Impact Project

Impact Research Centre, The University of Melbourne,
153 Barry Street, Carlton, Victoria 3053 Australia.

Telephone: (03) 344 7417 (*from overseas:* 61 3 344 7417)
Telex: AA 35185 UNIMEL Telegrams: UNIMELB, Parkville
Facsimile: (03) 344 5104 (*from overseas:* 61 3 344 5104)

Paper presented to a policy forum on

Exchange Rates and Interest Rates: Where to Now?

organized by the ACT Branch of

the Australian Agricultural Economics Society
Australian National University
30th September 1987

HOW DOMESTIC ECONOMIC CONDITIONS INFLUENCE THE REAL EXCHANGE RATE

by

Peter J. Higgs

IMPACT Research Centre
University of Melbourne

General Paper No. G-79 Melbourne September 1987

ISSN 0813 7986 ISBN 0 642 10200 7

ABSTRACT

Domestic economic policies that determine for example, the level of aggregate demand, protection, wages, and the tax-mix, can influence the real exchange rate. In this paper the ORANI model is used to estimate the extent of these influences on the real exchange rate and other endogenous macroeconomic variables. The sectoral implications of the above economic policies are also briefly examined.

Contents

Tables

REFERENCES

Australian Bureau of Statistics (1985) The Labour Force Australia, Catalogue No. 6203.0, Commonwealth Government Printer, Canberra.

Cooper, R.J. (1983) "A Tariff Experiment on the Interfaced ORANI-MACRO System", IMPACT Preliminary Working Paper No. IP-17, mimeo, 29 pp.

Dixon, P.B. and D. Johnson (1986) "Competitiveness Indices and Trade Performance", Australian Bulletin of Labour, Vol. 12, No. 3, June, pp. 154-172.

Dixon, P.B., B.R. Parmenter, and A.A. Powell (1982) "Farm Incomes and the Real Exchange Rate in Australia: Evidence from the ORANI Model", IMPACT General Paper No. G-41, mimeo, 17 pp.

Dixon, P.B., B.R. Parmenter, J. Sutton, and D.P. Vincent (1982) ORANI: A Multisectoral Model of the Australian Economy, North-Holland, Amsterdam.

Fallon, J. and L. Thompson (1987) "An Analysis of the Effects of Recent Changes in the Exchange Rate and the Terms of Trade on the Level and Composition of Economic Activity", Australian Economic Review, 2nd Quarter, pp. 24-36.

Higgs, Peter J. (1986) Adaptation and Survival in Australian Agriculture. Oxford University Press, Melbourne.

Higgs, Peter J. and A. Stoeckel (1987) "The Impact of a Range of Economic Policies on Australia's Balance of Trade", IMPACT General Paper No. G-80, mimeo, 28 pp.

Lim, G.C. and B.R. Parmenter (1985) " An Analysis of Recent Changes in the Australian Exchange Rate: Nominal and Real", Australian Economic Review, 2nd Quarter, pp. 19-26.

Meagher, G.A. and B.R. Parmenter (1985) "Some Short-Run Effects of Shifts from Direct to Indirect Taxation", mimeo, 63 pp. Available from the Institute of Applied Economic and Social Research, University of Melbourne, Melbourne.

Nguyen, D.T. and W.J. Martin (1987) "When is the Real Exchange Rate a Useful Concept?", paper presented to the 31st Conference of the Australian Agricultural Economics Society, University of Adelaide.

NOTES

* The author is indebted to Brian Parmenter and Alan Powell for comments.

1. Note that it could be argued that even some of these domestic policies are not really exogenous if they are reacting to external economic conditions such as a decline in the terms of trade. However, we will not pursue this point here.

2. Other studies to use the ORANI model to study the effects of a change in the real exchange rate include, Dixon, Parmenter and Powell (1982), Lim and Parmenter (1985), Higgs (1986), and Fallon and Thompson (1987).

3. Full documentation of the ORANI simulations is given in Higgs (1986).

4. Ideally we would use an index such as the factor-cost GDP deflator. However such an index is not computed by the ORANI model in 'stand-alone' mode. Therefore we have attempted to approximate it here with the CPI projection.

5. For an analysis of the imposition of a new consumption tax under alternative assumptions with respect to the distribution of the offsetting tax cuts given to labour and capital income see, for example, Higgs (1986).

6. Many alternative closures are possible. For example, the closure could have been one where the Government gave tax cuts until the Public Sector Borrowing Requirement (which actually fell slightly) was restored.

7. Note that for this simulation it is obviously not appropriate to use the CPI projection as an approximate index of prices received by producers. A more appropriate index is the factor-cost GDP deflator (which is computed by the NAGA module), and a 1.67 per cent consumption tax is projected to cause a 0.69 per cent fall in this deflator.

8. Note that the size of the real wage cut differs slightly between the experiments for two principal reasons. The first is simply that for the real wage cut experiment the CPI was used as a deflator, whereas for the tax-mix experiment the factor-cost GDP deflator was used. The second is that the real wage cut experiment was computed using the ORANI model in 'stand-alone' mode, while the tax-mix experiment was computed using the ORANI model in conjunction with the NAGA module. In other words, the experiments were computed using two different models, with slightly different percentages of costs indexed to the CPI, etc.

How Domestic Economic Conditions Influence the Real Exchange Rate

by

Peter J. Higgs

1. INTRODUCTION

Many recently and currently debated domestic economic policies have an influence on the real exchange rate. For example, the size of the Federal budget deficit, and the method of its financing, have implications for the real exchange rate. Protection policy also affects the real exchange rate, as do real wages: real wage restraint is often put forward as a policy for improving domestic competitiveness. Finally, even the changes in the mix of direct and indirect taxes, which were debated prior to the last Federal election, can have significant effects on the real exchange rate. In this paper we will use the ORANI model (developed by Dixon, Parmenter, Sutton and Vincent (1982)) to estimate the extent to which the real exchange rate, and other (perhaps more interesting) endogenous variables (such as the balance of trade and aggregate employment) are influenced by domestic economic policies.[1,2]

2. THE REAL EXCHANGE RATE

Many indices have been used to measure changes in the real exchange rate; see, for example, Nguyen and Martin (1987). Here the percentage change in the real exchange rate, ϕR, measured against the U.S. dollar, for example, is defined:

$$\phi_R = \phi_{A/US} + \psi_{US} - \psi_A \quad ; \quad (1)$$

where $\phi_{A/US}$ is the percentage change in the nominal exchange rate ($A/$US); and ψ_{US} and ψ_A are the percentage changes in price indices in the U.S. and Australia, respectively. To provide some intuition on equation (1) let us assume that we are interested in exporting a given physical volume of Australian goods to the U.S. and that initially $1A is worth $0.70US (i.e., the nominal exchange rate = $1A/$0.70US = 1.43). Now suppose that there is a 5 per cent nominal depreciation of the exchange rate ($\phi_{A/US}$ = 5.0) such that $1A is worth $0.67US ($0.70US × 0.95 = $0.67US). If there are no changes in domestic or foreign price indices (i.e., $\psi_{US} = \psi_A = 0$), then according to equation (1) the real exchange rate also depreciates by 5 per cent (i.e., ϕ_R = 5.0). In other words, our exports are 5 per cent more competitive. Note that a depreciation in the real exchange rate is shown in equation (1) as a positive change in ϕ_R. Now consider the case of a 5 per cent rise in the U.S. price index (ψ_{US} = 5.0) with the nominal exchange rate and the domestic price index held constant ($\phi_{A/US} = \psi_A = 0$). This is also equivalent to a 5 per cent depreciation in the real exchange rate because in terms of $US our exports are again 5 per cent more competitive. On the other hand, a 5 per cent rise in the domestic price index (ψ_A = 5.0) with the nominal exchange rate and the foreign price index held constant ($\phi_{A/US} = \psi_{US} = 0$) causes a 5 per cent appreciation of the real exchange rate (i.e., ϕ_R = -5.0). This is because a given physical volume of Australian goods is now worth 5 per cent more in Australian dollars before conversion at the fixed nominal exchange rate, into U.S. dollars of fixed U.S. purchasing power. That is, in terms of $US our exports are 5 per cent less competitive.

as an index of competitiveness, the CPI is not the appropriate deflator.

A given depreciation of the real exchange rate can be achieved in a number of ways, each of which can have different macroeconomic and sectoral effects. For example cuts in real absorption and in real wages both generate a depreciation of the real exchange rate; a cut in real absorption, however, causes a fall in aggregate employment, whereas a cut in the real wage rate has the opposite effect. An across-the-board tariff cut also generates a depreciation of the real exchange rate. However, such a cut causes a contraction in the manufacturing sector, whereas a cut in real absorption or in real wage rates causes an expansion. Therefore if a reduction in the real exchange rate is required to improve Australia's competitiveness, then this should be achieved in a balanced way with due consideration of the employment and sectoral consequences.

Finally, as has been argued by Dixon and Johnson (1986), the real exchange rate is essentially an endogenous variable and therefore it is not legitimate to think of independent movements in the real exchange rate as determinants of trade performance. If we are really concerned with, say, the balance of trade or aggregate employment, then we should concentrate on the effects of domestic economic policies on these variables directly, rather than on the real exchange rate; see, for example, Higgs and Stoeckel (1987).

approximately 0.31 per cent. Thus the projections for the imposition of a consumption tax of 1.67 per cent accompanied by compensating cuts in labour income taxes are very similar as those for the cut of 0.37 per cent in the real wage rate as a cost to employers.[8] The exceptions to this are the projected values of the CPI and of the real exchange rate when defined relative to the CPI.

Two final points can be made concerning a change in the tax mix. The first is that the results are very sensitive to the response of the labour movement. For example, if organized labour requires that pre-tax, as opposed to post-tax, wage rates are fully indexed to the CPI, then the 1.67 per cent consumption tax specified above would cause a 4.35 per cent appreciation of the real exchange rate (calculated using either deflator), with disastrous consequences for the balance of trade. The second point is that, as simulated here, the imposition of the tax does not increase production costs; in fact they fall slightly. Hence the inflationary impact of the package is a once-off jump in consumer prices without further price increases.

5. CONCLUSION

In this paper we have shown how domestic policies can influence the real exchange rate. Not surprisingly the domestic policies can have different effects on the real exchange rate depending on how it is defined. The most striking example of this was for the case of the imposition of a 1.67 per cent consumption tax which caused the real exchange to either depreciate by one per cent or appreciate by 1.06 per cent depending on whether the nominal wage rate or the CPI was used as a deflator. Thus if the real exchange rate is to be thought of

Two types of price indices are considered in this paper. The first is the nominal wage rate, which reflects production costs. This is the more appropriate index if we are interested in competitiveness. Using the percentage changes in the domestic and foreign nominal wage rates, w_A and w_{US}, respectively, equation (1) can be written:

$$\phi_R = \phi_{A/US} + w_{US} - w_A \quad . \qquad (2)$$

The second is the consumer price index (hereafter CPI, denoted algebraically by ξ), which reflects consumption costs. While such indices are commonly used in discussions of purchasing power parity, they usually are less appropriate if we are concerned with competitiveness. The CPI is included here for comparative purposes. Using the percentage changes in the domestic and foreign consumer price indices, ξ_A and ξ_{US}, respectively, equation (1) can similarly be written:

$$\phi_R = \phi_{A/US} + \xi_{US} - \xi_A \quad . \qquad (3)$$

It will be shown how domestic economic policies can have quite different effects on these two definitions of the real exchange rate.

3. THE ASSUMED ECONOMIC ENVIRONMENT

The key features of the economic environment assumed for the ORANI simulations are as follows.[3] The ORANI model does not distinguish between changes in the relative prices of traded and non-traded goods brought about on the one hand by a change in the nominal exchange rate or on the other hand by a change in the domestic price level. Here it

is assumed that induced changes in the real exchange rate appear as changes in domestic relative to foreign price indices and not as changes in the nominal exchange rate. In all simulations the change in the nominal exchange rate was fixed exogenously at zero (i.e., $\phi_{A/US} = 0$). It is also assumed that the domestic economic policies under consideration have a negligible effect on foreign price indices (i.e., $w_{US} = \xi_{US} = 0$). Thus in the ORANI simulations, adjustments in the real exchange rate are reflected as adjustments in the relevant domestic price index. In other words, equations (2) and (3) reduce to the percentage change in the real exchange rate being equal to the negative of the percentage change in the nominal Australian wage rate and the negative of the percentage change in the Australian consumer price index, respectively. There are assumed to be no shortages of labour at the going real wage rates. Thus employment levels are demand determined. It is assumed that induced changes in national income appear as changes in the balance of trade and not as changes in real aggregate absorption (i.e., the real value of consumption plus investment plus government spending) which is set exogenously. Finally, plant and equipment in use in every industry do not change (from the levels they otherwise would have reached) due to the shock under analysis (i.e., industry capital stocks in use are exogenous). Note that the short-run time period simulated allows for revisions in all industries' investment plans, for orders for capital goods to be placed and met, and for the new plant and equipment to be installed (but not yet switched on). The length of the short run in ORANI has been estimated by Cooper (1983) as 7.9 quarters. In policy work 'about two years' is the appropriate level of precision for describing the ORANI 'short run'.

be expected to meet with compliance by organized labour. The outcome is also going to depend on the distribution of the compensating tax cuts between labour and capital income. Here it is assumed that only the effective tax rate on labour income is cut.[5] Under the above conditions, the imposition of a consumption tax of 1.67 per cent would cause a one per cent depreciation in the real exchange rate (calculated using the nominal wage as a deflator).

A brief explanation of the above result is as follows. The government imposes a consumption tax of 1.67 per cent from which it collects revenue. When the tax is paid this causes a fall in real private absorption. The government then gives tax cuts on labour income to restore real private absorption to its original level.[6] Next we note that the consumption tax is inflationary; therefore, under the conditions set out above, the nominal rate of take-home pay must increase by the percentage change in the CPI. This leads us to the key empirical question to be answered: will the real wage rate as a cost to employers increase or fall as a result of the tax package? In other words, how will the increase in take-home pay be funded? If the tax rate on labour income had remained unchanged then clearly the pre-tax wage rate would have to have increased to maintain the purchasing power of take-home pay. However, it turns out that the cut in the effective tax rate on labour income (of 7.42 per cent) is sufficiently large to permit a fall in the pre-tax nominal wage rate of one per cent while maintaining the purchasing power of the take-home component of that wage rate. Furthermore, since the consumption tax is not levied on inputs to production, the fall in pre-tax nominal wage rates induces a fall in producers' prices. The end result is that real wage rates as a cost to employers (defined using an index of producers' prices[7]) fall by

rate falls the CPI falls by 0.63 per cent. Therefore the change in the real exchange rate calculated using the nominal wage as a deflator will differ from the change calculated using the CPI as a deflator. According the second of these indices, the real exchange rate depreciates by only 0.63 per cent if there is a 0.37 per cent cut in the real wage rate.

The real wage cut lowers domestic costs which improves the international competitiveness of the traded sectors. This leads to an increase in exports of 0.88 per cent and a decline in imports of 0.31 per cent. These results are reflected in the sectoral output projections with the export sectors Agriculture and Mining projected to increase by 0.58 per cent and 0.64 per cent respectively, and the import-competing Manufacturing sector to increase by 0.47 per cent. The cut in real wages is projected to increase aggregate employment by 0.32 per cent and real GDP by 0.22 per cent. Note that the expansion in the traded sectors flows on to the non-traded sectors of the economy as Services is projected to experience a 0.11 per cent increase in output.

The final domestic economic policy we will examine concerns a change in the tax mix in favour of indirect taxation. To trace the effects of such a change on the real exchange rate the ORANI National and Government Accounts module, NAGA, as developed by Meagher and Parmenter (1985) was used. A compensating tax cut is defined here to be a tax cut which when combined with the household consumption tax leaves real private absorption unchanged. The outcome of any tax package is going to depend crucially on the response of the labour movement. The case studied here, in which post-tax hourly wage rates (i.e., rates of take-home pay) are fully indexed to the CPI, is arguably one which could

4. RESULTS

The results of ORANI simulations of a cut in real absorption, an across-the-board tariff cut, a cut in the real wage rate, and a change in the tax mix in favour of indirect taxation, calibrated in each case to cause a one per cent depreciation in the real exchange rate (calculated using the nominal wage as a deflator), are given in Table 1. It can be seen from the table that to cause a one per cent depreciation in the real exchange rate (calculated using either the nominal wage or the CPI as deflators) real absorption would have to be cut by 0.43 per cent. A reduction in aggregate demand would cause contractions in the non-traded sector of the economy (the output of the Services sector is projected to decline by 0.26 per cent). However, it would also tend to reduce domestic costs (the CPI and the nominal wage rate, which are constrained to move together here by the assumption of fixed real wage rates, are projected to fall by one per cent) and thus improve the competitiveness of the traded sectors. Exports are projected to increase by 1.10 per cent. This result is reflected in the sectoral output projections with a 0.57 per cent increase in Agriculture and a 0.72 per cent increase in Mining. Aggregate imports are projected to decline by 0.85 per cent. This is due to the improved competitiveness of the import-competing Manufacturing sector whose output is projected to increase by 0.26 per cent. Finally, the cut in real absorption causes a fall in aggregate employment and real GDP.

A one per cent depreciation in the real exchange rate (again calculated using either deflator) can also be achieved by a 10.37 per cent across-the-board tariff cut. The direct impact of such a tariff

TABLE 1: THE IMPACTS OF A RANGE OF ECONOMIC POLICIES THAT CAUSE A ONE PER CENT DEPRECIATION IN THE REAL EXCHANGE RATE*

Variables	A Cut in Real Absorption[a] of 0.43 per cent	An Across-the-Board Tariff Cut[b] of 10.37 per cent	A Cut in the Real Wage Rate as a Cost to Employers of 0.37 per cent	The Imposition of a Consumption Tax of 1.67 per cent, Accompanied by Compensating Cuts in Income Taxes[c]
Real Exchange Rate:				
Nominal Wage Deflators[d]	1.00	1.00	1.00	1.00
Consumer Price Index Deflators[e]	1.00	1.00	0.63	-1.06
Nominal Wage Rate as a Cost to Employers	-1.00	-1.00	-1.00	-1.00
Consumer Price Index	-1.00	-1.00	-0.63	1.06
Aggregate Exports (foreign currency value)	1.10	1.12	0.88	0.89
Aggregate Imports (foreign currency value)	-0.85	0.66	-0.31	-0.32
Balance of Trade	0.55	0.14	0.33	0.33
Aggregate Employment[f]	-0.09	0.12	0.32	0.33
Real Gross Domestic Product[g]	-0.08	0.07	0.22	0.22
Sectoral Outputs[h]				
Agriculture	0.57	0.60	0.58	0.59
Mining	0.72	0.74	0.64	0.62
Manufacturing	0.26	-0.12	0.47	0.48
Services	-0.26	0.05	0.11	0.11

* All projections, with the exception of the balance of trade, are percentage deviations from the value the variable in question would have taken in about two years time in the absence of the shock at the head of the column. The balance of trade, while also a deviation from control, has the units billions of 1985-86 Australian dollars ($1 billion = $1000 million).

a Absorption is defined as the sum of household consumption, investment and government spending.

b Note that quantitative restrictions have been expressed in terms of tariff equivalents.

c It is assumed that post-tax wage rates are maintained in real terms and that the direct tax cuts in effective tax rates on labour are calculated to hold constant real private disposable income.

d See equation (2).

e See equation (3).

f Aggregate employment is calculated using persons weights. The seasonally adjusted number of persons employed in June 1985 was 6,637,900: Australian Bureau of Statistics (1985). Therefore a fall of, say, 0.09 per cent is equivalent to a reduction in employment of 5,974 persons.

g Real GDP has been calculated as a weighted sum of industry output responses using value-added weights.

h In terms of the industries distinguished in the ORANI model the Agricultural sector consists of industries 1 to 11, the Mining sector consists of industries 12 to 17, the Manufacturing sector consists of industries 18 to 83, and the Services sector consists of industries 84 to 112. A mapping between the ORANI industries and the industrial classification as used in the ABS 1977-78 input-output table is contained in Higgs (1986).

cut is to cause a fall in purchasers' prices due to the now cheaper imported goods. In view of the assumption of fixed real wages, a fall in (or a moderation in the rate of increase of) domestic prices would lead to lower money wage rates. These would feed into domestic prices which in turn would generate lower wage demands, etc. The ORANI model captures these general equilibrium effects and a 10.37 per cent across-the-board tariff cut is projected to cause the CPI to be one per cent lower after about two years relative to what it would have been in the absence of the tariff cut. As domestic costs fall, the international competitiveness of the traded sectors improves. Exports are projected to increase by 1.12 per cent. This result is reflected in the projections for Australia's export sectors. Agriculture is projected to increase its output by 0.60 per cent and Mining by 0.74 per cent. Imports are projected to increase by 0.66 per cent and the import-competing Manufacturing sector is projected to decline in output by 0.12 per cent (as expected, given that its level of protection from imports has been reduced). There is a small increase in both aggregate employment and real GDP due to the tariff cut.

The next domestic economic policy to be examined is a cut in the real wage rate. We need to distinguish between real wages as a cost to employers of labour, and real wages as take-home pay. The real wage as a cost to employers includes the gross wage, payroll taxes and other costs of employing labour deflated by an index of the general level of prices. For this simulation, the CPI will serve as a deflator.[4] It can be seen from the table that a 0.37 per cent cut in the real wage as a cost to employers will cause a one per cent depreciation in the real exchange rate (calculated using the nominal wage as a deflator). Note that due to multiplier effects, for each one per cent the nominal wage