330	867	20%	2,695	2%	1991/92	32.2%
1992/93	4,128	2.34	1,762	-4%	1992/93	285	1,252	370	882	2%	2,643	-2%	1992/93	33.4%
1993/94	4,346	2.50	1,736	-1%	1993/94	281	1,321	448	874	-1%	2,610	-1%	1993/94	33.5%
1994/95	4,856	2.77	1,752	1%	1994/95	293	1,495	613	882	1%	2,634	1%	1994/95	33.5%
1995/96	5,190	2.98	1,740	-1%	1995/96	312	1,671	793	878	-0%	2,618	-1%	1995/96	33.5%

Table: 8,3 cont.
Imported and local supply of goods to the Botswana market

Memo I: National Accounts estimates

GDP in manufacturing sector 7)				
	Current price	Constant price 11)	Implicite GDP price deflator Index	% pa
1981/82	70	126	0.56	NA
1982/83	77	115	0.67	21%
1983/84	81	120	0.67	0%
1984/85	87	96	0.91	35%
1985/86	124	124	1.00	10%
1986/87	168	146	1.15	15%
1987/88	192	190	1.01	-12%
1988/89	289	242	1.20	18%
1989/90	324	254	1.28	7%
1990/91	362	270	1.34	5%
1991/92	412	288	1.43	7%
1992/93	449	285	1.58	10%
1993/94	500	281	1.78	13%
1994/95	594	293	2.03	14%
1995/96	693	312	2.22	10%

Memo II: Price Indices

	WPI 8) (for import deflat Index	% pa	CPI 9) (for reference) Index	% pa
1981/82	0.63	NA	0.69	NA
1982/83	0.70	13%	0.78	13%
1983/84	0.77	9%	0.85	9%
1984/85	0.85	11%	0.91	8%
1985/86	1.00	17%	1.00	10%
1986/87	1.18	18%	1.10	10%
1987/88	1.34	14%	1.19	8%
1988/89	1.53	14%	1.32	11%
1989/90	1.74	13%	1.47	11%
1990/91	1.96	13%	1.63	11%
1991/92	2.16	10%	1.86	14%
1992/93	2.34	8%	2.16	16%
1993/94	2.50	7%	2.42	12%
1994/95	2.77	11%	2.67	10%
1995/96	2.98	8%	2.95	10%

Memo III: Assumed GO/GDP ratios for manufact. sector 10)

SAM78/79	3.06
1979/80	3.01
1980/81	2.96
1981/82	2.91
1982/83	2.86
SAM83/84	2.82
1984/85	2.77
SAM85/86	2.73
1986/87	2.97
1987/88	3.21
1988/89	3.45
1989/90	3.68
1990/91	3.92
1991/92	4.16
SAM92/93	4.40
1993/94	4.70
1994/95	5.10
1995/96	5.35

Notes:
1) Total Botswana imports (cif, inc. duty), at current prices. Source: see table 2,1.
2) GDP in manufacturing sector, as specified in the above Memo I.
3) Rough estimate of Gross Output, base on the GO/GDP ratios specified in the above Memo III.
4) Total exports of manufactured products, i.e. beef, textiles etc. From table 2,3.
5) Price deflator for imports: RSA Wholesale Price Index (WPI), as specified in the above Memo II.
6) Current priced exports, deflated by the GDP price deflator for manufacturing, as specified in the above Memo I.
7) Source: Ministry of Finance and Development Planning, Annual Economic Report, 1997. Note that series after 1988/89 have been revised. Estimates before and after that year may therefore not be comparable.
8) South Africa's Wholesale Price Index, rebased to 1985/86. Source: see table G,5.
9) Consumer Price Index, rebased to 1985/86. Source: see table G,5. (Specified for reference only).
10) Based on various SAM matrices. Non-SAM years are extrapolated or intrapolated. Ratios for the three last years are increased slightly more than trend due to the initiation of vehicle assembly.
11) Constant 1985/86 price.

TABLE: E,1

Summary of assumptions and results for alternative model III specifications. Scenario: 1

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: **1A**	**1A(1)**	**1A(2)**	**1A(3)**	**1A(4)**	**1A(5)**	**1A(6)**	**1B**	**1C**
Total changes in:										
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pula/US$ exchange rate	Derived	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
B : Specific assumptions and results (price-setter alternative) 1)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	5.4%	7.9%	9.0%	9.6%	9.8%	9.9%	10.0%	3.5%
Cost of Living index	Derived	5.4%	7.9%	9.0%	9.5%	9.8%	9.9%	10.0%	10.0%	7.0%
Competitive and profitability gains:										
Average competitive gain 2)	Derived	5.0%	2.3%	1.1%	0.5%	0.2%	0.1%	0.1%	0.0%	3.3%
Profitability gain in traditional export sectors 3)										
Nominal	Derived	-0.7%	-1.4%	-1.7%	-1.9%	-2.0%	-2.0%	-2.0%	-2.0%	-1.1%
Real	Derived	-6.0%	-8.7%	-9.9%	-10.5%	-10.7%	-10.8%	-10.9%	-10.9%	-7.8%
C : Specific assumptions and results (price-accepter alternative) 4)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	7.5%	9.4%	9.9%	10.0%	10.0%	10.0%	10.0%	4.3%
Cost of Living index	Derived	7.5%	9.4%	9.8%	10.0%	10.0%	10.0%	10.0%	10.0%	8.6%
Profitability gains: 3)										
As measured in nominal terms										
Traditional export sectors	Derived	-0.3%	-1.6%	-1.9%	-2.0%	-2.0%	-2.0%	-2.0%	-2.0%	-1.1%
Other tradables (export & local)	Derived	37.3%	16.7%	11.7%	10.4%	10.1%	10.0%	10.0%	10.0%	25.6%
Non-tradables	Derived	4.0%	8.5%	9.6%	9.9%	10.0%	10.0%	10.0%	10.0%	6.6%
As measured in real terms										
Traditional export sectors	Derived	-6.8%	-9.9%	-10.7%	-10.9%	-10.9%	-10.9%	-10.9%	-10.9%	-8.6%
Other tradables (export & local)	Derived	28.4%	6.9%	1.7%	0.4%	0.1%	0.0%	-0.0%	-0.0%	16.0%
Non-tradables	Derived	-2.7%	-0.7%	-0.2%	-0.0%	-0.0%	-0.0%	-0.0%	-0.0%	-1.5%

Notes: 1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.
2) Average competitive gain: average of home market and non-traditional export market gains.
3) See previous tables for definition.
4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

TABLE: E,2

Summary of assumptions and results for alternative model III specifications. Scenario: 2

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: 2A1	2A2	2B	2C1	2C2
Total changes in:						
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	10.0%	5.0%	5.0%
Pula/US$ exchange rate	Derived	10.0%	10.0%	0.0%	4.8%	4.8%
B : Specific assumptions and results (price-setter alternative) 1)						
Wages and Cost of Living						
Wage-rate index	Assumed	0.0%	10.0%	0.0%	0.0%	4.8%
Cost of Living index	Derived	5.4%	10.0%	-0.0%	2.6%	4.8%
Competitive and profitability gains:						
Average competitive gain 2)	Derived	5.0%	0.0%	0.0%	2.5%	-0.0%
Profitability gain in traditional export sectors 3)						
Nominal	Derived	11.4%	10.0%	0.0%	5.4%	4.8%
Real	Derived	5.4%	-0.0%	-0.0%	2.6%	-0.0%
C : Specific assumptions and results (price-accepter alternative) 4)						
Wages and Cost of Living						
Wage-rate index	Assumed	0.0%	10.0%	0.0%	0.0%	4.8%
Cost of Living index	Derived	7.5%	10.0%	-0.0%	3.6%	4.8%
Profitability gains: 3)						
As measured in nominal terms						
Traditional export sectors	Derived	11.7%	10.0%	-0.0%	5.6%	4.8%
Other tradables (export & local)	Derived	37.3%	10.0%	0.0%	17.8%	4.8%
Non-tradables	Derived	4.0%	10.0%	-0.0%	1.9%	4.8%
As measured in real terms						
Traditional export sectors	Derived	4.4%	-0.0%	-0.0%	2.2%	0.0%
Other tradables (export & local)	Derived	28.4%	-0.0%	-0.0%	14.0%	0.0%
Non-tradables	Derived	-2.7%	-0.0%	-0.0%	-1.3%	-0.0%

Notes:

1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.

2) Average competitive gain: average of home market and non-traditional export market gains.

3) See previous tables for definition.

4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

TABLE: E,3

Summary of assumptions and results for alternative model III specifications. Scenario: 3

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: **3A1**	**3A2**	**3B1**	**3B2**	**3C**	**3D**	**3E**	**3F1**	**3F2**
Total changes in:										
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	15.0%	20.0%	25.0%	25.0%
Pula/US$ exchange rate	Derived	20.0%	20.0%	14.3%	14.3%	9.1%	4.3%	0.0%	-4.0%	-4.0%
B : Specific assumptions and results (price-setter alternative) 1)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	-12.0%
Cost of Living index	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	-2.3%	-4.5%	-6.5%	-12.0%
Competitive and profitability gains:										
Average competitive gain 2)	Derived	5.0%	0.0%	2.5%	-0.0%	0.0%	-2.5%	-5.0%	-7.6%	0.0%
Profitability gain in traditional export sectors 3)										
Nominal	Derived	23.4%	22.0%	16.9%	16.2%	10.9%	5.5%	0.5%	-4.0%	-2.4%
Real	Derived	16.7%	10.9%	13.8%	10.9%	10.9%	8.2%	5.6%	3.0%	10.9%
C : Specific assumptions and results (price-accepter alternative) 4)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	-12.0%
Cost of Living index	Derived	7.5%	10.0%	3.6%	4.8%	-0.0%	-3.3%	-6.3%	-9.0%	-12.0%
Profitability gains: 3)										
As measured in nominal terms										
Traditional export sectors	Derived	23.7%	22.0%	17.0%	16.2%	10.9%	5.4%	0.3%	-4.4%	-2.4%
Other tradables (export & local)	Derived	37.3%	10.0%	17.8%	4.8%	0.0%	-16.2%	-31.1%	-44.8%	-12.0%
Non-tradables	Derived	4.0%	10.0%	1.9%	4.8%	-0.0%	-1.7%	-3.3%	-4.8%	-12.0%
As measured in real terms										
Traditional export sectors	Derived	15.7%	10.9%	13.3%	10.9%	10.9%	8.7%	6.4%	4.3%	10.9%
Other tradables (export & local)	Derived	28.4%	-0.0%	14.0%	0.0%	-0.0%	-13.6%	-26.9%	-39.8%	-0.0%
Non-tradables	Derived	-2.7%	-0.0%	-1.3%	-0.0%	-0.0%	1.3%	2.6%	3.8%	-0.0%

Notes: 1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.
2) Average competitive gain: average of home market and non-traditional export market gains.
3) See previous tables for definition.
4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

TABLE: E,4

Summary of assumptions and results for alternative model III specifications. Scenario: 4

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: 4A1	4A2	4B1	4B2	4C	4D1	4D2	4E1	4E2
Total changes in:										
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	-5.0%	-5.0%	15.0%	15.0%
Pula/US$ exchange rate	Derived	5.0%	5.0%	0.0%	0.0%	-4.5%	10.5%	10.5%	-8.7%	-8.7%
B : Specific assumptions and results (price-setter alternative) 1)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.3%
Cost of Living index	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	8.5%	15.8%	-2.3%	-4.3%
Competitive and profitability gains:										
Average competitive gain 2)	Derived	5.0%	0.0%	2.5%	-0.0%	0.0%	7.6%	-0.0%	-2.5%	-0.0%
Profitability gain in traditional export sectors 3)										
Nominal	Derived	5.4%	4.0%	-0.3%	-1.0%	-5.5%	11.6%	9.5%	-10.2%	-9.6%
Real	Derived	-0.3%	-5.5%	-3.0%	-5.5%	-5.5%	2.4%	-5.5%	-7.9%	-5.5%
C : Specific assumptions and results (price-accepter alternative) 4)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.4%
Cost of Living index	Derived	7.5%	10.0%	3.6%	4.8%	-0.0%	11.9%	15.8%	-3.3%	-4.3%
Profitability gains: 3)										
As measured in nominal terms										
Traditional export sectors	Derived	5.7%	4.0%	0.2%	-1.0%	-5.5%	12.1%	9.5%	-10.3%	-9.6%
Other tradables (export & local)	Derived	37.3%	10.0%	17.8%	4.8%	0.0%	58.9%	15.8%	-16.2%	-4.3%
Non-tradables	Derived	4.0%	10.0%	1.9%	4.8%	-0.0%	6.3%	15.8%	-1.7%	-4.3%
As measured in real terms										
Traditional export sectors	Derived	-1.2%	-5.5%	-3.4%	-5.5%	-5.5%	1.1%	-5.5%	-7.5%	-5.5%
Other tradables (export & local)	Derived	28.4%	-0.0%	14.0%	0.0%	-0.0%	43.2%	-0.0%	-13.6%	0.0%
Non-tradables	Derived	-2.7%	-0.0%	-1.3%	-0.0%	-0.0%	-4.2%	-0.0%	1.3%	-0.0%

Notes: 1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.

2) Average competitive gain: average of home market and non-traditional export market gains.

3) See previous tables for definition.

4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

TABLE: E,5

Summary of assumptions and results for alternative model III specifications. Scenario: 5

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: **5A1**	**5A2**	**5B1**	**5B2**	**5C**	**5D1**	**5D2**	**5E1**	**5E2**
Total changes in:										
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	-5.0%	-5.0%	15.0%	15.0%
Pula/US$ exchange rate	Derived	0.0%	0.0%	-4.8%	-4.8%	-9.1%	5.3%	5.3%	-13.0%	-13.0%
B : Specific assumptions and results (price-setter alternative) 1)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.3%
Cost of Living index	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	8.5%	15.8%	-2.3%	-4.3%
Competitive and profitability gains:										
Average competitive gain 2)	Derived	5.0%	0.0%	2.5%	-0.0%	0.0%	7.6%	-0.0%	-2.5%	-0.0%
Profitability gain in traditional export sectors 3)										
Nominal	Derived	-0.7%	-2.0%	-6.0%	-6.7%	-10.9%	5.3%	3.1%	-15.4%	-14.8%
Real	Derived	-6.0%	-10.9%	-8.5%	-10.9%	-10.9%	-3.4%	-10.9%	-13.3%	-10.9%
C : Specific assumptions and results (price-accepter alternative) 4)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.4%
Cost of Living index	Derived	7.5%	10.0%	3.6%	4.8%	-0.0%	11.9%	15.8%	-3.3%	-4.3%
Profitability gains: 3)										
As measured in nominal terms										
Traditional export sectors	Derived	-0.3%	-2.0%	-5.9%	-6.7%	-10.9%	5.8%	3.1%	-15.5%	-14.8%
Other tradables (export & local)	Derived	37.3%	10.0%	17.8%	4.8%	0.0%	58.9%	15.8%	-16.2%	-4.3%
Non-tradables	Derived	4.0%	10.0%	1.9%	4.8%	-0.0%	6.3%	15.8%	-1.7%	-4.3%
As measured in real terms										
Traditional export sectors	Derived	-6.8%	-10.9%	-8.9%	-10.9%	-10.9%	-4.7%	-10.9%	-12.9%	-10.9%
Other tradables (export & local)	Derived	28.4%	-0.0%	14.0%	0.0%	-0.0%	43.2%	-0.0%	-13.6%	0.0%
Non-tradables	Derived	-2.7%	-0.0%	-1.3%	-0.0%	-0.0%	-4.2%	-0.0%	1.3%	-0.0%

Notes: 1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.
2) Average competitive gain: average of home market and non-traditional export market gains.
3) See previous tables for definition.
4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

TABLE: E,6

Summary of assumptions and results for alternative model III specifications. Scenario: 6

NB: All estimates are presented in terms of percentage changes from the initial situation.

A : General assumptions and results	Type of data	Scenario ref.: **6A1**	**6A2**	**6B1**	**6B2**	**6C**	**6D1**	**6D2**	**6E1**	**6E2**
Total changes in:										
General RSA price-index	Assumed	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Rand/US$ exchange rate	Assumed	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%	-5.0%
Rand/Pula exchange rate	Assumed	0.0%	0.0%	5.0%	5.0%	10.0%	-5.0%	-5.0%	15.0%	15.0%
Pula/US$ exchange rate	Derived	-5.0%	-5.0%	-9.5%	-9.5%	-13.6%	0.0%	0.0%	-17.4%	-17.4%
B : Specific assumptions and results (price-setter alternative) 1)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.3%
Cost of Living index	Derived	5.4%	10.0%	2.6%	4.8%	-0.0%	8.5%	15.8%	-2.3%	-4.3%
Competitive and profitability gains:										
Average competitive gain 2)	Derived	5.0%	0.0%	2.5%	-0.0%	0.0%	7.6%	-0.0%	-2.5%	-0.0%
Profitability gain in traditional export sectors 3)										
Nominal	Derived	-6.7%	-8.1%	-11.8%	-12.4%	-16.4%	-1.0%	-3.2%	-20.6%	-20.0%
Real	Derived	-11.7%	-16.4%	-14.1%	-16.4%	-16.4%	-9.2%	-16.4%	-18.6%	-16.4%
C : Specific assumptions and results (price-accepter alternative) 4)										
Wages and Cost of Living										
Wage-rate index	Assumed	0.0%	10.0%	0.0%	4.8%	0.0%	0.0%	15.8%	0.0%	-4.4%
Cost of Living index	Derived	7.5%	10.0%	3.6%	4.8%	-0.0%	11.9%	15.8%	-3.3%	-4.3%
Profitability gains: 3)										
As measured in nominal terms										
Traditional export sectors	Derived	-6.4%	-8.1%	-11.6%	-12.4%	-16.4%	-0.5%	-3.2%	-20.8%	-20.0%
Other tradables (export & local)	Derived	37.3%	10.0%	17.8%	4.8%	0.0%	58.9%	15.8%	-16.2%	-4.3%
Non-tradables	Derived	4.0%	10.0%	1.9%	4.8%	-0.0%	6.3%	15.8%	-1.7%	-4.3%
As measured in real terms										
Traditional export sectors	Derived	-12.4%	-16.4%	-14.5%	-16.4%	-16.4%	-10.4%	-16.4%	-18.3%	-16.4%
Other tradables (export & local)	Derived	28.4%	-0.0%	14.0%	0.0%	-0.0%	43.2%	-0.0%	-13.6%	0.0%
Non-tradables	Derived	-2.7%	-0.0%	-1.3%	-0.0%	-0.0%	-4.2%	-0.0%	1.3%	-0.0%

Notes: 1) Specific assumptions and results, for model III as specified with the price-setter assumption for all non-traditional tradables.

2) Average competitive gain: average of home market and non-traditional export market gains.

3) See previous tables for definition.

4) Specific assumptions and results, for model III as specified with the price-accepter assumption.

Table: F,1

De/revaluations required to obtain given levels of competitive gains or losses (0%, +5% & -5%)

NB: All estimates are presented in terms of percentage changes from the initial situation.

Gearing Factor: 1.00	Column: I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
Total (cumm.) changes in:	Data report:												
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	10.0%	10.0%	10.0%	20.7%	21.2%	10.0%	10.0%	1.1%	0.7%	2.5%	5.0%	7.5%	10.0%
: Cost of Living index	10.0%	15.8%	16.0%	20.7%	21.2%	5.2%	5.0%	1.1%	0.7%	2.5%	5.0%	7.5%	10.0%
Average price-index for:													
: All prod., exc.tradit'al exp. 1)	10.0%	13.9%	14.0%	20.7%	21.2%	6.8%	6.6%	1.1%	0.7%	2.5%	5.0%	7.5%	10.0%
: All home m'rkt tradeables 2)	10.0%	14.6%	14.9%	20.7%	21.2%	6.1%	6.0%	1.1%	0.7%	2.5%	5.0%	7.5%	10.0%
: All non-trad. exports; FOB 3)	10.0%	14.6%	14.8%	20.7%	21.2%	6.2%	6.0%	1.1%	0.7%	2.5%	5.0%	7.5%	10.0%
: All non-trad.exp.; mrkt-prc 4)	10.0%	4.7%	4.5%	10.0%	10.0%	15.3%	15.5%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Changes in Exchange Rates:													
Rand/US$ exchange rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rand/Pula exchange rate	0.0%	-8.9%	-9.2%	-8.9%	-9.2%	8.9%	9.2%	8.9%	9.2%	7.3%	4.8%	2.3%	0.0%
Pula/US$ exchange rate	0.0%	9.7%	10.1%	9.7%	10.1%	-8.1%	-8.4%	-8.1%	-8.4%	-6.8%	-4.6%	-2.3%	0.0%
Competitive and profitability gains:													
Com.gain in the home market 5)	0.0%	5.0%	5.2%	0.0%	0.0%	-5.0%	-5.2%	0.0%	-0.0%	-0.0%	-0.0%	0.0%	0.0%
Com.gain in the non-trd. exp.mrk. 6)	0.0%	4.8%	5.0%	0.0%	0.0%	-4.8%	-5.0%	0.0%	-0.0%	-0.0%	-0.0%	0.0%	0.0%
Profit.gain in tradit.export sectors 7)													
Nominal 8)	-2.0%	9.0%	9.4%	7.5%	7.9%	-11.2%	-11.6%	-10.0%	-10.3%	-8.7%	-6.5%	-4.3%	-2.0%
Real 9)	-10.9%	-6.2%	-6.0%	-10.9%	-10.9%	-15.4%	-15.5%	-10.9%	-10.9%	-10.9%	-10.9%	-10.9%	-10.9%

Notes:

1) Average production price index for all local products excl. traditional exports.
2) Average production price index for all local tradeable products supplied to the home market, (valued at local (Pula) market prices).
3) Average production price index for all non-traditional exports, (valued at (Pula) FOB price).
4) Average production price index for all non-traditional exports, (valued at foreign market price, i.e. at Rand, inc. transport costs).
5) Botswana's competitive gain in the home market (tradeable products only).
6) Botswana's competitive gain in the non-traditional export market.
7) Botswana's profitability gain; measuring the nominal and real change in the value of the Gross Operating Surplus (GOS) earned by the traditional export sectors, expressed as a % of the initial GOS value.
8) Percentage increase in GOS, as measured in current prices.
9) Percentage increase in GOS, as measured by deflated prices; (i.e when the "new" GOS value is deflated by a price index for Total Domestic Uses).

Table : G,1
Exchange rate data

	Average annual exchange rates			Annual % pa increase in:		
	Rand/Pula	US$/Pula	US$/Rand	Rand/Pula	US$/Pula	US$/Rand
	EXRP	EXDP	EXDR	EXRP%	EXDP%	EXDR%
1980	1.000	1.287	1.288	NA	NA	NA
1981	1.047	1.200	1.147	4.7%	-6.8%	-11.0%
1982	1.057	0.979	0.926	1.0%	-18.4%	-19.3%
1983	1.015	0.912	0.898	-4.0%	-6.8%	-2.9%
1984	1.131	0.779	0.689	11.3%	-14.6%	-23.3%
1985	1.166	0.530	0.454	3.2%	-32.0%	-34.1%
1986	1.216	0.536	0.441	4.2%	1.1%	-3.0%
1987	1.212	0.596	0.492	-0.3%	11.3%	11.6%
1988	1.243	0.550	0.442	2.5%	-7.8%	-10.0%
1989	1.302	0.497	0.382	4.8%	-9.6%	-13.7%
1990	1.388	0.536	0.386	6.6%	7.8%	1.2%
1991	1.368	0.499	0.365	-1.5%	-6.8%	-5.5%
1992	1.334	0.471	0.353	-2.5%	-5.6%	-3.2%
1993	1.351	0.419	0.310	1.3%	-11.2%	-12.3%
1994	1.325	0.375	0.283	-1.9%	-10.4%	-8.6%
1995	1.310	0.362	0.277	-1.1%	-3.4%	-2.3%
1996	1.293	0.309	0.239	-1.3%	-14.7%	-13.6%

1) EXDR calculated by the formula: EXDP/EXRP

1993	Rand/Pula	% incr.
January	1.3536	0.8%
February	1.3532	-0.0%
March	1.3530	-0.0%
April	1.3552	0.2%
May	1.3553	0.0%
June	1.3556	0.0%
July	1.3561	0.0%
August	1.3566	0.0%
September	1.3564	-0.0%
October	1.3536	-0.2%
November	1.3401	-1.0%
December	1.3265	-1.0%
Average	1.3512	1.3%

1994	Rand/Pula	% incr.
January	1.3251	-1.1%
February	1.3236	-0.1%
March	1.3287	0.4%
April	1.3393	0.8%
May	1.3434	0.3%
June	1.3475	0.3%
July	1.3355	-0.9%
August	1.3199	-1.2%
September	1.3136	-0.5%
October	1.3081	-0.4%
November	1.3081	-0.0%
December	1.3064	-0.1%
Average	1.3249	-1.9%

1995	Rand/Pula	% incr.
January	1.3051	-0.2%
February	1.3065	0.1%
March	1.3148	0.6%
April	1.3205	0.4%
May	1.3195	-0.1%
June	1.3206	0.1%
July	1.3192	-0.1%
August	1.3144	-0.4%
September	1.3042	-0.8%
October	1.2982	-0.5%
November	1.2988	0.0%
December	1.2969	-0.1%
Average	1.3099	-1.1%

1996	Rand/Pula	% incr.
January	1.2952	-0.3%
February	1.2866	-0.7%
March	1.2893	0.2%
April	1.3025	1.0%
May	1.3035	0.1%
June	1.2957	-0.6%
July	1.2884	-0.6%
August	1.2941	0.4%
September	1.2966	0.2%
October	1.2904	-0.5%
November	1.2925	0.2%
December	1.2869	-0.4%
Average	1.2934	-1.3%

Table: G,2
Wage rates versus Consumer Price Index

	Average wages 1)			Indexed (Base: March 1987) Average wages			% incr. over last period 3) Average wages		
	Citizen	Total	CPI 2)	Citizen	Total	CPI	Citizen	Total	CPI
1986 March	NA	NA	31.8	NA	NA	91.0	NA	NA	NA
Sept.	NA	NA	33.5	NA	NA	95.9	NA	NA	5.3%
1987 March	310.8	379.2	34.9	100.0	100.0	100.0	NA	NA	4.3%
Sept.	321.1	386.6	36.8	103.3	102.0	105.3	3.3%	2.0%	5.3%
1988 March	343.5	413.2	37.7	110.5	109.0	108.0	7.0%	6.9%	2.6%
Sept.	368.9	451.6	40.1	118.7	119.1	114.9	7.4%	9.3%	6.4%
1989 March	403.8	482.9	42.3	129.9	127.4	121.0	9.4%	6.9%	5.3%
Sept.	433.2	523.4	44.6	139.4	138.0	127.7	7.3%	8.4%	5.6%
1990 March	447.4	542.8	47.1	143.9	143.1	134.9	3.3%	3.7%	5.6%
Sept.	479.0	585.0	49.5	154.1	154.3	141.6	7.1%	7.8%	5.0%
1991 March	566.0	681.0	52.5	182.1	179.6	150.1	18.2%	16.4%	6.0%
Sept.	576.0	690.0	55.7	185.3	182.0	159.3	1.8%	1.3%	6.1%
1992 March	607.0	740.0	60.2	195.3	195.2	172.1	5.4%	7.2%	8.0%
Sept.	660.0	789.0	65.2	212.3	208.1	186.5	8.7%	6.6%	8.3%
1993 March	740.0	884.0	69.4	238.1	233.1	198.7	12.1%	12.0%	6.6%
Sept.	799.0	948.0	73.9	257.1	250.0	211.5	8.0%	7.2%	6.5%
1994 March	799.0	944.0	77.1	257.1	249.0	220.7	0.0%	-0.4%	4.3%
Sept.	828.0	977.0	81.4	266.4	257.7	233.0	3.6%	3.5%	5.6%
1995 March	NA	NA	85.7	NA	NA	NA	NA	NA	5.2%
Sept.	NA	NA	90.2	NA	NA	NA	NA	NA	5.3%

Source: Misc. CSO publications

Notes: 1) Average monthly wages per employee, all sectors
2) CSO's Consumer Price Index, base: Nov.1996
3) Last period = 6 months earlier

Table: G,3

Wage/CPI ratios for alternative base periods

Ratio between Wage/CPI indices, for alternative Base periods 1)

	Base:	1987	1988		1989		1990		1991		1992		1993		1994	
	March	Sept.	March	Sept.	March	Sept.	March	Sept.	March	Sept.	March	Sept.	March	Sept.	March	Sept.
1987 March	**1.00**	1.03	0.99	0.96	0.95	0.93	0.94	0.92	0.84	0.88	0.88	0.90	0.85	0.85	0.89	0.90
Sept.	0.97	**1.00**	0.96	0.93	0.92	0.90	0.91	0.89	0.81	0.85	0.85	0.87	0.83	0.82	0.86	0.88
1988 March	1.01	1.04	**1.00**	0.97	0.96	0.93	0.95	0.93	0.84	0.88	0.89	0.90	0.86	0.85	0.89	0.91
Sept.	1.04	1.07	1.03	**1.00**	0.98	0.96	0.98	0.95	0.87	0.91	0.91	0.93	0.88	0.88	0.92	0.94
1989 March	1.05	1.09	1.04	1.02	**1.00**	0.97	0.99	0.97	0.88	0.92	0.93	0.94	0.90	0.89	0.93	0.95
Sept.	1.08	1.12	1.07	1.04	1.03	**1.00**	1.02	0.99	0.90	0.95	0.95	0.97	0.92	0.91	0.96	0.98
1990 March	1.06	1.10	1.05	1.02	1.01	0.98	**1.00**	0.97	0.89	0.93	0.94	0.95	0.90	0.90	0.94	0.96
Sept.	1.09	1.12	1.08	1.05	1.03	1.01	1.03	**1.00**	0.91	0.95	0.96	0.98	0.93	0.92	0.97	0.99
1991 March	1.20	1.24	1.19	1.15	1.14	1.11	1.13	1.10	**1.00**	1.05	1.06	1.07	1.02	1.01	1.06	1.08
Sept.	1.14	1.18	1.13	1.10	1.08	1.06	1.08	1.05	0.95	**1.00**	1.01	1.02	0.97	0.97	1.01	1.03
1992 March	1.13	1.17	1.12	1.09	1.08	1.05	1.07	1.04	0.95	0.99	**1.00**	1.02	0.97	0.96	1.00	1.03
Sept.	1.12	1.15	1.11	1.08	1.06	1.03	1.05	1.02	0.93	0.98	0.98	**1.00**	0.95	0.94	0.99	1.01
1993 March	1.17	1.21	1.16	1.13	1.11	1.09	1.11	1.08	0.98	1.03	1.03	1.05	**1.00**	0.99	1.04	1.06
Sept.	1.18	1.22	1.17	1.14	1.12	1.09	1.11	1.08	0.99	1.03	1.04	1.06	1.01	**1.00**	1.05	1.07
1994 March	1.13	1.17	1.12	1.09	1.07	1.04	1.06	1.04	0.94	0.99	1.00	1.01	0.96	0.95	**1.00**	1.02
Sept.	1.11	1.14	1.10	1.07	1.05	1.02	1.04	1.02	0.92	0.97	0.98	0.99	0.94	0.94	0.98	**1.00**

Note: 1) For ratios BELOW their relevant base (nb: the base is marked in bold):

- If the ratio is > 1.0: the wage index is higher than the CPI, i.e. wage increases have outgrown the CPI inflation.
- If the ratio is = 1.0: the wage index is equal to the CPI, i.e. the two have grown to the same degree.
- If the ratio is < 1.0: the wage index is lower than the CPI, i.e. CPI inflation has outgrown the wage increases.

The reverse is true for ratios ABOVE their relevant base. Both indices are then growing TOWARDS the same base-value of 100.
Hence, the faster the growth rate, the smaller the index value.
Consequently, for ratios ABOVE their relevant base:

- If the ratio is < 1.0: the wage index is lower than the CPI, i.e. wage increases have outgrown the CPI inflation.
- If the ratio is = 1.0: the wage index is equal to the CPI, i.e. the two have grown to the same degree.
- If the ratio is > 1.0: the wage index is higher than the CPI, i.e. CPI inflation has outgrown the wage increases.

Table: G,4
Average wage rate in Central Government sector

Average monthly wage paid per person during selected months

		Pula	% pa
1987	March	71.2	NA
	Sept	99.5	39.7%
1988	March	345.7	247.4%
	Sept	426.2	23.3%
1989	March	557.3	30.8%
	Sept	585.8	5.1%
1990	March	612.2	4.5%
	Sept	602.0	-1.7%
1991	March	797.0	32.4%
	Sept	799.0	0.3%
1992	March	835.0	4.5%
	Sept	860.0	3.0%
1993	March	1,056.0	22.8%
	Sept	1,040.0	1.5%
1994	March	1,074.0	3.3%
	Sept	1,078.0	0.4%

	Annual averages of above CSO statistics		Officially declared 1)
	Pula	% pa	% pa
1979	NA	NA	49.0%
1980	NA	NA	6.0%
1981	NA	NA	7.5%
1982	NA	NA	0.0%
1983	NA	NA	8.0%
1984	NA	NA	10.0%
1985	NA	NA	6.0%
1986	NA	NA	12-29% 2)
1987	85.4	NA	10.0%
1988	385.9	352.0%	7.0%
1989	571.5	48.1%	10.0%
1990	607.1	6.2%	11.0%
1991	798.0	31.4%	12.0%
1992	847.5	6.2%	10.0%
1993	1,048.0	23.7%	15-23% 2)
1994	1,076.0	2.7%	0.0%
1995	NA	NA	8.0%
1996	NA	NA	5.0%
1997	NA	NA	9.5%

Notes:
1) Government salary increases, as declared in Budget Speeches etc.
2) Variable, within the given upper and lower limit.

Source: Misc. CSO Publications, Budget Speeches and BoB Annual Reports.

Table: G,5
Miscellaneous price data

				Index (base: 1980 I)			Relative differences		% pq increase 5)		Wage data	
	RSA WPI 1) Col: 1	Bot. CPI 2) Col: 2	Rand/Pula ex.rate 3) Col: 3	RSA WPI Col: 4	Bot. CPI Col: 5	Bot. IPI 4) Col: 6	(WPI-CPI) /CPI Col: 7	(CPI-IPI) /CPI Col: 8	Bot. CPI Col: 9	Bot. IPI Col: 10	CSO avg. wages 6) Col: 11	Gov. wages 7) Col: 12
1980 I	26.2	17.0	1.037	1.000	1.000	1.000	0.00	0.00	NA	NA	NA	2.1%
II	27.0	17.4	1.005	1.031	1.024	1.064	0.01	-0.04	2.4%	6.4%	NA	2.1%
III	28.4	18.2	0.979	1.087	1.070	1.151	0.02	-0.08	4.4%	8.2%	NA	2.1%
IV	29.8	18.7	0.978	1.139	1.102	1.207	0.03	-0.10	3.0%	4.9%	NA	2.1%
1981 I	30.4	20.0	1.008	1.161	1.176	1.193	-0.01	-0.01	6.8%	-1.1%	NA	2.5%
II	31.1	20.5	1.026	1.187	1.207	1.200	-0.02	0.01	2.6%	0.6%	NA	2.5%
III	32.4	21.0	1.062	1.237	1.237	1.208	0.00	0.02	2.5%	0.7%	NA	2.5%
IV	33.4	21.5	1.091	1.277	1.266	1.214	0.01	0.04	2.3%	0.4%	NA	2.5%
1982 I	34.4	21.8	1.094	1.316	1.282	1.246	0.03	0.03	1.3%	2.7%	NA	0.6%
II	35.6	22.6	1.066	1.360	1.330	1.323	0.02	0.01	3.7%	6.1%	NA	0.6%
III	36.6	23.7	1.042	1.400	1.394	1.392	0.00	0.00	4.8%	5.2%	NA	0.6%
IV	37.9	24.2	1.027	1.449	1.424	1.462	0.02	-0.03	2.2%	5.1%	NA	0.6%
1983 I	38.7	24.6	1.012	1.478	1.449	1.514	0.02	-0.04	1.7%	3.5%	NA	2.6%
II	39.6	25.3	1.007	1.514	1.490	1.557	0.02	-0.05	2.8%	2.8%	NA	2.6%
III	40.4	25.8	1.005	1.544	1.519	1.592	0.02	-0.05	1.9%	2.3%	NA	2.6%
IV	41.2	26.2	1.037	1.573	1.543	1.573	0.02	-0.02	1.6%	-1.2%	NA	2.6%
1984 I	41.7	26.9	1.063	1.593	1.582	1.553	0.01	0.02	2.5%	-1.3%	NA	3.0%
II	42.8	27.5	1.082	1.635	1.618	1.566	0.01	0.03	2.3%	0.8%	NA	3.0%
III	43.8	28.1	1.150	1.672	1.655	1.507	0.01	0.09	2.3%	-3.8%	NA	3.0%
IV	45.2	28.2	1.227	1.728	1.659	1.460	0.04	0.12	0.2%	-3.1%	NA	3.0%
1985 I	47.1	28.4	1.128	1.799	1.671	1.653	0.08	0.01	0.7%	13.2%	NA	2.1%
II	48.8	29.7	1.113	1.865	1.747	1.737	0.07	0.01	4.5%	5.1%	NA	2.1%
III	50.5	30.6	1.180	1.928	1.802	1.694	0.07	0.06	3.2%	-2.5%	NA	2.1%
IV	53.2	30.9	1.246	2.032	1.822	1.691	0.12	0.07	1.1%	-0.2%	NA	2.1%
1986 I	55.6	31.7	1.204	2.123	1.866	1.828	0.14	0.02	2.5%	8.1%	NA	5.3%
II	57.8	32.5	1.232	2.207	1.916	1.857	0.15	0.03	2.6%	1.6%	NA	5.3%
III	60.4	33.3	1.226	2.308	1.962	1.952	0.18	0.00	2.4%	5.1%	NA	5.3%
IV	63.1	34.0	1.200	2.409	2.002	2.081	0.20	-0.04	2.0%	6.6%	NA	5.3%
1987 I	65.2	34.8	1.209	2.491	2.050	2.137	0.22	-0.04	2.4%	2.7%	NA	3.0%
II	67.2	36.0	1.208	2.568	2.118	2.202	0.21	-0.04	3.3%	3.1%	1.0%	3.0%
III	69.1	36.6	1.212	2.642	2.158	2.259	0.22	-0.05	1.9%	2.6%	1.0%	3.0%
IV	71.2	37.0	1.219	2.722	2.179	2.314	0.25	-0.06	1.0%	2.5%	3.4%	3.0%
1988 I	73.7	37.3	1.239	2.815	2.200	2.356	0.28	-0.07	1.0%	1.8%	3.4%	2.3%
II	76.8	38.6	1.250	2.934	2.272	2.433	0.29	-0.07	3.3%	3.3%	4.6%	2.3%
III	78.8	39.8	1.244	3.010	2.343	2.509	0.28	-0.07	3.1%	3.1%	4.6%	2.3%
IV	81.2	40.8	1.239	3.101	2.401	2.594	0.29	-0.08	2.5%	3.4%	3.4%	2.3%
1989 I	84.7	41.9	1.237	3.237	2.465	2.713	0.31	-0.10	2.7%	4.6%	3.4%	3.0%
II	88.1	43.3	1.277	3.366	2.549	2.732	0.32	-0.07	3.4%	0.7%	4.1%	3.0%
III	90.4	44.3	1.343	3.456	2.609	2.668	0.32	-0.02	2.4%	-2.3%	4.1%	3.0%
IV	93.0	45.1	1.351	3.555	2.658	2.728	0.34	-0.03	1.9%	2.2%	1.8%	3.0%

Table: G,5 cont.
Miscellaneous price data

				Index (base: 1980 I)			Relative differences		% pq increase 5)		Wage data	
	RSA WPI 1) Col: 1	Bot. CPI 2) Col: 2	Rand/Pula ex.rate 3) Col: 3	RSA WPI Col: 4	Bot. CPI Col: 5	Bot. IPI 4) Col: 6	(WPI-CPI) /CPI Col: 7	(CPI-IPI) /CPI Col: 8	Bot. CPI Col: 9	Bot. IPI Col: 10	CSO avg. wages 6) Col: 11	Gov. wages 7) Col: 12
1990 I	95.3	46.7	1.364	3.643	2.749	2.767	0.32	-0.01	3.4%	1.4%	1.8%	3.3%
II	98.6	48.1	1.399	3.767	2.835	2.791	0.33	0.02	3.1%	0.9%	3.8%	3.3%
III	101.5	49.1	1.423	3.879	2.891	2.826	0.34	0.02	2.0%	1.3%	3.8%	3.3%
IV	105.2	50.6	1.365	4.020	2.978	3.052	0.35	-0.02	3.0%	8.0%	7.9%	3.3%
1991 I	108.4	52.1	1.368	4.142	3.066	3.138	0.35	-0.02	3.0%	2.8%	7.9%	3.5%
II	110.6	53.4	1.377	4.226	3.143	3.181	0.34	-0.01	2.5%	1.4%	0.7%	3.5%
III	113.3	55.0	1.391	4.329	3.242	3.225	0.34	0.01	3.1%	1.4%	0.7%	3.5%
IV	116.2	56.9	1.334	4.440	3.349	3.450	0.33	-0.03	3.3%	7.0%	3.6%	3.5%
1992 I	117.9	59.2	1.325	4.505	3.485	3.524	0.29	-0.01	4.1%	2.1%	3.6%	3.0%
II	121.3	62.3	1.330	4.635	3.672	3.612	0.26	0.02	5.4%	2.5%	3.3%	3.0%
III	124.3	64.5	1.333	4.750	3.801	3.692	0.25	0.03	3.5%	2.2%	3.3%	3.0%
IV	125.9	66.4	1.348	4.811	3.910	3.700	0.23	0.05	2.9%	0.2%	5.8%	3.0%
1993 I	128.1	68.8	1.353	4.895	4.055	3.749	0.21	0.08	3.7%	1.3%	5.8%	4.6%
II	130.1	71.2	1.355	4.971	4.193	3.802	0.19	0.09	3.4%	1.4%	3.6%	4.6%
III	131.8	73.5	1.356	5.036	4.330	3.849	0.16	0.11	3.3%	1.2%	3.6%	4.6%
IV	133.7	75.1	1.340	5.109	4.420	3.952	0.16	0.11	2.1%	2.7%	-0.2%	4.6%
1994 I	137.4	76.6	1.326	5.250	4.514	4.105	0.16	0.09	2.1%	3.9%	-0.2%	0.6%
II	140.3	79.0	1.343	5.361	4.655	4.136	0.15	0.11	3.1%	0.8%	1.7%	0.6%
III	145.1	81.0	1.323	5.544	4.771	4.344	0.16	0.09	2.5%	5.0%	1.7%	0.6%
IV	147.6	82.4	1.308	5.640	4.852	4.471	0.16	0.08	1.7%	2.9%	NA	0.6%
1995 I	152.3	84.8	1.309	5.820	4.995	4.609	0.17	0.08	2.9%	3.1%	NA	2.6%
II	156.3	87.2	1.320	5.972	5.133	4.689	0.16	0.09	2.8%	1.7%	NA	2.6%
III	157.4	89.5	1.313	6.014	5.271	4.749	0.14	0.10	2.7%	1.3%	NA	2.6%
IV	161.2	91.2	1.298	6.160	5.369	4.919	0.15	0.08	1.9%	3.6%	NA	2.6%
1996 I	163.1	93.6	1.290	6.232	5.511	5.006	0.13	0.09	2.6%	1.8%	NA	1.9%
II	165.6	96.1	1.301	6.328	5.661	5.043	0.12	0.11	2.7%	0.7%	NA	1.9%
III	170.1	98.4	1.293	6.500	5.798	5.210	0.12	0.10	2.4%	3.3%	NA	1.9%
IV	175.0	100.0	1.290	6.687	5.891	5.373	0.14	0.09	1.6%	3.1%	NA	1.9%

Notes: 1) RSA Wholesale Price Index, base 1990. From misc. issues of IMF: Internat. Finance Statistics
2) Botswana Consumer Price Index, base: Nov.96
3) Average Rand/Pula exchange rate for period in question
4) Botswana Import Price Index, (calculated by converting the RSA WPI to Pula terms)
5) Percentage increase over previous quarter.
6) Rough wage increase estimates, based on CSO average monthly wage data.
7) Rough wage increase estimates, based on declared wage increases in the government sector, plus 2.5% pa creep.

Table: H,1

Sensitivity analysis wrt gearing factor. First round effects of alternative gearing factors

NB: All estimates are presented in terms of percentage changes from the initial situation.

	Wage increase "round" no:										
	0	0	0	0	0	0	0	0	0	0	0
Total (cumm.) changes in:	Data report:										
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
BOT: Wage-rate index	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
: Cost of Living index	4.6%	4.8%	4.9%	5.1%	5.3%	5.4%	5.5%	5.7%	6.3%	7.1%	8.7%
Average prod. price-index for:											
: All products (exc.trad.exp.) 1	2.6%	2.8%	3.0%	3.3%	3.5%	3.6%	3.8%	4.1%	4.7%	5.8%	7.7%
: All home mark. tradeables 2	3.4%	3.6%	3.8%	4.0%	4.2%	4.4%	4.5%	4.8%	5.4%	6.3%	7.9%
: All non-trad. exports; FOB	3.1%	3.4%	3.6%	3.9%	4.1%	4.3%	4.5%	4.8%	5.5%	6.7%	8.7%
: All n-trad.exp.; mrkt-price 4)	3.5%	3.7%	3.9%	4.2%	4.4%	4.6%	4.7%	5.1%	5.8%	6.9%	8.8%
Changes in Exchange Rates:											
Rand/US$ exchange rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rand/Pula exchange rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pula/US$ exchange rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Competitive and profitability gains:											
Com.gain in the home market 5)	6.0%	5.9%	5.7%	5.4%	5.3%	5.1%	5.0%	4.8%	4.2%	3.4%	1.9%
Com.gain in the non-trd. exp.mrk. 6	5.9%	5.8%	5.5%	5.3%	5.1%	4.9%	4.8%	4.5%	3.9%	2.9%	1.1%
Profit.gain in tradit.export sectors 7)											
Nominal 8)	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.8%
Real 9)	-5.4%	-5.5%	-5.6%	-5.8%	-5.9%	-6.0%	-6.1%	-6.3%	-6.7%	-7.4%	-8.6%
Memo: GOS "gearing" factor	**0.000**	**0.250**	**0.500**	**0.750**	**0.900**	**1.000**	**1.100**	**1.250**	**1.500**	**1.750**	**2.000**

Notes: 1) Average production price index for all local products excl. traditional exports.
2) Average production price index for all local tradeable products supplied to the home market, (valued at local (Pula) market prices).
3) Average production price index for all non-traditional exports, (valued at (Pula) FOB price).
4) Average production price index for all non-traditional exports, (valued at foreign market price, i.e. at Rand, inc. transport costs).
5) Botswana's competitive gain in the home market (tradeable products only).
6) Botswana's competitive gain in the non-traditional export market.
7) Botswana's profitability gain; measuring the nominal and real change in the value of the Gross Operating Surplus (GOS) earned by the traditional export sectors, expressed as a % of the initial GOS value.
8) Percentage increase in GOS, as measured in current prices.
9) Percentage increase in GOS, as measured by deflated prices; (i.e when the "new" GOS value is deflated by a price index for Total Domestic Uses).

Table: H,2

Sensitivity analysis wrt gearing factor. Last round effects of alternative gearing factors

NB: All estimates are presented in terms of percentage changes from the initial situation.

	Wage increase "round" no:										
	Last	Last	Last	Last	Last	Last	Last	Last	Last	Last	Last
Total (cumm.) changes in:	Data report:										
RSA : General price-index	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	See
BOT: Wage-rate index	6.8%	7.2%	7.8%	8.7%	9.4%	10.0%	10.7%	12.3%	17.3%	37.4%	note 10)
: Cost of Living index	6.8%	7.2%	7.8%	8.7%	9.4%	10.0%	10.7%	12.3%	17.3%	37.4%	below.
Average prod. price-index for:											
: All products (exc.trad.exp.) 1	5.6%	6.2%	7.1%	8.2%	9.2%	10.0%	11.0%	13.0%	19.6%	45.7%	
: All home mark. tradeables 2	6.2%	6.8%	7.5%	8.5%	9.3%	10.0%	10.8%	12.5%	18.0%	39.7%	
: All non-trad. exports; FOB	5.7%	6.3%	7.2%	8.3%	9.2%	10.0%	11.0%	12.9%	19.3%	44.7%	
: All n-trad.exp.; mrkt-price 4)	5.9%	6.5%	7.3%	8.4%	9.3%	10.0%	10.9%	12.8%	18.9%	43.0%	
Changes in Exchange Rates:											
Rand/US$ exchange rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Rand/Pula exchange rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Pula/US$ exchange rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Competitive and profitability gains:											
Com.gain in the home market 5)	3.4%	2.9%	2.3%	1.4%	0.6%	0.0%	-0.8%	-2.3%	-7.3%	-27.0%	
Com.gain in the non-trd. exp.mrk. 6	3.7%	3.2%	2.5%	1.5%	0.7%	0.0%	-0.8%	-2.5%	-8.1%	-30.0%	
Profit.gain in tradit.export sectors 7)											
Nominal 8)	-1.7%	-1.7%	-1.8%	-1.9%	-2.0%	-2.0%	-2.1%	-2.3%	-3.1%	-6.2%	
Real 9)	-8.1%	-8.5%	-9.0%	-9.8%	-10.4%	-10.9%	-11.6%	-12.9%	-16.8%	-30.2%	
Memo: GOS "gearing" factor	**0.000**	**0.250**	**0.500**	**0.750**	**0.900**	**1.000**	**1.100**	**1.250**	**1.500**	**1.750**	**2.000**

Notes: 1) - 9) See notes 1 - 9 in table H,1.

10) The system has no equilibrium solution for a gearing factor of 2.0. Gearing factors above 1.75 give rapidly increasing equilibrium solutions in terms of COL and wage rate increases. For gearing factors = 1.918 and above the system no longer has an equilibrium solution; the system has then become "explosive".

Table: H,3
The "speed" of the inflationary process for various gearing factors

Standard assumptions:

RSA gen. price-index	10.00%
Rand/Pula exch. rate	0.00%

	Wage increase "round" no:																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Gearing Factor : 1.50																		
Bot.: wage-rate index	0.00%	6.26%	10.25%	12.79%	14.41%	15.44%	16.10%	16.52%	16.79%	16.96%	17.07%	17.14%	17.18%	17.21%	17.23%	17.24%	17.25%	
: COL index	6.26%	10.25%	12.79%	14.41%	15.44%	16.10%	16.52%	16.79%	16.96%	17.07%	17.14%	17.18%	17.21%	17.23%	17.24%	17.25%	17.25%	
COL in % of final impact	36.3%	59.4%	74.1%	83.5%	89.5%	93.3%	95.8%	97.3%	98.3%	98.9%	99.3%	99.6%	99.7%	99.9%	99.9%	100.0%	100.0%	
Gearing Factor : 1.25																		
Bot.: wage-rate index	0.00%	5.74%	8.79%	10.42%	11.28%	11.74%	11.99%	12.12%	12.19%	12.23%	12.25%	12.26%						
: COL index	5.74%	8.79%	10.42%	11.28%	11.74%	11.99%	12.12%	12.19%	12.23%	12.25%	12.26%	12.26%						
COL in % of final impact	46.8%	71.7%	84.9%	92.0%	95.7%	97.7%	98.8%	99.4%	99.7%	99.9%	100.0%	100.0%						
Gearing Factor : 1.10																		
Bot.: wage-rate index	0.00%	5.51%	8.19%	9.50%	10.14%	10.45%	10.60%	10.67%	10.71%	10.73%	10.74%							
: COL index	5.51%	8.19%	9.50%	10.14%	10.45%	10.60%	10.67%	10.71%	10.73%	10.74%	10.74%							
COL in % of final impact	51.3%	76.3%	88.4%	94.4%	97.3%	98.7%	99.4%	99.7%	99.9%	100.0%	100.0%							
Gearing Factor : 1.00																		
Bot.: wage-rate index	0.00%	5.38%	7.87%	9.02%	9.55%	9.79%	9.90%	9.95%	9.98%	9.99%	10.00%							
: COL index	5.38%	7.87%	9.02%	9.55%	9.79%	9.90%	9.95%	9.98%	9.99%	10.00%	10.00%							
COL in % of final impact	53.8%	78.7%	90.2%	95.5%	97.9%	99.0%	99.5%	99.8%	99.9%	100.0%	100.0%							
Gearing Factor : 0.90																		
Bot.: wage-rate index	0.00%	5.27%	7.59%	8.61%	9.05%	9.25%	9.34%	9.38%	9.39%	9.40%								
: COL index	5.27%	7.59%	8.61%	9.05%	9.25%	9.34%	9.38%	9.39%	9.40%	9.40%								
COL in % of final impact	56.1%	80.7%	91.5%	96.3%	98.4%	99.3%	99.7%	99.9%	100.0%	100.0%								
Gearing Factor : 0.75																		
Bot.: wage-rate index	0.00%	5.12%	7.23%	8.09%	8.45%	8.59%	8.65%	8.68%	8.69%									
: COL index	5.12%	7.23%	8.09%	8.45%	8.59%	8.65%	8.68%	8.69%	8.69%									
COL in % of final impact	58.9%	83.1%	93.1%	97.2%	98.9%	99.5%	99.8%	100.0%	100.0%									
Gearing Factor : 0.60																		
Bot.: wage-rate index	0.00%	4.92%	6.75%	7.43%	7.69%	7.78%	7.82%	7.83%	7.84%									
: COL index	4.92%	6.75%	7.43%	7.69%	7.78%	7.82%	7.83%	7.84%	7.84%									
COL in % of final impact	62.8%	86.1%	94.8%	98.1%	99.3%	99.7%	99.9%	100.0%	100.0%									