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ABSTRACT

The present paper presents a short-run theoretical macroeconomic model of the type suggested in Sachs (1996), attempting to differentiate economic development in East Asia with Latin America. Latin America, when compared to East Asia is said to exhibit a pattern of growth associated with relative natural-resource abundance. The economy in the model that follows is comprised of 3 sectors, two of which involve traded goods and one non-traded commodity. A monetary sector is also incorporated. The first traded good is the natural resource based sector whose output is entirely exogenous and purely for export. The other traded commodity is a manufactured good, consumed at home and exported abroad. In the Latin American case devaluation might be contractionary, and a resource boom could lead to the rise of the non-traded sector at the expense of the traded good. The effect of an expansion in the money supply induced by capital inflows is to expand the economy. When the model is tuned to the East Asian case, resource booms might even expand the traded sector, and devaluation may be expansionary. This suggests two major policy implications. First, a policy-induced devaluation, or policies to prevent exchange rate appreciation should accompany a resource boom. Secondly, policies of taxing non-traded goods aimed at fostering traded goods production may also be considered under some circumstances.

I BACKGROUND AND MOTIVATION

The present paper presents a short-run *theoretical* macroeconomic model of a small open economy endowed with a natural resource exporting sector. It follows the sectoral delineation between traded and non-traded goods outlined in Sachs (1996). That paper attempts to differentiate between the economic development experience of East Asia and Latin America. The salient features of Sachs' dichotomy are: (a) East Asian economies rely more heavily on manufactured exports[1], whereas Latin America has a relatively greater share of natural resource intensive exports; and, (b) the non-traded sector exhibits a greater price in Latin America. According to Sachs (1996), Latin America, when compared to East Asia, displays a pattern of growth associated with natural-resource abundance. This in turn implies that its long-run growth rates will be less impressive than in East Asia.

By way of general motivation, let us start from the premise that a country with a greater endowment of natural resources relative to the rest of the world may be momentarily blessed, but will eventually be subjected to a 'winners curse'. In other words, its economic performance, in the long run, will be worse than that of countries that have a relatively poor resource endowment. Also countries placing a heavier reliance on natural resource based goods in their production structure will experience greater cyclical fluctuations in their trend national income, compared to nations that have a more diversified production base. The question that immediately springs to mind is what actually constitutes relative resource abundance? Is it the endowment of more productive agricultural land per-capita; the ownership of valuable minerals such as gold; significant reserves of a precious commodity such as oil; or even the ability to exact tribute and transfers from other countries? All of these, and other, notions of relative resource abundance have been relevant at different points in historical time.[2]

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[1] There are exceptions in both regions; for example, Malaysia and Indonesia are major exporters of primary commodities.

[2] There is a problem of measuring what constitutes a relatively resource abundant economy for the purposes of empirical work. One way of defining it is the share of primary exports in GDP, as in Sachs and Warner (1999a). Curiously, this makes Somalia a resource-abundant economy! Perhaps, the term 'staple trap' is more appropriate in a case like Somalia's. Other measures of resource abundance include cropland per-capita.

To reiterate, the model that follows is a short-run theoretical macroeconomic model involving three sectors: a resource based commodity, a non-traded good and a traded sector. The model in my paper *explicitly* analyses short-run effects of resource booms, devaluation, a rise in the money supply induced by capital inflows and taxation to discourage non-traded goods consumption. Most of these are mentioned in Sachs (1996), although a complete formal model is absent from that paper. Within a single basic framework, typologies are developed in my paper, distinguishing between what could be the East Asian and Latin American experience ex-post. It is worthwhile emphasizing, at the outset, what the model does not incorporate. First, the model is not a growth model involving the accumulation of physical, human, institutional and social capital. The short-run comparative statics contained in the paper has implications, however, for long-run growth and development. Secondly, it is not a model involving strategic interaction between interested parties to a resource boom. Game-theoretic political economy is not contained in the paper; although policy is analysed, both explicitly and implicitly.

The rest of the paper is organized as follows. Section II is a selective review of literature relevant to the construction of macroeconomic models involving resource booms. Section III contains a sketch of the model; section IV describes the equilibrium in the model; and, section V presents variations in the model's parameters. Finally, section VI includes a summary as well as some policy implications.

II LITERATURE REVIEW

The debate over the superiority of manufacturing compared to agriculture and other natural resource based economic activities has gone on since the dawn of the history of economic thought. The consensus appears to be that manufacturing is more dynamic and growth promoting when compared to agriculture. Casting our minds back to the early days of 'development' economics, the combination of three reasons led to the belief that manufacturing should be encouraged at the expense of agriculture as part of a sound development strategy. First, the notion of surplus labour in agriculture (Lewis, 1954) suggested that a costless shift of labour from agriculture to manufacturing could be engineered. Secondly, the work of Hirschman (1958) pointed out that manufactures generated beneficial

forward and backward linkages and therefore that sector should be encouraged. Finally, and most influentially, Prebisch (1950) and Singer (1950), pointed to a secular tendency for primary goods prices to decline vis-à-vis manufactures, thus relying on primary goods exports was like backing the wrong horse. A dissenting voice to this general trend was to be found in Myint (1958), who asserted that agricultural exports provided the necessary spur for growth via a 'vent for surplus'.

Present-day theorists emphasizing the growth retarding effects of relative natural resource abundance are, however, passionately opposed to the activist industrial policy and protectionism that followed from the suggestions of the earlier school advocating manufacturing led development. Their reasoning follows a different course. One such strand is associated with the effects of resource booms: the 'Dutch Disease' literature, see Neary and Wijnbergen (1986) for example. The problem is not associated with a steady reliance on agriculture or resource based exports, but a sudden windfall gain. This may be due to a sudden, but temporary, increase in the price of oil and other primary commodities, as in the 1970s, only to be reversed in the 1980s. Alternatively it can also be associated with natural resource discoveries, increases in worker remittances or other unrequited international transfers.[3] Irrespective of the cause, a resource boom crowds out the leading sector of the economy. In an open economy a massive current account surplus appears, leading to currency appreciation under a regime of flexible exchange rates.[4] This renders existing (non-resource boom) exports even more uncompetitive in world markets. A shift in domestic output from tradables to non-tradables takes place.

Why should this be a problem over time? As the model in Krugman (1987) illustrates, if there are learning by doing effects, a country which ceases to export manufactures can irreversibly lose competitiveness, even when the exchange rate gets back to normal after the boom has subsided. Thus, *temporary* resource booms cause *hysteresis*, a permanent loss of competitiveness. For developing countries, this means that their future potential for exporting manufactured goods and diversifying the production base is stunted. If there are positive externalities from human-capital

[3] The analysis of Dutch Disease is very similar to the debate over the 'transfer' problem during the inter-war years.

[4] For the general analysis of Dutch Disease within a composite macroeconomic good framework, under flexible exchange rates, perfect international capital mobility and rational expectations in foreign exchange markets, see Murshed (1997b), chapter 6.

accumulation in manufacturing only, as in Matsuyama (1992), and resource booms retard the development of the more dynamic manufacturing sector, the growth path of the economy under free trade is lower than that of relatively resource poor countries.[5]

A related, but different literature concerns the so-called 'staple trap'. See Auty (1998) on this. A staple trap implies reliance on a narrow range of 'staples' in national income and for export, or more simply an undiversified production base. The origins of the staple trap lie in a high natural resource endowment, including cropland. This high endowment, in the case of many countries, may be a feature of past history but no longer present. Thus, it is perfectly possible to have countries caught in a staple trap, who appear very poor today, but at one time were relatively well endowed with land or mineral resources. Since these staples are primary commodities, their prices are subject to considerable fluctuations and along with it the economic fortunes of the nations concerned. A staple trap also promotes policy errors.

A second strand of the modern literature on the 'winners curse' emphasizes the political economy aspects of corruption and inefficiency that follows a resource boom, see Auty (1997), as well as Sachs and Warner (1999a) on this. Revenues from a resource boom lead to wasteful rent seeking behaviour and directly unproductive activities in the bid to appropriate the proceeds of the boom. This inhibits good governance and the successful accumulation of institutional capacities. Another dangerous development could be ham-fisted attempts to reverse Dutch Disease, via the pursuit of counter-productive and flawed industrial policies under a protective umbrella. These and other aspects of policy error in resource abundant economies are succinctly reviewed in Auty (1998). When it comes to the accumulation of social and institutional capital, resource abundance could pose a problem (Auty, 1998).

Woolcock et al. (1999) refer to two different types of natural resource based economies. The first type is labelled 'point-sourced'. In point-source natural resource based economies, the rents from these activities are appropriated by the few, and the spin-offs are limited in terms of social and institutional capital formation. Examples of point-source type resource based economies would be some mineral dependent Latin American economies. Clearly these types of economies are not only inegalitarian, but

[5] Matsuyama's (1992) model's policy implication is somewhat different. It states that trade liberalization would be an erroneous policy, as it would lead to greater specialization in natural resource exports.

also perform poorly in the long run. The second type is named 'diffuse'. It is the converse of point source, and here benefits of any resource bounty are more evenly dispersed. These economies grow faster in the longer-run and utilize resource booms more efficiently. Examples, in this latter category would be more egalitarian agrarian communities, as in South East Asia.[6] Woolcock et al. (1999) present some evidence indicating greater fluctuations in growth rates of point source economies, particularly since 1980.

Finally, there is the literature of a more recent vintage, on *theoretical* multi-sectoral macroeconomic models dealing with resource-abundance.[7] In the paper by Sachs and Warner (1999a) a role for human capital is incorporated into a model with a non-traded sector, a traded good and a purely exportable natural resource sector. Human capital accumulation, in the form of an externality, takes place as a result of traded/manufacturing production only. Moreover, both papers by Sachs and Warner (1999a and 1999b) ignore monetary factors and the role of the nominal exchange rate in their model. These factors play a crucial role in the Dutch Disease process. Be that as it may, resource booms, in the Sachs and Warner (1999a) model retard the growth of the economy via the crowding out of production in the traded (manufactures) sector. The stock of human capital is diminished as employment in tradables declines; this in turn hampers future production of all goods, and hence the growth of the economy. Growth is, however, studied within the limited framework of a two period model in Sachs and Warner (1999a). A shortcoming of the Sachs and Warner (1999a) model is the *ad hoc* manner in which human capital is treated as a pure externality emerging from manufacturing employment. One of the earliest treatments of human capital accumulation is contained in Shell (1966). In that model, knowledge is a public good, the accumulation of which benefits all sectors in the economy through cost savings. Acquiring knowledge is not a costless process as in Sachs and Warner (1999a), but being a public good, is entirely financed by the state via taxation of the productive sector in Shell (1966). Furthermore, there does not seem to be compelling empirical evidence suggesting that human capital accumulation arises solely out of the activities of the traded-manufacturing segment of the economy.

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[6] It could be argued that in North East Asia a similar pattern of egalitarianism was associated with the absence of any significant natural resource endowment.

[7] Note that the more contemporary literature speaks more about resource abundance and/or the reliance on natural resource exports (staple trap). The expression 'Dutch Disease' is less frequently encountered. Perhaps, this reflects the fact that booms in commodity prices have not occurred since the late 1970s.

The different paradigm in Sachs and Warner (1999b) permits increasing returns to scale in either of the two sectors of the economy (traded or non-traded), but not both. Increasing returns characterize the production of a range of intermediate inputs that could be employed in final production.[8] This feature is similar to Krugman (1979), as well as Grossman and Helpman (1991), where in a setting of monopolistic competition, varieties of new products are either innovated or imitated from abroad. Capital is omitted as a factor of production, output relies on labour and the range of domestically produced intermediate inputs mentioned. The model then addresses whether resource booms can contribute towards 'big-push' type industrialization. A resource boom, it is asserted, unambiguously expands the non-tradable sector, while at the same time shrinking the traded sector.[9] If it is the expanding (non-traded) sector that uses these intermediate inputs, it may contribute to a successful big push. If the opposite is the case, and it is the traded sector which uses the intermediate inputs, big-pushes are less likely. One of the strengths of the Sachs and Warner (1999b) is that expectations regarding future potential profitability are incorporated. Unless expectations about the future are optimistic, even the most propitious circumstances may not trigger-off accelerated industrialization or the big-push. Implicitly, these expectations are related to the political system, social and institutional capital as discussed at some length in Auty (1998) and Woolcock et al. (1999).

Rodriguez and Sachs (1999) present a Ramsey growth model where an economy undergoing a resource boom, which eventually peters out, enjoys higher consumption temporarily. The key assumption driving this result is that the country does not accumulate assets abroad leading to a net creditor position in the international economy. If it did, it could permanently raise its consumption, based on asset income from abroad. The absence of a net creditor position in international financial markets may be a feature of several Latin American resource-rich countries such as Venezuela discussed in Rodriguez and Sachs (1999), but it is not true of others, such as the Gulf States.

[8] It is asserted that the increasing returns to scale emanate from entrepreneurial abilities.

[9] As will seen from the model below this is not always necessarily the case, and conditions for it are developed in my model.

III SKETCH OF THE MODEL

The economy is comprised of 3 sectors on the real side, two of which are traded goods and one a non-traded commodity. A monetary sector is also incorporated. The first traded good is denoted by R, for the natural resource based sector whose output is entirely exogenous and purely for export, R represents the value of exports from this sector in domestic currency units. The value of output in the resource-based sector is treated exogenously, following Sachs (1996), Sachs and Warner (1999a) and other treatments of 'Dutch Disease' models, as in Neary and Wijnbergen (1986). R could also include foreign aid and other forms of unrequited transfers such as worker remittances from abroad. This view of the R sector, however, makes it less appropriate for modelling or analysing agriculture, as output is exogenously given, and no supply factors such as land are taken into account.

M indexes the other traded sector, which is both consumed domestically and exported. It is basically a labour-intensive manufactured good. In addition, there are consumption imports, C_F which compete with M in domestic consumption. M is produced utilizing labour only, following Sachs (1996), in order to capture the part played by labour intensive manufactured goods for export and domestic consumption. The price of M, P_T, is normalized at unity, and is in any case given in a small open economy. Following Sachs (1996) the supply of M is described by:

$$M = \theta L_M \qquad (1)$$

L_M represents labour employed in the M sector and θ stands for the marginal value product of labour in that sector.

The non-traded goods sector is represented by N, the production of which requires capital, labour and an imported intermediate input (T). It therefore needs some foreign technological input, and is the capital-intensive sector by definition. In a sense the output of the N sector is more 'sophisticated' than in the other sectors, but perhaps that is precisely why it is non-traded. Note that the manufacturing could lie within both the M and N sectors, and the 'real-life' counterpart of the non-traded sector is not restricted to public and private services only. In summary, the output of the N sector could include government services, private services, as well as some shielded but sophisticated manufacturing.

For the sake of analytical convenience, fixed proportions characterize the use of the intermediate input from abroad in the N sector. See Findlay and Rodriguez (1977) for a discussion of production functions where an imported input enters in a 'Leontief' fashion. The output of the N sector, in general reduced form, can be represented as:

$$P_N N = P_N N(P_N, E) \tag{2}$$

P_N represents the price of non-tradable. The supply of N increases with P_N but declines as the nominal exchange rate depreciates (E increases) as this makes the intermediate input more expensive. As far as the domestic value added of the N sector is concerned, this is obtained by subtracting the value of the intermediate input:

$$(P_N - \lambda)N(P_N, E) = P^D{}_N N \tag{3}$$

where $\lambda = ET$, as $P_T = 1$, $P^D{}_N$ measures domestic value added in the N sector.

Turning to consumption or the demand side, in the manufactured traded goods sector, this is composed of domestic demand (C_M) and foreign or export demand (X_M):

$$C_M(P_N, Y, E) + X_M(E) = M \tag{4}$$

Domestic demand for the output of the M sector depends positively on the price of the non-traded good, P_N as well as income, Y. It is also positively related to the exchange rate, a rise in E represents *devaluation*, an increase in the cost of obtaining imported substitutes. Export demand is positively related to the nominal exchange rate. Equation (4) represents equilibrium in the M sector. Equation (4) can be interpreted as demand, on the left-hand side equalling supply on the right-hand side.

In the non-traded goods sector, equilibrium supply equals demand is represented by:

$$C_N(P_N, Y) + I_N(r) = (P_N - \lambda)N(P_N, E) \tag{5}$$

Domestic consumption of non-tradables is negatively related to its own price and positively linked to income. I_N stands for investment, that is the

savings leading to capital formation in that sector, negatively related to the interest rate (r).

Equations (4) and (5) can be viewed as the balance or equilibrium relations for the traded (non-natural resource) and non-traded goods sector respectively in the sense of supply equals demand. We need to specify the concept of national income, Y or GDP. This consists of domestic value-added in all three productive sectors, N, M and R, less imports. Thus:

$$Y = (P_N - \lambda)N(P_N, E) + M + R - EC_F(E, Y) \quad (6)$$

Note that there are two imports, λ, the imported input, and C_F, consumption imports. They have been subtracted from the value of domestic product, as they do not augment domestic value-added. Consumption imports are positively related to its relative price described by the exchange rate, as well as income. Also the value of output in the resource-based sector enters as a constituent part of income in addition to the domestic value added of the M and N sectors.

It is useful at this stage to define an overall price index (P), representing the aggregate cost of consumption of all three goods: imported consumption goods (priced by E), non-traded goods and domestic non-resource based traded goods prices. This price index is a cost of living or consumer price index. It represents the cost of purchasing a basket of goods comprising imported consumer goods, non-tradables and traded goods. The prices of these three goods are represented by E, P_N and P_T respectively.[10] Note that resource exports and the imported intermediate goods prices are excluded, as these are not consumed. The consumer price index is of use in measuring the real consumption wage and arriving at an appropriate definition of real money balances. The consumer price index takes the form:

$$P = E^{\beta} P_N^{\alpha} P_T^{(1-\alpha-\beta)}$$

This collapses to:

$$P = E^{\beta} P_N^{\alpha} \quad (7)$$

as $P_T = 1$.

[10] The exponents in P (β, α and 1- α – β) represent the weights or shares of the three goods in the representative consumers consumption basket. They sum to unity.

I now turn to specifying a monetary sector for this economy that takes the following form:

$$H(Y, r) = H/P \quad (8)$$

Equation (8) is exactly the same as the LM function for the economy. It represents equilibrium on the monetary side of the economy. Money demand, on the left-hand side of (8), is negatively related to interest rates and positively linked to Y. The latter also incorporates the wealth effect of resource booms, a rise in the value of R will not only impact on goods demand, but also raise asset (money) demand. H denotes the value of nominal balances. When it is deflated by the consumer price index, P we obtain the value of real balances. Note also that changes in the exchange rate will impact on real balances, for example nominal exchange rate depreciation or devaluation (rise in E) lowers real money supply.

Finally we come to the balance of trade:

$$R + X_M(E) - EC_F(E, Y) - ETN(.) = F \quad (9)$$

The left-hand side represents the trade balance or exports minus imports. There are two exports: the natural resource based export as well as the manufactured traded sector's exports. The two imports are consumption and intermediate inputs respectively. F stands for the trade balance, which is positive if there is a trade surplus, negative if there is a deficit. I postulate a fixed exchange rate regime. This corresponds to the stylized facts for the vast majority of developing countries. Under a system of fixed exchange rates the balance of payments is a residual in the short-run, improvements in the trade balance causes an increase in the stock of foreign exchange reserves, F and vice versa. Flexible exchange rates can, however, be easily incorporated. This will add an extra endogenous variable, E, into the system. E will rise (depreciate) with balance of payments deficits and vice-versa. For the sake of tractability, I have omitted capital or financial flows from equation (9); this makes the trade balance equivalent to the balance of payments. The impact of financial inflows is, however, studied below via an equivalent increase in the money supply. I also assume that the economy has no inherited debt from the past. This may be unrealistic for Latin American economies in particular; I wish to focus on other issues, and keep the analytical workings tractable for those purposes.

Following Sachs (1996), it is worthwhile enumerating some of the differences between East Asian and Latin American stylized examples. It ought to be emphasized at this juncture that the distinction between point-sourced and diffuse natural resource based economies, as mentioned in Woolcock et al. (1999) is very similar to the Latin American and East Asian characterization contained in Sachs (1996).[11] To move on, in Latin America there is a greater tendency to rely on exports of the resource sector. In the East Asian case the more important exportable is labour-intensive manufactures (M).[12] Sachs (1996) also asserts that non-traded and imported consumption goods figure more largely in the Latin American consumption basket, relative to East Asia. Sachs (1996) alleges that in the typical East Asian economy it is M that is the labour intensive sector, whereas it is N in Latin America. Comparing the growth experience of the two regions over the past three decades, Sachs (1996) says that there is a tendency for real wages to rise in East Asia, but the converse takes place in Latin America.[13] He also observes that in the longer run debt servicing in East Asia is accompanied by rising real wages, as it is financed by increased exports of goods that are intensive in labour. In Latin America real wages fall in order to service debt servicing as the M sector is less labour intensive.

Since the model that follows is not a growth model, I cannot meaningfully incorporate human capital. If the accumulation of human capital, however, takes place only as a result of increased employment in the M sector (Sachs and Warner, 1999a), we can trivially conclude that an increase in the equilibrium output of M increases the stock of knowledge. Alternatively, knowledge could be a public good financed by general taxation. We could, also introduce both types of knowledge (public and private). In order to focus on other matters, and avoid excessive complication, I leave this out of the present model. The reader is, however, referred to Murshed (1997a) on this particular modelling technique.

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[11] Woolcock et al. are concerned with natural resource endowment. It has to be remembered that many North East Asian economies, such as Taiwan never had much in terms of natural resources. The position is different in South East Asia, where several countries have natural resources that are 'diffused'. This means we have two East Asian types of economy, diffused natural resource rich and resource poor economies, both of which are egalitarian.

[12] In East Asia, over time, technologically and human capital intensive manufactured exports take over from unskilled labour intensive manufactured goods exports.

[13] The real consumption wage is the money wage, W divided by the cost of living index, P. From (7) it is thus, $W/(E^{\beta} P_N^{\alpha})$.

IV EQUILIBRIUM

Following Sachs (1996) it is postulated that in the non-traded goods sector, N, excess demand causes its relative price P_N to be bid up. The rise in P_N will restore equilibrium in that sector. In the non-resource based traded goods sector, M excess demand causes output to rise, but one could make its relative price increase as well. In the monetary sector excess demand for money leads to a rise in interest rates, which restores equilibrium. I assume that excess capacity exists in the short run. Both the productive sectors are like fix-price sectors, in the sense of Taylor (1983). This postulate can be later relaxed by the imposition of capacity constraints or full employment. The assumption of excess capacity in the short run is compatible with a state where factors of production are paid their marginal product. Nor does it preclude increases in money wages when either one or more productive sectors expand.

The short-run equilibrium of the model can be described by writing equations (5), (4) and (8) in excess demand format, after substituting (6) into them. The idea is that excess demand in these three independent equilibrium relations leads to an increase in P_N, M and r respectively; corresponding to the non-traded goods sector, the traded (but not natural resource based) sector and the money market. Totally differentiating (5), (4) and (8) and writing them in matrix format will give us:

$$\begin{bmatrix} C_{N1} + C_{N2}\rho - N - P_N N_1 & C_{N2}(\mathbf{1} - C_{F2}) & I_{N1} \\ C_{M1} + C_{M2}\rho & -\mathbf{1} & \mathbf{0} \\ H_1\rho + \delta & H_1(\mathbf{1} - C_{F2}) & H_2 \end{bmatrix} \begin{bmatrix} dP_N \\ dM \\ dr \end{bmatrix}$$
$$= \begin{bmatrix} -C_{N2} & \mathbf{0} & -C_{N2}\Omega + (P_N - \lambda)N_2 - TN \\ -C_{M2} & \mathbf{0} & -C_{M2}\Omega - X_{M1} - C_{M3} \\ -H_1 & \mathbf{1}/(P_N{}^{\alpha}E^{\beta}) & -H_1\Omega + \beta H/(E^{1+\beta}P_N{}^{\alpha}) \end{bmatrix} \begin{bmatrix} dR \\ dH \\ dE \end{bmatrix} \quad (10)$$

Note that $\rho = (N + P_N N_1)(1 - C_{F2}) > 0.$ (11)

Also $\Omega = (P_N - \lambda)N_2 - TN - C_F - C_{F1} - C_{F2} \gtreqless 0$ (12)

The parameter Ω can be interpreted as the 'income' effect of an alteration in the exchange rate, in the sense it captures the effect of an alteration in E on Y in equation (6). Its sign is ambiguous (it could be either positive or negative). As will become apparent below, the sign and magnitude of Ω

will turn out to be crucial for the analysis of devaluation below. $\Omega < 0$ if $C_{F1} < 1$, which means that the demand for consumption imports is inelastic with respect to the exchange rate. $\Omega > 0$ only if $C_{F1} > 1$, and $C_{F1} < N_2$. In this case the demand for consumption imports is elastic, and the impact of a change in E has to be greater on consumption imports than on imports of intermediate inputs.

Furthermore, $\delta = \alpha H/ (E^{\beta} P_N^{1+\alpha}) > 0$ (13)

The signs of the various partial derivatives above are:

$\{C_{N1}, I_{N1}, H_2, C_{F1}, N_2\} < 0$; $\{C_{N2}, C_{F2}, C_{M1}, C_{M2}, C_{M3}, N_1, H_1, X_{M1}\} > 0$.

The determinant (J) of the Jacobian matrix is:

$$J = -H_2(C_{N1} + C_{N2}\rho - N - P_N N_1) + I_{N1}(H_1\rho + \delta) + \{(1 - C_{F2})(C_{M1} + C_{M2}\rho)\}\{H_1 I_{N1} - H_2 C_{N2}\} \quad (14)$$

The determinant is negative in sign as $(1 - C_{F2})(C_{M1} + C_{M2}) < 1$. This means that the model is stable, which is also helpful in the conduct of meaningful comparative statics analysis that follows (in accordance with Samuelson's correspondence principle).

V VARIATIONS IN PARAMETERS

This section is concerned with comparative statics analysis around the equilibrium described in the previous section.

A An increase in R

This may come about as a result of natural resource discoveries, an increase in the world price of mineral exports, or increased transfers from abroad. It will result in the following effects:

$$\frac{dP_N}{dR} = \frac{\{1 + C_{M2}(1 - C_{F2})\}\{C_{N2}H_2 + I_{N1}H_1\}}{J} \quad (15)$$

Note that $J < 0$. The above expression will be positive if $|H_2C_{N2}| > |I_{N1}H_1|$. This implies an expansion in non-tradables following a resource boom. In

this case the propensity to consume non-traded goods (C_{N2}) is high; a situation that might characterize Latin America. The real wage would increase in the stylized Latin American case. There is also the possibility that the non-traded goods sector contracts following the increase in R. In other words (15) is negative if $|I_{N1}H_1| > |H_2C_{N2}|$. Here the resource boom raises asset or money demand that pushes up domestic interest rates, r, which in turn dampens investment (capital accumulation) in the N sector. This possibility is not considered in Sachs and Warner (1999a and b), but is considered in the earlier 'Dutch Disease' models, for developed countries, see Neary and Wijnbergen (1984). The non-traded sector may even contract, but is associated with a large asset demand as mentioned above. If policy-makers want to counteract this tendency, they would pursue expansionary monetary policies in conjunction with the resource boom.

Turning to the effects of a rise in R on the M sector:

$$\frac{dM}{dR} = \frac{C_{N2}H_2C_{M1} - C_{M2}H_2\{C_{N1} - N - P_NN_1\} + \delta C_{M2}I_{N1} - I_{N1}H_1C_{M1}}{J} \tag{16}$$

This will be negative, implying a decline in the non-resource based traded sector, only if $|I_{N1}H_1| > |H_2C_{N2}|$. The reversal of this condition is sufficient for an expansion in the M sector. The M sector could also expand following an increase in R if $\delta C_{M2} > H_1\ C_{M1}$, which implies the marginal propensity to consume M is quite high. It is this instance which more closely resembles, without being the same, the East Asian case discussed in Sachs (1996).

When we examine the combined effect of the rise in R on both the N and M sectors four possibilities occur. First, both M and N could expand, and this will happen if $|H_2C_{N2}| > |I_{N1}H_1|$ in both (15) and (16) above. Looking at the implication of this condition we discover that it points to a high propensity to consume non-tradable goods, a low wealth effect of the resource boom on money demand and a low interest rate response to investment in non-traded goods. The second possibility is for the non-traded sector to expand while the traded sector, M contracts; the Latin American case. This requires $|I_{N1}H_1| > |H_2C_{N2}|$ in (15), however in (16) $|C_{M1}I_{N1}H_1| > |C_{N1}H_2C_{N2}|$. The latter is a necessary condition and implies that the price elasticity of non-traded goods demand (C_{N1}) is low or inelastic. In other words, the rise in P_N as that sector expands does not reduce demand by very much. This is, of course the classic Dutch Disease outcome. Thirdly, there is the stylized East Asian example. Here it is the M sector

that expands whereas the N sector contracts. In (15) $|I_{N1}H_1| > |H_2C_{N2}|$, and in (16) if $\delta C_{M2} > H_1\ C_{M1}$. The latter condition implies a high propensity to consume the domestically produced traded good, M. Interestingly, Sachs (1996) does not consider this last possibility. Finally, both the M and N sectors could contract. This is the most extreme form of Dutch Disease and associated with strong wealth effects impacting on money demand. See Neary and Wijnbergen (1984), on this. In that model a resource boom, albeit in a developed economy with a high demand for financial assets, brings about generalized unemployment. It also has affinities to 'growth collapses' following resource booms as mentioned in Auty (1998).

The results above with respect to a rise in R on the N and M sectors can be depicted in terms of a diagram, in M and P_N space. In figure 1 (see page 29) the NN and MM schedules represent equilibrium (supply equals demand) in the non-traded and traded goods markets respectively.[14] They are both positively sloped as an increase in either M or P_N raises income and thus the demand for the other good goes up. The initial equilibrium in both markets occurs at the intersection point A. An upward movement in NN represents an expansionary effect on output in the N sector, NN_0 moves to NN_1. It reflects the fact that more N is demanded for each level of M. In the M sector, a rightward movement signals expansion from MM_0 to MM_1. This indicates that a greater quantity of M is demanded for each level of N produced. If the resource boom produces an expansion in both sectors we arrive at point C in the new equilibrium following the rise in R. Contractionary effects on output are depicted by a leftward movements in the MM to MM_2, and downward movements in NN to NN_2. If both sectors contract point B indicates final equilibrium. The Latin American or Dutch Disease outcome is shown at point E, with the non-traded sector expanding but the traded sector contracting. The diametrically opposed East Asian case is depicted at point D in figure 1.

Turning to the impact on interest rates, this is unambiguously positive:

$$\frac{dr}{dR} = \frac{\{C_{N1} - N_1 - P_N N_1\}\{H_1 + C_{M2}(\mathbf{1} - C_{F2})H_1\} - C_{N2}\delta\{\mathbf{1} + (\mathbf{1} - C_{F2})C_{M2}\}}{J} > \mathbf{0} \qquad (17)$$

[14] The NN and MM schedules are obtained by totally differentiating (5) and (4) for dP_N and dM, setting dr and other differentials equal to zero. We then discover that the ratios of the differentials, $dP_N/dM > 0$, in both (5) and (4). Thus both MM and NN schedules, derived from (5) and (4) respectively, are positively sloped. But the slope of MM is greater as the ratio is greater in (4). This makes MM steeper than NN in figure 1.

Finally, we come to the impact on the trade balance (also the balance of payments) of the resource boom. This is obtained by totally differentiating the trade balance equation (9) with respect to R:

$$\frac{dF}{dR} = \mathbf{1} - EC_{F2}\frac{dY}{dR} - ETN_1\frac{dP_N}{dR} \tag{18}$$

The last two expressions on the right-hand side of (18) are negative in the 'Latin American' case, representing increased imports of intermediate inputs and consumption goods. If the impact of the rise in R on total income, Y is both positive and very large, and the propensity to import consumer goods (C_{F2}) is substantial, then there could be a substantial reversal of improvements in the balance of payments of the rise in R revenues, which are all export revenues. In the East Asian case, the last term could be positive, and the trade balance will improve as long as the propensity to import (C_{F2}) is not very high.

B A rise in H

A rise in H can emerge for a variety of reasons: increases in the money supply that are policy induced and/or short-term capital inflows that increase the money supply.

$$\frac{dP_N}{dH} = \frac{I_{N1}}{P_N{}^{\alpha}E^{\beta}J} > \mathbf{0} \tag{19}$$

where $J < 0$.

$$\frac{dM}{dH} = \frac{I_{N1}(C_{M1} + C_{M2}\rho)}{P_N{}^{\alpha}E^{\beta}J} > \mathbf{0} \tag{20}$$

$$\frac{dr}{dH} = \frac{-\{C_{N1} + C_{N2}\rho - N - P_N N_1\} - C_{N2}\{(\mathbf{1} - C_{F2})(C_{M1} + C_{M2}\rho)\}}{P_N{}^{\alpha}E^{\beta}J} < \mathbf{0} \tag{21}$$

Thus, an increase in H causes an expansion in both the N and M sectors. It is interesting, however, to note that the expansionary impact is greater in the non-traded goods sector, by comparing equation (19) with (20), a 'Latin American' type outcome. The reason is that the rise in H impacts on interest rates, the lower interest rates affect capital accumulation positively in the N sector. We do not have capital as a factor of production in the traded non-natural resource traded goods sector. Finally, the effect on the trade balance

is clearly negative, as can be seen by differentiating the trade balance equation (9) with respect to E:

$$\frac{dF}{dH} = -EC_{F2}\frac{dY}{dH} - ETN_1\frac{dP_N}{dH} \tag{22}$$

C A devaluation (rise in E)

Policy based exchange rate depreciation can be motivated by a variety of reasons, including balance of payments crises, the desire to improve international competitiveness and attempts to cope with debt servicing. It could also be part of a programme of structural adjustment or efforts to counteract 'Dutch Disease'.

Devaluation, which is an increase in E, will from (8) lower the value of real money balances, and hence put upward pressure on the interest rate r. Note that devaluation, at least upon impact, lowers the real wage as the price of imported consumption goods increases. It will also make the intermediate import more expensive in terms of domestic currency.

When we examine the impact of devaluation on the non-traded sector:

$$\frac{dP_N}{dE} = \frac{-H_2\{-C_{N2}\Omega + (P_N - \lambda)N_2 - TN\} + H_2C_{N2}(\mathbf{1} - C_{F2})H_2\{C_{M2}\Omega + X_{M1} + C_{M3}\}}{J}$$
$$\frac{-I_{N1}H_1\{C_{M2}\Omega + X_{M1} + C_{M3}\}\{(\mathbf{1} - C_{F2})\} - H_1\Omega I_{N1} + (I_{N1}\beta H)/(E^{1+\beta}P_N{}^{\alpha})}{J} \tag{23}$$

As noted above the analysis of the effect of devaluation will depend quite crucially on Ω, which can be construed as the effect, on national income, of devaluation (impact of changes in E on Y). There are two opposing effects of devaluation upon imports: one negative on the supply-side as imported inputs cost more domestically; the other is the positive impact devaluation has by reducing consumption imports, which become more expensive in terms of the home currency. If we examine (12), we find that $\Omega < 0$ when the negative impact of devaluation on the non-traded sector (via imported intermediate input costs) dominates its positive effect via consumption imports. This is what Krugman and Taylor (1978) refer to as 'contractionary' devaluation, although their analysis would also include the effect on exports, which we consider in (29) below. It is also the classic Latin American 'structuralist' outcome. Let us refer to this as case 1. The

converse, when $\Omega > 0$, more like in East Asia, we call this case 2. This is because in the stylized East Asian scenario the non-traded sector is less significant, and consumption imports are likely to be highly price-elastic.

Case 1 ($\Omega < 0$), Latin America: In this instance:

$$\begin{aligned} &\frac{dP_N}{dE} > \mathbf{0}, if \\ &|(P_N - \lambda)N_2 - TN| > |C_{N2}\Omega| \\ &|C_{M2}\Omega| > |C_{M3} + X_{M1}| \\ &|I_{N1}H_1| > |C_{N2}H_2| \end{aligned} \tag{24}$$

The reversal of the above is necessary for $dP_N/dE < 0$.

Case 2 ($\Omega > 0$), East Asia:

$$\begin{aligned} &\frac{dP_N}{dE} > \mathbf{0}, if \\ &|C_{N2}H_2| > |I_{N1}H_1| \end{aligned} \tag{25}$$

The reversal of this condition is necessary for $dP_N/dE < 0$.

With regard to the effect of devaluation on the non-resource based tradable good, M, we obtain:

$$\frac{dM}{dE} = \frac{-H_2\{C_{N1} + C_{N2}\rho - N - P_N N_1\}\{C_{M3} + X_{M1}\} - H_2\{C_{N1} - N - P_N N_1\}C_{M2}\Omega}{J}$$
$$\frac{-H_2\{(P_N - \lambda)N_2 - TN\}\{C_{M1} + C_{M2}\rho\} + C_{N2}\Omega H_2 C_{M1}}{J} +$$
$$\frac{I_{N1}\{-H_1\Omega C_{M1} + (\beta H)/(E^{1+\beta}P_N{}^{\alpha})\{C_{M1} + C_{M2}\rho\} + I_{N1}\{H_1\rho + \delta\}\{X_{M1} + C_{M3}\} + I_{N1}\delta C_{M2}\Omega}{J} \tag{26}$$

$\Omega < 0$ is necessary for $dM/dE < 0$. This was case 1 above, the 'Latin American' experience. If the converse is true, and $\Omega > 0$, the East Asian model holds, then $dM/dE > 0$ if:

$$|C_{N2}H_2| > |I_{N1}H_1| \tag{27}$$

In the East Asian case both sectors are likely to expand, as indicated by a shift from the point A to the final point C in figure 1. The increase in the

traded goods sector will, however, be the greater of the two. In the Latin American case there could be a negative impact in one or both sectors of the economy. If the contractionary effect is only in the non-traded commodities, point D will be the new equilibrium in figure 1. This is the opposite of the Dutch Disease effect of a rise in R in the stylized Latin American case. If both sectors decline, the new equilibrium is at point B.

One would expect devaluation, as it lowers the value of real money balances, to push up interest rates. The expression for this effect, equation (28) below, turns out to be quite involved.

$$\frac{dr}{dE} =$$
$$\frac{\{H_1\Omega - (\beta H)/(E^{1+\beta}P_N{}^{\alpha}) + H_1(\mathbf{1}-C_{F2})(C_{M2}\Omega + X_{M1} + C_{M3})\}\{C_{N1} + C_{N2}\rho - N - P_N N_1\}}{J}$$
$$- \frac{\{C_{N2}(\mathbf{1}-C_{F2}\}\{(C_{M1}+C_{M2})(\beta H)/(E^{1+\beta}P_N{}^{\alpha}) + (H_1\rho+\delta)(X_{M1}+C_{M3}) + \delta C_{M2}\Omega\}}{J}$$
$$+ \frac{\{(P_N-\lambda)N_2 - C_{N2}\Omega - TN\}\{C_{M2}\rho(H_1(\mathbf{1}-C_{F2}) + (H_1\rho+\delta)\}}{J}$$
$$+ \frac{\{(P_N-\lambda)N_2 - TN\}\{C_{M1}H_1(\mathbf{1}-C_{F2})\}}{J} \qquad (28)$$

If $\Omega > 0$, then $dr/dE > 0$, if $|H_1\Omega| > |(\beta H/E^{(1+\beta)}P_N{}^{\alpha}|$, implying a high income elasticity of money demand. Even if $\Omega < 0$, $dr/dE > 0$, as long as the condition above is reversed, as well as: (a) $|N_2| > |C_{N2}\Omega|$, and (b) $|X_{M2}+C_{M3}| > |C_{M2}\Omega|$ in absolute value. Note that these are sufficient conditions.

Finally, we come to the all-important impact of devaluation on the balance of trade or payments. From (9):

$$\frac{dF}{dE} = X_{M1} - C_F(\mathbf{1}+\eta) - TN - ETN_2 - EC_{F2}\frac{dY}{dE} - TN_1\frac{dP_N}{dE} \qquad (29)$$

Where $\eta = EC_{F1}/C_F < 0$. This is the elasticity of consumption import demand with respect to the nominal exchange rate. Note that $N_1 > 0$ and $N_2 < 0$. The first term on the right-hand side of (29) is positive. With regards to the second term, if imports are inelastically demanded then the balance of payments worsens, however if they are elastically demanded, the trade balance improves. The third and fourth terms on the right-hand side of (29) refer to the additional payment which is needed to finance intermediate

inputs for N production, the smaller is the N sector the lesser is this adverse supply-side effect of devaluation on the balance of payments. Finally the last two terms on the right-hand side of (29) are likely to be negative unless Y and the N sector decline following devaluation. In summary, devaluation is likely to be positive in its effects on the economy the smaller the non-traded goods sector and the more elastic the demand for consumption imports. This may be the stylized nature of 'East Asia' as envisaged by Sachs (1996) or diffused economies as characterized by Woolcock et al. (1999). The converse will, therefore, characterize the typical Latin American or point sourced economy in the short-run.

D A tax on non-traded goods

In addition to devaluation more directly interventionist policies could be pursued to foster the output of the tradable labour-intensive sector. One form of such policies could be an *ad-valorem* tax, τ, on the price of the non-traded good, P_N. Note that even when the tax is levied on the supplier, it ends up being borne by the consumer. The tax is similar to VAT. The object is to discourage consumption of the N sector's output after say, a resource boom and sustain domestic demand for the traded good, M. The proceeds of the tax on the consumption of non-traded goods are redistributed back to the population in a lump-sum fashion.[15] In other words, it does not alter the distribution of income, and national income Y is unchanged. In the technical sense $dY/d\tau = 0$ in equation (6), because the public receives the tax revenue back as an income supplement. This policy is akin to industrial policy favouring labour-intensive tradables production vis-à-vis more capital-intensive non-traded commodities. If successful, the policy will expand M sector production at the expense of N sector output in the context of a constant national income, Y. Ultimately, the aim is to avoid some of the pitfalls of the 'Dutch Disease' which shifts the production base towards non-tradable goods away from tradable goods that are also for export. The policy instrument chosen, however, amounts to a consumption tax, which is essentially an 'expenditure-switching' policy with a view to making consumers spend more on M relative to N.

In order to proceed we need to modify the equilibrium relations of the model to take account of the tax. These were, (5), (4) and (8), respectively.

[15] Alternatively, the tax revenues may be utilized to subsidise the production of M. But such a policy, within this particular model, would merely augment supply without necessarily raising domestic consumer demand. Also the algebraic effects of doing this are very similar to the case when the revenue is given back to consumers.

Once the tax, τ, on the price of the non-traded good, P_N is incorporated we have:

$$C_N(P_N(1 + \tau); Y) + I_N(r) = (P_N - \lambda)N(P_N, E) \quad (5')$$

Note that τP_N 'nets' out from the right-hand side of (5′).

$$C_M(P_N(1 + \tau); Y; E) + X_M(E) = M \quad (4')$$

and

$$H(Y, r) = H/[E^{\beta}\{P_N(1 + \tau)\}^{\alpha}] \quad (8')$$

Recall that Y will be unaffected after the imposition of the tax (dY = 0). This is because the revenues are redistributed back to the public. To simplify the computation of the results, I utilize the standard technique where the *initial* value of $\tau = 0$, but of course $d\tau \rightarrow 0$. Totally, differentiating (5′), (4′) and (8′) we discover that the Jacobian of the matrix is in (10) is unchanged, but the right-hand side relevant for $d\tau$ becomes:

$$\begin{bmatrix} -C_{N1}P_N \\ -C_{M1}P_N \\ -\delta P_N \end{bmatrix} d\tau \quad (10')$$

This is what will be utilized for the comparative static exercises.

Turning first to the effect of the tax on the non-traded sector, we discover that:

$$\frac{dP_N}{d\tau} = \frac{P_N H_2\{C_{N1} + C_{N2}(\mathbf{1} - C_{F2})C_{M1}\} - I_{N1}\{H_1(\mathbf{1} - C_{F2})(C_{M1}P_N) + \delta P_N\}}{J} \quad (30)$$

Note that $|J| < 0$. The expression above will be negative if $|C_{N1}| > |C_{N2}(1-C_{F2})C_{M1}|$. The reversal of this condition is necessary, but not sufficient, to induce a fall in the equilibrium output of N. The condition states that the price elasticity of demand for N with respect to a change in price (C_{N1}), outweighs the marginal propensity to consume non-tradable goods (C_{N2}). The former effect causes a decline in consumer demand for the N sector's output as it is now more expensive; the latter is the propensity to consume non-tradables, which if high enough (as in the point-source or the Latin American stereotype) could even negate the object of the tax, as consumers have a strong preference for the non-traded good. In the more virtuous East

Asian (or in the diffuse natural resource endowment) case, the output of the N sector declines following the imposition of the tax.

When we come to the effect on the output of traded-goods, we find that:

$$\frac{dM}{d\tau} = \frac{\{N + P_N N_1\} P_N H_2 C_{M1} + I_{N1} P_N \rho \{H_1 C_{M1} - \delta C_{M2}\}}{J} \tag{31}$$

This will be positive as long as, $C_{M1}H_1 > \delta C_{M2}$. Again, this implies the price effect outweighs the marginal propensity to consume. The price effect makes consumers choose more M; in order for the tax to work, this parameter must be high.

When we come to depict these results diagrammatically in figure 1, point D illustrates the 'successful' post-tax intervention, with a decline in the N sector accompanied by an expansion in the M sector. Starting from an initial position at A where NN_0 and MM_0 intersect, the tax will shift the MM schedule to the right, to MM_1 say indicating expansion. The NN schedule moves downward to NN_2 depicting contraction.

The effect of the tax on interest rates is analytically complicated. This is despite the fact that from, (8') the value of real balances declines, as the tax becomes operational, putting upward pressure on the interest rate, as there is excess demand for money. But a decline in the N sector, and investment in that sector moderates interest rate increases. The algebraic effect is:

$$\frac{dr}{d\tau} = \frac{(C_{N2}\rho - N - P_N N_1)\delta P_N - (N + P_N N_1)(1 - C_{F2}) H_1 C_{M1} P_N}{J}$$
$$+ \frac{P_N C_{N2}(\mathbf{1} - C_{F2})\delta\rho C_{M2} - C_{N1} P_N \{H_1(\mathbf{1} - C_{F2}) C_{M2}\rho + H_1\rho\}}{J} \tag{32}$$

This is ambiguous in sign, the first line in (32) is positive and the second negative, but the entire effect is likely to be positive.

Finally, we have the effect on the trade balance, from (9):

$$\frac{dF}{d\tau} = -ETN\frac{dP_N}{d\tau} > \mathbf{0} \tag{33}$$

Hence the trade balance improves after the imposition of a tax on the N sector, as long as non-tradable production declines, and with it the need to import intermediate inputs.

VI SUMMARY AND POLICY IMPLICATIONS

To summarize, the preceding short-run macroeconomic model analyses the effects of natural resource endowment, and policies designed to cope with the associated winner's curse. The effects on the economy are dichotomized along the lines of Latin America/East Asia, suggested in Sachs (1996); or alternatively, the point-source/diffuse natural resource delineation proposed by Woolcock et al. (1999), see the table below. These two sets of differences are not mutually exclusive and can often be paired to form an analytical correspondence. We will then potentially possess two distinct cases and sets of results; one reflecting the Latin America (point-sourced) stylization, and the other the East Asia (resource endowed diffused) case.

SUMMARY OF ANALYTICAL RESULTS

TYPE	*RESOURCE BOOM*	*RISE IN MONEY SUPPLY*	*DEVALUATION*	*INDUSTRIAL POLICY (for M, against N)*
Latin America/ Point Sourced	M falls, N rises; or, both decline	Both sectors expand, N by more	N contracts. M may also fall	May work
East Asia/Diffused Resource Endowed	Both rise; or, M rises, N falls	Both sectors expand, N by more	Both M and N expand	Works unambiguously
East Asia/Diffused No Resources	N.A.	Both sectors expand, N by more	Both M and N expand	Works unambiguously

The first two analytical results, in section V above, correspond to resource booms and capital inflows. It should be remembered that a resource boom could be caused by a variety of reasons: natural resource discoveries, increases in the prices of staple exportables, worker remittances and other forms of transfers. A major innovation of my analytical model is that resource booms do not automatically cause the traded sector to contract and the non-traded sector to expand. This is partially a result of the existence of excess capacity in the economy. But relative parameter sizes do matter. A full range of possibilities emerges. Under East Asian (diffused) conditions of a high propensity to consume the domestically produced traded good, M, this sector could expand. Also, both the traded and non-traded sectors could contract. This is the most extreme form of Dutch Disease, and associated with strong wealth effects impacting on money demand and is more likely under certain extreme configurations of point-sourced or Latin American conditions. The effect of an expansion in the money supply induced by capital inflows is to expand the economy.

The second pair of comparative static exercises in section V is concerned with policies to tackle resource booms. In a certain sense, devaluation is the opposite of a resource boom, and may be a policy initiated to avoid the adverse effects of resource booms. There is the possibility of contractionary devaluation, particularly for the non-traded sector. This likelihood is strongly associated with Latin American or point-sourced characteristics. When devaluation is expansionary, it is so because the non-traded sector is less important to domestic consumers and there is a sharp reduction in imported consumer goods. These are more likely in the East Asian or diffused case.

A policy to tax non-traded goods consumption will be akin to industrial policy favouring the production of traded goods. Such a policy would be initiated because of the view that labour-intensive manufactured traded goods are superior to non-traded goods production; the latter including manufacturing 'dinosaurs' from the past. This policy is most likely to succeed when non-traded goods are quite price-elastic in demand, and the propensity to consume them out of income is small. Arguably, these are features of the more successful East Asian economies with their diffused production structure. Size would also be an important consideration. Without a critical mass of consumers geared to the domestic consumption of labour-intensive traded manufactures, industrial policies of this type would be rendered meaningless.

In considering further extensions to the model, one would want to extend the short-run flow equilibrium analysis above into a more dynamic stock-flow equilibrium. Incorporating a role for human capital would also be crucial, as this factor plays an important role in the development of the more dynamic manufacturing sector. In Sachs and Warner (1999a), human capital accumulation only takes place as a result of manufacturing production, the counterpart of the M sector in my model. It takes the form of a production externality in the context of perfect competition, and there is no cost involved. A proper formulation of human capital accumulation would take into account the public goods aspect, as well as firm-specific features of this process, as in Murshed (1997a). Other extensions would involve very different game-theoretic models of endogenous policy formation and rent seeking.

A further analytical refinement would be to augment the role of human capital with the innovation-imitation notions of brand creation under monopolistic competition of the type considered in Grossman and Helpman

(1991). This paradigm, when contrasted to a purely human-capital approach, can offer richer insights, as it points to the importance of infrastructure, institutions, social capital and the ability to adapt to a changing environment. These factors, of course, are the product of the non-traded sector, therefore, that side of the economy may have a positive part to play after all.

In terms of policies to foster human capital accumulation, one has to bear in mind that several of the more affluent resource rich economies have invested heavily in education, such as Saudi Arabia. But in their case the human capital could be of the wrong type, as it is mainly employed in unproductive services, in the non-traded sector. For poorer countries, investment in primary education is important, as it will allow them to export labour-intensive manufactures. For middle-income nations, where primary enrolment is universal, investment in other types of skills is advisable, as it could permit the production and export of more technologically intensive products.

A remaining question is why had some natural resource rich economies such as the USA, Canada and Australia, and New Zealand done well in the past in terms of growth and eventual industrialization. Perhaps, resource abundance had a greater complementarity with growth and manufacturing development a century ago. Also, manufacturing production for the domestic market led to the development of an efficient industrial sector, at least for the USA. Here again, size matters.

Resource abundance, even when it persists for centuries, is ultimately transient. There is, therefore, a clear danger of eventually sliding into a low level equilibrium or staple trap. Staple traps are symptomatic of the condition of underdevelopment. In other words, low incomes and poor long-term growth rates are ultimately the result of an undiversified production structure, and the inability to adapt to change. Policies matter, and these often need to be adapted to the size of the economy. The right policy mix includes macroeconomic stability, openness (as it promotes competitiveness), as well as the accumulation of human, institutional and social capital. Here, issues of political economy, which determine policy, can be quite crucial. Also, one can never discount the value of the appropriate timing of policy changes, which are often the product of pure chance.

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Figure 1 Effects of resource booms, devaluation and industrial policies