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ECONOMIC DEVELOPMENT AND ENDOGENOUS TERMS-OF-TRADE DETERMINATION: REVIEW AND REINTERPRETATION OF THE PREBISCH-SINGER THESIS

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In this paper the theoretical literature relating to the Prebisch-Singer Thesis and economic development is extensively reviewed. The aim is to examine models which exhibit a positive relation between indicators of economic development, such as per capita income, real wages or employment and terms of trade development. In many models the economy is better off when terms of trade fall and income and price elasticities do not appear in the growth rate solutions. As this is at variance with the Prebisch-Singer Thesis, two simple models have been developed: (i) in a "vent-for-surplus" model, income and price elasticities appear in the solution for employment, but the terms of trade are driven down by the factors that increase employment; (ii) in a model with exogenous employment and imported capital goods, higher income elasticities of export demand increase in the long-run growth rates of real wages, per capita income, capital-labour ratio and the terms of trade, thus representing the ideas of Prebisch, Singer and Myrdal on the relation between exports and growth.

Introduction

When D. Senghaas (1982) published his big summary of an interdisciplinary project entitled *Von Europa Lernen* (Learning from Europe), he could have put a question mark at the end of the title. The reason is not to doubt that there may be something to be learned from European history. The reason is to point to the fact that there might be some things that developing countries can learn only from their own history. The example *par excellence* is the fact that developing countries are importers of capital goods to a much greater extent than European followers have ever been. The crucial point to be learned is the working of economic growth through imported capital goods that have to be paid for by exports. The best known proponents of this view were Singer, Prebisch and Myrdal. The debate on this view may be examined in three parts:

(i) Singer, working on UN documents, and Prebisch (1950) found, when considering long-run data, that the terms of trade of developing countries' primary goods in relation to developed countries' manufactured goods were falling. The debate on whether or not this is true is still going on. Roughly, one hundred contributions of the old literature have been briefly summarized by Nguyen (1981, pp. 46-56): one-third of them says that terms of trade fall, one-third sees constancy, and the rest even increasing terms of trade. The more recent discussion uses high-tech, time-series analysis. Cuddington and Urzua (1989, pp. 426-442) emphasize stationarity. However, Sapsford *et al.* (1992) criticize the data and methodology used, and Ardeni and Wright (1992) use non-stationary methods allowing for decomposition into trends and cycles. Both find a small rate of decreasing terms of trade in the long run. The order of magnitude that is under discussion is between zero and 0.8 per cent. These results are supported by Bleany and Greenaway (1993, pp. 349-363), and Barros and Amazonas (1993, pp. 99-116), who provide estimates and tests and a review of some of the literature. When going to manufactures, the debate between Sarkar and Singer (1993, pp. 1617-1620) on the one side and Athukorala

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(1993, pp. 1607-1613) and Bleany (1993, pp. 1615-1616) on the other reveals that there is a decline in the terms of trade of non-ferrous metals and a slight or no decline in other manufactures. Unless quality-measurement issues bias the whole data analysis - which is still unclear at present - the inclusion of manufactures does not reverse the impression, from analyses of primary commodity prices only, of falling terms of trade (Bleany and Greenaway, 1993).

(ii) The second debate that has taken place began with the view that the terms of trade are indeed falling. If this is so, investment should be shifted away from the primary to the secondary sector. To give (infant) industry a chance, tariffs would seem to be desirable. The exact concept has never really been presented, at least not in terms of dynamic theory. The history has been disappointing (see Ernst 1973, pp. 332-403, for a summary), because protectionism has led to imports of capital goods higher than the imports substituted by domestic production. Trade theorists have always criticized this idea because of distortions generated by tariffs. The same distortions when used for export promotion, however, often seemed acceptable to them, a view that frequently undermined the credibility of anti-protectionist arguments. Recently, more successful NICs (newly industrializing countries) seem to have in common human capital investment at all levels, combined with a strategy to go from less to more sophisticated technologies (Verspagen, 1993, table IX.6). This has been accompanied by tariff protection and realistic exchange rates (Sachs, 1989).

(iii) The third part of the view concerns the exact relation between the terms of trade, growth and welfare. Falling terms of trade in themselves are not bad if they are the result of superior technical progress, which enables the country to export more and improve its world market position (Kravis, 1970, pp. 850-872; Evans, 1987, pp. 657-671). A positive correlation between the terms of trade, growth and welfare needs to be derived under plausible assumptions. Prebisch[1] and Myrdal[2] argued that low income and price elasticities are unfavourable to economic growth because the capacity to pay for imported capital goods is lowered by them. This is what this paper intends to demonstrate, since the theoretical state of the art of the literature is not very well developed.

Spraos (1983, p. 99) noted that there had been no formal theorizing on the Prebisch-Singer Thesis, except for Bhagwati's "immiserizing growth" and an analysis within the static neoclassical trade model. Spraos excluded the papers by Findlay (1980, pp. 291-299, and 1981, pp. 424-457) from his observation, because Findlay assumed unit income elasticities - an assumption that is at variance with the Prebisch-Singer Thesis. Södersten (1981, p. 462), commenting on Findlay's paper (1981), argued that the assumption of an unlimited supply of labour (also used by others as discussed below) could not be valid in the long run, and asked whether it would not "be more interesting to have two Solow-type economies trading with each other instead". In the Solow model (1956, pp. 65-94), the central variables that indicate an improvement in economic well-being - the wage rate and per capita income - grow at the rate of technical progress. The main challenge from the Prebisch-Singer Thesis is that there may be foreign trade conditions which cause these variables to grow at a slower rate than in the Solow model. One such condition is the scarcity of imported inputs, which could be reduced by increasing exports. This point, which Prebisch emphasized in his 1950 paper, has recently been re-emphasized by Linnemann (1993, pp. 142-139) and Athukorala (1993), the former pointing to empirical research by Esfahani (1991, pp. 93-116).

In section A, this paper adds the lacking theoretical underpinnings to the literature on exports and growth. It attempts to demonstrate why most of the theoretical analysis of the terms of trade phenomenon has been inadequate from the development point of view. It then presents in section B an open Solow-type model, in which the arguments of Prebisch and Singer on income and price elasticities of export demand are indeed the reason for lower growth rates in comparison to those of the closed Solow model. Section C draws some conclusions with respect to policies and research requirements.

A. The terms of trade and economic development: a brief critique of the literature

1. The static neoclassical trade model

Theorizing on the terms of trade within the static neoclassical trade model aims to derive conditions under which the terms of trade rise or fall. The model used by Spraos (1983, p. 85), for example, yields the condition that after an increase in labour productivity the terms of trade will fall if the ratio of world income elasticities for commodities and manufactures is smaller than their respective labour productivity ratios, under the assumption that the two countries are fully specialized. If specialization is imperfect, the condition becomes more complicated (Södersten, 1980, chapter 9, appendix).

Whichever of the models mentioned above is being considered, they all suffer from a serious deficiency: in order to find out whether or not the terms of trade are falling, one has to know beforehand the changes in labour productivity and national income in terms of domestic goods. But the question by Prebisch and Singer was raised inversely: they asked to what extent could per capita income grow in capital importing developing economies with limited exports, given a certain rate of technical progress; the terms of trade were taken as an indicator or explanatory variable that might point to an answer. If one simply transformed the static model into a dynamic one, not much would be gained. With some modifications, the Ricardian argument of diminishing returns to scale could be considered in the static model, as was done by Jorgenson (1961, pp. 309-334) in a dynamic model. However, dynamics under decreasing returns would favour the classical view of increasing prices of primary products - the opposite of the Prebisch-Singer Thesis.

Brecher and Choudhri (1982, pp. 181-190) consider a Heckscher-Ohlin model with both manufactured and primary products. Foreign investment by northern citizens in the South increases production of capital-intensive primary products. Incomes are increased by the more efficient use of world capital. Demand shifts to manufactures imported by the South, and the terms of trade and welfare in the South fall in that model. However, this is a once-and-for-all effect because, once interest rates are internationally equalized, the capital movement stops. The long-run growth effects of the terms-of-trade movements are therefore completely de-emphasized, as is admitted by the authors. However, it is exactly this aspect which forms the main challenge of the Prebisch-Singer Thesis. If one simply transformed the static model into a dynamic one, not much would be gained. With some modifications, the Ricardian argument of diminishing returns to scale could be considered in the static model, as was done by Jorgenson (1961) in a dynamic model. Dynamics under decreasing returns, however, would favour the classical view of increasing prices of primary products - the opposite of the Prebisch-Singer Thesis.

The question which may be raised is whether there are more distinguishing characteristics of developing countries than the comparative statics of productivity and returns to scale. At least two lines of thought that deviate from the pure neoclassical line may be considered: firstly, the unlimited supply of labour tradition, following Lewis (1954, pp. 139-191); and, secondly, the impact of capital goods importation. It is shown below that the terms of trade cannot be an indicator of development in the first case without including the second, leaving as the more promising aspect the importation of capital goods. The main difference between our interpretation of the Prebisch-Singer Thesis and the neoclassical one is that it is not a simple demand-supply exercise, but that exports also have an influence on productivity via the amount of capital goods imported. To some extent, all these requirements are fulfilled in Evans' (1987) static trade model. Evans does not discuss the welfare and dynamic growth effects of the terms-of-trade changes. However, this is the crucial question of the whole debate. The direct connection between exports and productivity is the reason why income and price elasticities of export demand are part of the common driving forces behind growth rates and terms of trade, and make the latter an interesting indicator of development.

2. Labour surplus and capital imports: growth in the classical phase

Findlay (1980, 1981 and 1983) has shown that the optimistic result of disguised unemployment disappearing under exogenous technical progress, usually obtained from the closed classical dualistic growth model with technical progress, no longer

holds if the Lewis economy must import its capital goods from a developed economy represented by a Solow model.

It is well known that in the closed Lewis model, with a fixed real wage, technical progress increases the marginal product of capital, which is equal to the rate of profit. If savings are a fixed proportion of profits and investment equals savings, an increase in the marginal product of capital induces a continuous increase in the rate of growth. At some stage, this rate of growth becomes greater than the rate of population growth. This diminishes unemployment until it disappears.

In the Findlay model, imported capital goods are different from the developing countries' output. It is therefore necessary to multiply the marginal product of capital, f', with the terms of trade, p, in order to get the rate of profit, r, so that:

$$r = pf' \qquad (A.1)$$

The growth rate of the developing countries, g, is the rate of profit multiplied by the rate of savings of capital owners, s, using a classical savings function:

$$g = sr = sf'p \qquad (A.2)$$

An important result derived by Findlay is that there exists a stable equilibrium growth path in which the rate of growth in the South is equal to that in the North, which in turn is the usual natural growth rate of the labour force measured in efficiency units, thus yielding:

$$n = g = sf'p \qquad (A.3)$$

This determines the terms of trade as:

$$p = n / sf' \qquad (A.3')$$

Given that the natural rate of growth is exogenous, an increase in the marginal product of capital induced by technical progress (which is so crucial in the Lewis model) must inexorably lead to a fall in the terms of trade. This is very important because it inhibits the rate of growth in the South from increasing permanently. This is in stark contrast to the closed Lewis model. In this formulation, the terms of trade are only influenced by the supply side, whereas elasticities of export demand have no impact on the terms of trade and the growth rate. The terms of trade are important in the model because capital goods are imported. Moreover, the steady-state result has been derived under the additional assumption that all goods have unit income elasticities. Findlay's slow-growth result, if compared to the closed Lewis model, would probably be strengthened if different (low) income elasticities were introduced. The result is also valid in the case of capital mobility (Burgstaller and Saavedra-Rivano, 1984, pp. 213-237; Burgstaller, 1985, pp. 241-260).

Note that disguised unemployment will only disappear if the natural rates of growth in both the North and the South are higher than population growth in the South. Therefore Södersten's (1980, p. 462) opinion that disguised employment will disappear - the main feature of the closed Lewis model - is no longer assured if developing countries have higher population growth rates than developed countries. Thus, if there exists a labour surplus economy with a fixed real-wage rate, this state may persist for longer. If, on the other hand, the steady-state rate of growth is higher than population growth in the South, sooner or later disguised unemployment disappears if price elasticities of demand for imports are sufficiently high.

Darity (1990, pp. 816-827) modeled Keynesian and Kaleckian variants of Findlay's model. However, there is no role for elasticities of export demand in these variants.

Another North-South model closely related to Findlay's has been presented by Molana and Vines (1989, pp. 443-453). A drawback of the paper is the assumption of Cobb-Douglas preferences. They imply unit income elasticities, which is clearly at variance with Prebisch's intentions. We shall therefore not discuss this model here.

It seems necessary to derive a model that is less complicated than two-country models and can take into account the intentions of Prebisch, Singer and Myrdal to include demand properties in the explanation of falling terms of trade.

The role of export demand elasticities will be made explicit by offering the two models below with imported capital goods and an export demand function which only differ in the closure rules. Under the classical closure rule, the terms of trade

will be independent of demand elasticities, whereas they are dependent on them under an exogenous-employment closure. The reason - which it is important to understand with regard to the models in this section - is that, with the unlimited supplies of labour captured by a fixed wage assumption, export demand increases employment without driving up unit costs. Prices are therefore constant, except in the case of a deviation of the growth rate of exogenous wages from that of technology. Under exogenous employment, wages are driven up through exports increasing labour demand, and competitive cost-prices are therefore driven up in the case of high-demand elasticities. If demand grows more slowly than cost-reducing technical progress, the terms of trade fall. This is the essence of the demand considerations of the Prebisch-Singer Thesis.

Most of the points discussed so far may be illustrated by replacing the North in Findlay's model with an export demand function. The model is then reminiscent of the "vent-for-surplus" idea (see Findlay, 1970, for a static version) and consists of the following four equations. Y denotes output, K capital, L labour, and A the level of technology; ß denotes the elasticity of production of capital and " ^ " a growth rate. The output production function assumed is:

$$Y = K^{ß}(AL)^{1-ß} \quad \text{or} \qquad \text{(A.4)}$$
$$\hat{Y} = ß\hat{K} + (1-ß)(\hat{A} + \hat{L})$$

Assuming an absence of capital movements because loans merely shift payments through exports into the future, and denoting s as the constant savings ratio and the relative price of exported output to that of imported inputs as p and "$\dot{x}$" as the derivative of x with respect to time, the equality of savings and investment, after dividing them by K, may be written as:

$$\dot{K}/K = spY/K \quad or \quad \hat{\dot{K}} = \hat{p} + \hat{Y} - \hat{K} \qquad \text{(A.5)}$$

The importation of capital goods, $\dot{K}$, has then to be paid for by exports pX (X is measured in home goods) implying:

$$\dot{K}/K = pX/K \quad or \quad \hat{\dot{K}} = \hat{p} + \hat{X} - \hat{K} \qquad \text{(A.6)}$$

To bring income and price elasticities of export demand, denoted as ρ and η, into the model in the simplest possible way, we add an export demand function with Z as income of the countries' customers:

$$X = Z^{ρ}p^{η} \quad or \quad \hat{X} = ρ\hat{Z} + η\hat{p} \qquad \text{(A.7)}$$

A second, potentially luxury, consumption good that might also be imported is assumed to be absent because of perfect protectionist measures - an assumption that guarantees that the reduction of imports does not solve any of the problems the economy will have, according to this model. Finally, we assume that there is a fixed real wage, w, measured in terms of domestic goods to which entrepreneurs equate the marginal product of labour:

$$w = (1-ß)K^{ß}(AL)^{-ß}A \quad or \qquad \text{(A.8)}$$
$$\hat{w} = ß(\hat{K} - \hat{A} - \hat{L}) + \hat{A}$$

In this model Y, K, L, X and p are the endogenous variables, A, w, and Z are the exogenous variables, and ß, s, ρ and η are parameters. A transition to new growth theory could be made through endogenizing s and A. For the sake of simplicity, this is not done here. Defining $k \equiv K/(AL)$, the last equation may be solved for the rate of growth of k:

$$\hat{k} = (\hat{w} - \hat{A})/ß \qquad \text{(A.8')}$$

The exogenous growth of real wages encourages substitution of labour for capital and therefore increases the capital-labour ratio, and the rate of technical progress decreases it by increasing the marginal product of labour, unless insertion of the last result in equation (A.4) yields:

$$\hat{Y} - \hat{K} = (ß - 1)(\hat{w} - \hat{A})/ß \qquad \text{(A.4')}$$

Capital productivity will increase (decrease) if the rate of technical progress exceeds (falls short of) that of the wage rate. Insertion of the last result in equation (A.5) yields:

$$\hat{\dot{K}} = \hat{p} + (ß-1)(\hat{w} - \hat{A})ß \qquad \text{(A.5')}$$

If wages and technical progress grow at equal rates, there is a one-to-one correlation between the terms of trade growth rate and the growth rate of

the rate of capital accumulation. Insertion of equation (A.7) in equation (A.6) yields:

$$\hat{K} = \hat{p}+\rho\hat{Z}+\eta\hat{p}-\hat{K} \qquad (A.6')$$

This is the second equation where one finds an impact of the terms of trade on capital accumulation. Equation (A.5) may be viewed as the (zero) savings gap and (A.6) as the (zero) trade gap and the last two equations as their dynamic analogues. Solving equation (A.5') for $\hat{p}$, inserting it into (A.6') and solving for $\hat{K}$ provides us with the central equation for the dynamics of the model:

$$\hat{\hat{K}} = \frac{(1+\eta)(1-\beta)}{-\eta \quad (-\beta)}(\hat{A}-\hat{w}) + \rho\hat{Z}/(-\eta)+\eta^{-1}\hat{K} \qquad (A.6'')$$

As $\eta < 0$ the slope in the $(\hat{K},\hat{K})$-plane is negative and therefore the equation will approach a constant, $\hat{K}$:

$$\hat{K} = \frac{(1+\eta)(1-\beta)}{(-\beta)}(\hat{A}-\hat{w})+\rho\hat{Z} \qquad (A.6''')$$

The intercepts may have any sign. As the denominator is negative, $(1+\eta)(\hat{A}-\hat{w})\leq 0$ is a sufficient condition for the positive intercepts drawn in figure 1. At price inelastic export demand, $\hat{w}>\hat{A}$ allows for a positive long-term rate of accumulation. If exports are price elastic, the sufficient condition requires wages to grow at a slower rate than technical progress - a condition that may be softened if $\rho\hat{Z}$ is high, i.e. products are viewed as attractive in the world and/or customers' income growth is strong.

The main idea of the vent-for-surplus theory is that export increases employment. Solving equation (A.8) or (A.8') for $\hat{L}$ and inserting the long-term solution yields:

$$\hat{L} = \hat{K}-\hat{A}-(\hat{w}-\hat{A})/\beta$$

$$= \frac{(1+\eta)(1-\beta)}{(-\beta)}(\hat{A}-\hat{w})+\rho\hat{Z}-\hat{A}-(\hat{w}-\hat{A})/\beta$$

$$= \rho\hat{Z}-\hat{A}+\frac{-\beta\eta-\beta+\eta}{\beta}(\hat{w}-\hat{A})$$

$$= \rho\hat{Z}-\hat{A}+\frac{\eta(1-\beta)-\beta}{\beta}(\hat{w}-\hat{A})$$

$$= \rho\hat{Z}+\frac{\eta(1-\beta)-\beta}{\beta}\hat{w}-\hat{A}\frac{\eta(1-\beta)}{\beta}$$

A higher income elasticity of export demand and a higher growth rate of customers' income increase employment. Higher wages decrease employment. Technical progress increases employment; the more price elastic export demand, the stronger the employment effect of technical progress and wages. The long-run value of the terms of trade can be read off directly from equation (A.5') after putting $\hat{K}$ equal to zero:

$$\hat{p} = (1-\beta)(\hat{w}-\hat{A})/\beta \qquad (A.5'')$$

The terms of trade only depend on supply-side variables and are independent of export-demand elasticities. In the long run, the terms of trade only reflect the "handmaiden" part of exports: technical progress decreases costs, which in turn decreases competitive prices, which may increase exports and capital accumulation if they are price-elastic. But technical progress will increase employment. Prebisch argued that wage growth may be low because of an absence of union power (see also Bardhan, 1982, on union power in a closely related context). If wage growth is lower than technical progress, the terms of trade will fall in this version of the vent-for-surplus model. Finally, if there are competitive factor markets, firms will equate their marginal product of capital to the rate of interest, which yields the same equation as in Findlay's paper of section A.1 above:

$$r = \beta p k^{\beta-1} \quad or$$

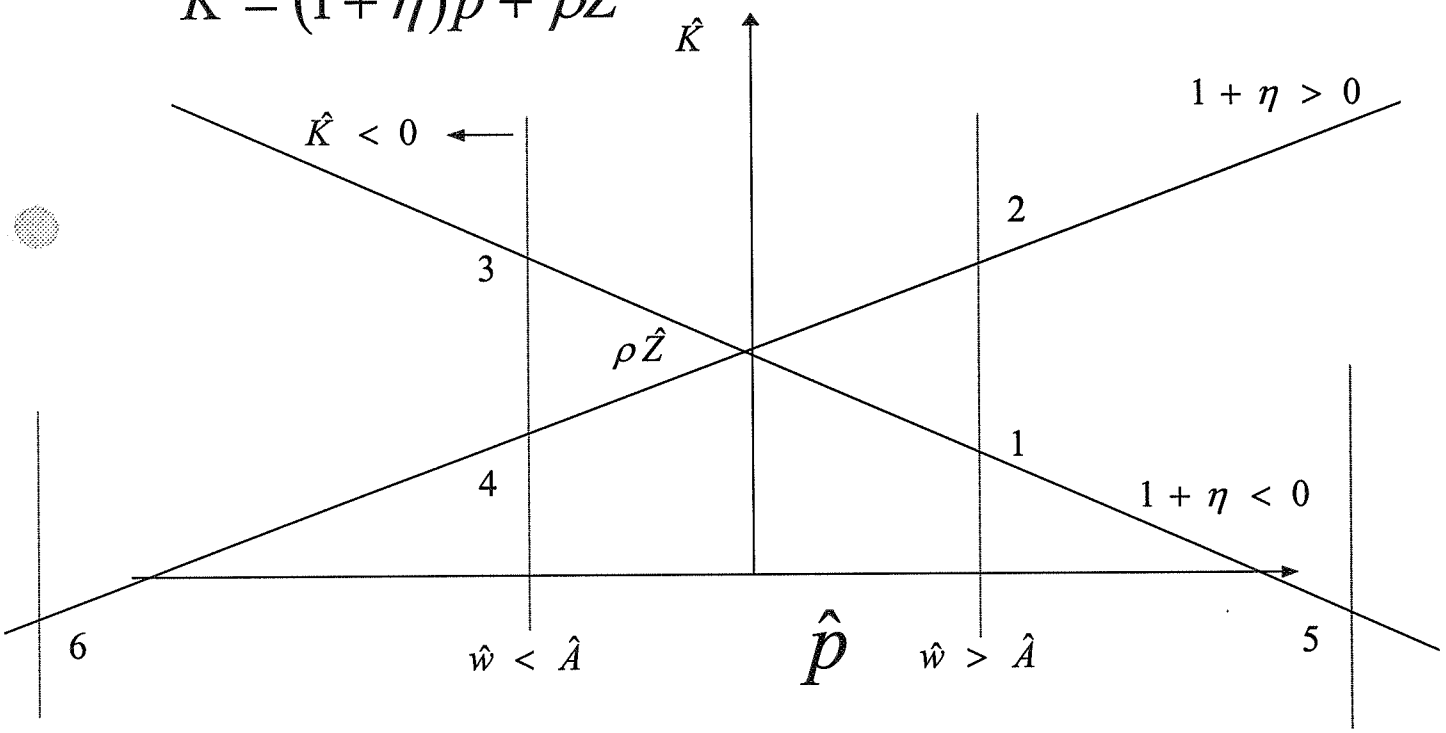
$$\hat{r} = \hat{p}+(\beta-1)\hat{k}=(1-\beta)(\hat{w}-\hat{A})/\beta+(\beta-1)(\hat{w}-\hat{A})/\beta=0$$

$\hat{p}$ and $\hat{k}$ have been replaced, using equations (A.5'') and (A.8'). So the rate of profit will be constant in the long run. This model has a rather neoclassical spirit, although wages have been fixed because the excessively high growth rates of wages, net of technical progress, determine the growth of unemployment and terms of trade. What we are in search of, however, is a model in which indicators of well-being as well as the growth rate of the terms of trade depend on the elasticities of export demand.

Vent – for – Suplus

$$\hat{\dot{K}} = 0 \qquad \hat{p} = (1-\beta)(\hat{w} - \hat{A})/\beta$$

$$\hat{K} = (1+\eta)\hat{p} + \rho\hat{Z}$$



	$1 + \eta > 0$	$1 + \eta < 0$
$\hat{w} > \hat{A}$	2	1 $\hat{K} < 0$
$\hat{w} < \hat{A}$	4 $\hat{K} < 0$	3

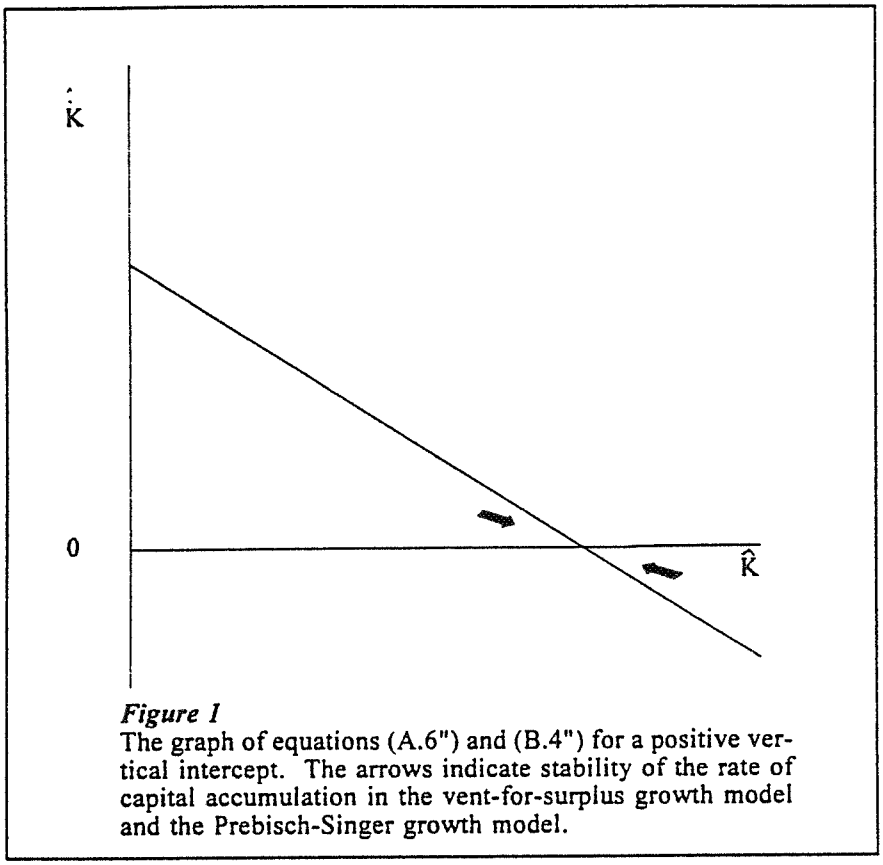


Figure 1
The graph of equations (A.6") and (B.4") for a positive vertical intercept. The arrows indicate stability of the rate of capital accumulation in the vent-for-surplus growth model and the Prebisch-Singer growth model.

It is the assumption of fixed wages that produces Findlay's results and those of the model just presented. The question then arises as to whether imports of capital goods and low export demand elasticities may be a reason for slow growth in a model with flexible wages and exogenous employment. This will be shown in the next section. Such a modified open Solow economy therefore seems to be the more interesting case for interpreting Prebisch, Singer and Myrdal, in order to challenge optimistic expectations concerning developing country growth.

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B. A neoclassical interpretation of the Prebisch-Singer Thesis

The only models in which the terms of trade are an indicator of underdevelopment - although in an adverse way - are Findlay's contribution and the very similar vent-for-surplus model presented above. In Findlay's model, the terms of trade are important - although independent of export elasticities - as they indicate that the advantages of technical progress are passed on to trading partners. Imported capital goods are not an element in the models of Spraos (1983), Södersten (1980) and Maneschi (1983). They were considered by Zarembka (1972), but only in a model for small countries; exports thus being unrestricted, capital goods may be imported without problems. The consideration of capital goods importation used by Findlay (1980) and Taylor (1981, pp. 589-602) has a long tradition. The importance of capital goods imports was pervasive throughout Prebisch's papers and today is a common argument in the whole literature on dependency theory.

A first step in examining the consequences of the introduction of imported capital goods in the neoclassical growth model was made by Bardhan and Lewis (1970), although they did not refer to the Prebisch-Singer Thesis. The model presented below contains several modifications of theirs in a simplified way. They did not try to explain the importation of capital goods, but rather examined its consequences for terms of trade, accumulation and real-wage growth; these are important variables if the terms of trade are considered to be an indicator of development.

To separate the interpretation of the Prebisch-Singer Thesis from the Ricardian argument of decreasing returns, we assume that national output is produced under constant returns to scale.

There are again two factors, capital and labour and exogenous technical progress. To abstract from technologically induced changes in income distribution, the elasticity of substitution is assumed to be one. As in the previous model, a Cobb-Douglas function is used:

$$Y = e^{bt} K^{\beta} L^{1-\beta} \quad or \quad \hat{Y} = b + \beta \hat{K} + (1-\beta)\hat{L} \qquad (B.1)$$

with b as the rate of technical progress and all the other symbols being the same as in the previous model. Labour is assumed to grow at an exogenously given rate ϵ:

$$L(t) = L(0)e^{\epsilon t} \quad or \quad \hat{L} = \epsilon \qquad (B.2)$$

This assumption avoids the complications known from models with endogenous population growth.

An important problem for developing countries seems to be that international allocation is such that they are importers of capital goods. This problem is repeatedly mentioned in Prebisch's papers (1950, pp. 12 and 17; 1961, pp. 5, 11 and 12). Prebisch obviously believed that this problem could be alleviated if imports of luxury consumption goods were reduced. This may be the case. To show that it cannot be a solution on its own, we assume again that only capital goods are imported, thus implicitly assuming that the problem of luxury goods imports is solved. In spite of this assumed solution, terms-of-trade and growth problems may occur. Imported capital goods and limited export demand are the core of the problem, not luxury goods imports. Thus, by assumption, capital goods invested in each period, denoted by $\dot{K}$, must be imported, and there are no other imports:

$$M = \dot{K} \qquad (B.3)$$

M denotes imports. Since imports are assumed to consist of capital goods only, trade-balance equilibrium requires that they be paid for by exports. So investment is limited by exports X, valued in terms of imported capital goods (Prebisch, 1950, p. 2):

$$\dot{K}/K = pX/K \quad or \quad \hat{\dot{K}} = \hat{p} + \hat{X} - \hat{K} \qquad (B.4)$$

where p is the terms of trade, i.e. the price of domestic goods in terms of imported capital goods. Investment has to be financed by domestic savings measured in units of imported capital goods. To keep matters simple, a constant rate of savings s from national output is assumed:

$$spY/K = \dot{K}/K \quad or \quad \hat{\dot{K}} = \hat{p} + \hat{Y} - \hat{K} \qquad (B.5)$$

Investment, limited by exports, cannot grow faster than exports. Exports are assumed to depend on customers' income, Z, and the terms of trade, p. The reader is reminded that Prebisch assumed a low income elasticity of export demand (Prebisch, 1959, pp. 251/2) and a price elasticity greater than minus infinity (1961, p. 5), and even greater than minus one; in short, he assumed low income and price elasticities of export demand (1959, p. 256). Faini *et al.* (1992, pp. 865-882), Hentschel (1992) and Stern *et al.* (1976) found that indeed the values of price elasticities of exports were in the neighbourhood of minus one. As will be seen later, low elasticities of export demand may be the reason for slow investment growth and other important variables if capital goods are imported. To ease computation, the export function is assumed to be log-linear:

$$X = e^{\omega t} \text{ or } X = Z^{\rho} p^{\eta} \quad and \qquad (B.6)$$

$$\hat{X} = \omega + \eta \hat{p} = \rho \hat{Z} + \eta \hat{P}$$

ρ is the income elasticity and the price elasticity of export demand. The first formulation is the one used by Bardhan and Lewis (1970) and the second is used in the non-neoclassical models of Thirlwall (1983, pp. 249-261), and both formulations are equivalent if $\omega = \rho \hat{Z}$. This equivalence allows us to relate the Bardhan-Lewis model to the Prebisch-Singer problem of low elasticities. It is important for this interpretation that this does not rely on any factor-market imperfection. Given wage and interest rates, the usual marginal productivity conditions for competitive markets from profit maximization hold:

$$r = pe^{bt} \beta K^{\beta-1} L^{1-\beta} \quad or \qquad (B.7)$$

$$\hat{r} = \hat{p} + b + (\beta - 1)(\hat{K} - \hat{L})$$

where w is the wage rate measured in units of foreign goods and w/p is the wage rate measured in units of domestic goods. The eight equations explain eight variables Y, L, M, p, K, X, w and r; as equations (B.2), (B.3), (B.7) and (B.8) determine

L, M, w, r, the other four equations may be used to solve the model. Inserting the growth rate versions of the production and export functions into the savings and export constraint for investment - equations (B.4) and (B.5) - yields:

$$\hat{\dot{K}} = \hat{p} + \rho\hat{Z} + \eta\hat{p} - \hat{K} \qquad (B.4')$$

$$\hat{\dot{K}} = \hat{p} + b + \beta\hat{K} + (1-\beta)\hat{L} - \hat{K} \qquad (B.5')$$

The wage rate - used here as a rough indicator of welfare - will grow at the same rate as the marginal productivity of labour. The latter is determined by the rate of technical progress and the growth rate of the capital-labour ratio, henceforth defined as $k \equiv K/L$:

$$\hat{w} - \hat{p} = b + \beta\hat{k} \qquad (B.8')$$

The rate of technical progress being given exogenously, the critical point is whether the growth rate of the capital-labour ratio is slowed down by low export elasticities which limit imports of capital goods. The solution of the model, in terms of growth rates for the long-term equilibrium growth path interpreted below, may be obtained as follows: solving equation (B.5') for $\hat{p}$ and inserting it into equation (B.4') yields after some manipulation:

$$\hat{\dot{K}} = \frac{\rho\hat{Z} - (1+\eta)b - (1-\eta)(1-\beta)\epsilon}{-\eta} + \frac{-\beta + \eta(1-\beta)}{-\eta}\hat{K} \qquad (B.4'')$$

In the $(\hat{\dot{K}}, \hat{K})$ -plane, this is a linear differential equation with a negative slope. A price-elastic export-demand function is a sufficient condition for obtaining positive intercepts (drawn in figure 1). Setting $\hat{\dot{K}} = 0$ and going back to the other equations, the solution for the terms of trade, the capital-labour ratio and real wages can be computed as follows:

$$\hat{p} = (\rho\hat{Z} - \epsilon)(1-\beta) - b]/[-\eta(1-\beta) + \beta] \qquad (B.9)$$

$$\hat{k} = [\rho\hat{Z} - \epsilon - (1+\eta)b]/[-\eta(1-\beta) + \beta] \qquad (B.10)$$

$$\hat{w} - \hat{p} = [(\rho\hat{Z} - \epsilon)\beta - \eta\, b]/[-\eta(1-\beta) + \beta] \qquad (B.11)$$

As the denominator is positive for all three variables, the interpretation will first focus on the numerator, and thereafter equations (B.9) and (B.11) will be drawn in figures 2 and 3, demonstrating the dependence of the terms of trade and the real wage on the income elasticity of exports ρ for alternative values of the price elasticity of exports η. The numerator in equations (B.9) to (B.11) is the sum of two terms. The first term captures the "engine of growth" part in the spirit of Prebisch, Singer and Myrdal, as well as Lewis and others: customers' income growth multiplied by income elasticity drives the growth rates of the terms of trade, capital-labour ratios and the wage rate. The second term captures the handmaiden part of the story - made possible here through the explicit introduction of technical progress in the Bardhan-Lewis model - which is more in the spirit of Kravis (1970), who argued that exports are merely driven by the price decreasing effects of technical progress, so that the causality therefore goes from growth to exports, and not the other way around, as emphasized by the "engine of growth" proponents. This view was supported by Evans (1987), who assumed that capital goods could be produced within the South. However, the assumption that they are not is crucial to the way in which this paper perceives the Prebisch-Singer Thesis. This model contains both features, which will be discussed in greater detail below.

The benefits from technical progress may be described as follows: The immediate effect of technical progress is to reduce production costs; it reduces the terms of trade in equation (B.9). This was recognized by Prebisch (1950, p. 5, footnote 4). The question now is whether this effect will lead to increasing or decreasing exports and investment; if exports are price-elastic, they will increase and therefore enhance the rate of growth of the capital-labour ratio in equation (B.10); if exports are price-inelastic, technical progress by decreasing the terms of trade has a negative effect on the rate of growth of the capital-labour ratio in equation (B.10). Technical progress has both a direct and an indirect influence on the real-wage growth rate, the indirect effect being caused by the capital-labour ratio. It may be seen that the direct effect outweighs the indirect effect, as in equation (B.11). Nevertheless, the smaller the price elasticity, the

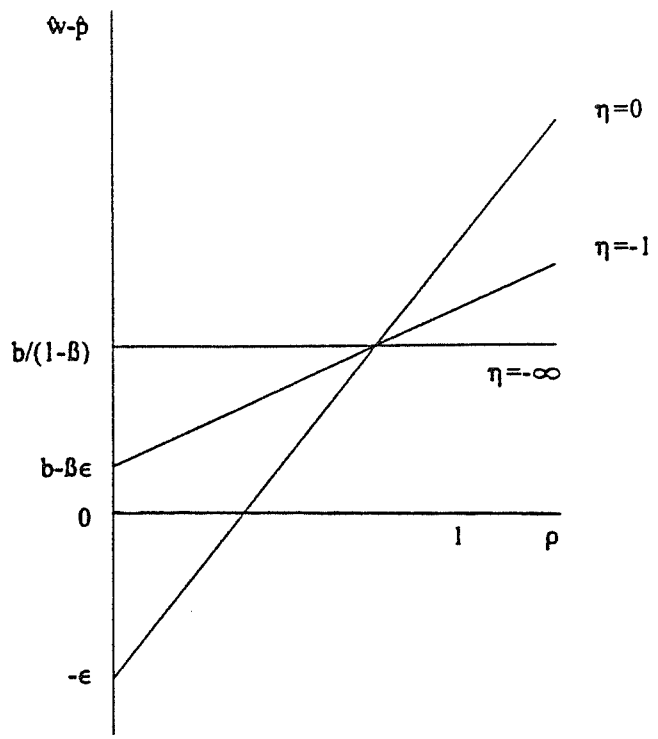

Figure 2
The growth rate of real wages increases with the income elasticity of exports. This is drawn for $\hat{Z}=\epsilon+b/(1-\beta)$ and alternative values of price elasticity η.

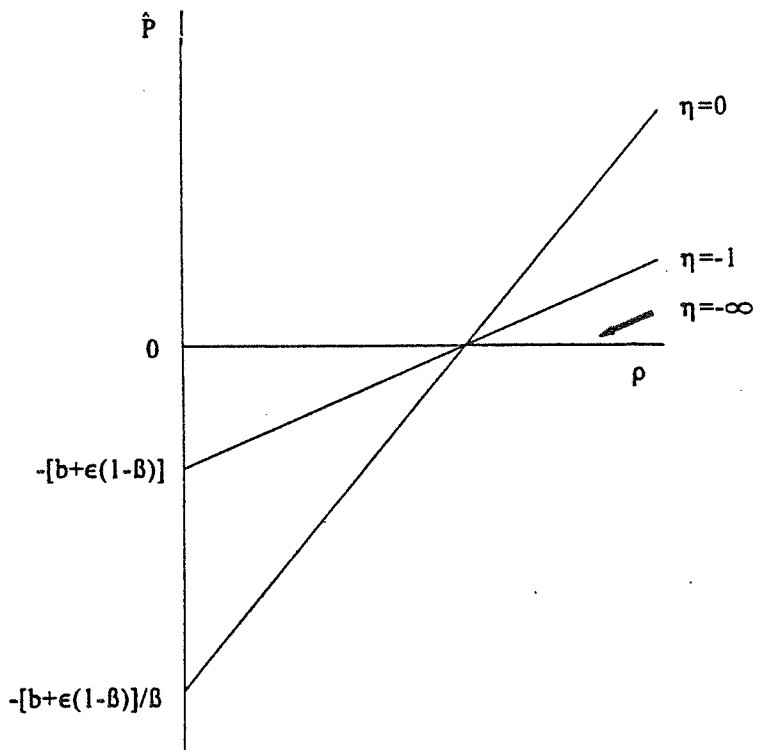

Figure 3
The growth rate of the terms of trade increases with the income elasticity of exports. This is drawn for $\hat{Z}=\epsilon-b/(1-\beta)$ and alternative values of price elasticity η.

smaller the contribution of technical progress to real-wage growth; in the limit, if price elasticities were zero, technical progress would have no influence on the growth rate of the real-wage rate. To summarize, technical progress has a negative impact on the terms of trade and a non-negative influence on real wages. With respect to technical progress, the terms of trade are obviously no indicator of development, because technical progress has opposing effects on the terms of trade and the real-wage rate.

What makes the terms of trade an indicator of development is the influence of the income elasticity of export demand and world income growth, $\rho\hat{Z}$. A higher income elasticity yields a higher growth of export demand for each given growth rate of world income and higher growth rates of capital imports in equation (B.10), the latter leading to higher real-wage growth in equation (B.11), and therefore higher growth rates of the terms of trade in (B.9). A critical problem is whether the increase of exports, induced by the rate of growth of world income, $\rho\hat{Z}$, is higher than the rate of population growth because the difference determines the rate of growth of the capital-labour ratio in equation (B.10). If the difference between the product just mentioned and the rate of population growth is negative because of a low income elasticity of export demand ρ, this will have a negative impact on the terms of trade, capital-labour ratio and real-wage growth, which will thus depend in the same way on the income elasticity of export demand (Prebisch, 1959, p. 258).

To summarize, the terms of trade will decline if the rate of technical progress is not outweighed by a large difference between export growth rate, $\rho\hat{Z}$ and population growth in equation (B.9); low income and price elasticities may make the growth rates of the capital-labour ratio and the real-wage rate negative in equations (B.10) and (B.11). p is an indicator of economic development here, because its growth rate and that of the real wage are both driven in the same direction by all the arguments contained in their solution, except for the technical progress term.

A comparison with the results of the Solow growth model is an essential point of this paper and is therefore made below. In the closed neoclassical growth model, with a production function as in equation (B.1), the real wage, capital- labour ratio and per capita income grow at the rate $b/(1-\beta)$. There are two special cases in which this result may be achieved in the present model:

1. Equation (B.11) may be written as:

$$\hat{w} - \hat{p} = [b/(1-\beta)]\{1-\beta/[\eta(1-\beta)]\} + (\rho\hat{Z} - \epsilon)\beta/[-\eta(1-\beta)+\beta] \qquad (B.11')$$

For $\eta \to -\infty$ we have $\hat{w} - \hat{p} = b/(1-\beta)$ for all values of $\rho\hat{Z}$. This is the neoclassical small country case.

2. If we assume that the world as a whole grows like a closed Solow economy at the rate $\hat{Z} = \epsilon + b/(1-\beta)$, , then we find:

$$\hat{w} - \hat{p} = b/(1-\beta) \quad \textit{and} \qquad (B.12)$$
$$\hat{p} = 0, \text{ both if } \rho = 1$$

In this case, the engine of growth $\hat{Z} - \epsilon$ is as fast as the handmaiden, $b/(1-\beta)$.

$\hat{w} - \hat{p}$ is drawn in figure 2 as a function of ρ under the assumption of $\hat{Z} = \epsilon + b/(1-\beta)$ for alternative values of η (for a derivation, equations [B.11'] and [B.12] have been used; vertical intercepts and slopes are derived in Annex I). Whereas the small country case - drawn as a horizontal line in figure 2 - reflects the predominant traditional neoclassical view that exports do not limit growth (Donges and Riedel, 1977, pp. 58-87), the latter case reminds us of a paper by Seers (1962), in which he argued that growth differences are due to differences in the income elasticities of export demand. Figure 2 shows that an income elasticity lower (higher) than one yields lower (higher) growth rates than in the Solow model if capital goods are imported and the price elasticity is not minus infinity. The impact of the income elasticity on the growth rate is still higher if exports are less price elastic, because then price movements have a less smoothing impact on growth rates.

As the model is not only driven by technical progress but by exports as well, a similar relation between the terms of trade and the income elasticity of export demand is drawn in figure 3 (for a derivation, equation [B.12] has been used and vertical intercepts and slopes are derived in Annex II).

Whenever the income elasticity of export demand is smaller than one, the terms of trade fall and the real wage grows slower than in the Solow economy, thus showing the close relationship between real wages and terms of trade development, both governed by the income elasticity of export demand, whose impact is increased (decreased) through lower (higher) price elasticity of export demand.

Capital goods importation and low elasticities of export demand were the main issues presented by Prebisch (1950 and 1959) and Singer (1950, p. 479). If we wished to investigate their empirical relevance, some generalizations of the model would be necessary: consumption imports would have to be introduced, domestic capital goods, indebtedness, and so on.

Data on customers' income Z would have to be computed separately for each country. The growth theoretic nature of the problem casts doubt as to the usefulness of cross-section studies, since taking an average of countries as diverse as Brazil and Mali is of little interest; countries would be interested in knowing whether they grow slowly because of low elasticities of export demand or because of diminishing returns in output production. If they were aware of this, they could start thinking about economic policy measures. Nothing in the model depends on primary products, which were used as an example in the 1950s, although they are still of great importance (Barros and Amazonas, 1993, p. 99-102; Hoffmann and Zivkovic, 1992). The strong growth of (semi-) manufactured industrial goods has also become a broadly accepted fact in recent years (Donges and Riedel, 1977; Sapsford *et al.*, 1992). What matters is elasticities of export demand, regardless of the nature of the products - and their impact on real wages and per capita income as a measure of poverty or wealth. Moreover, no presumptions are needed concerning long-term equality of growth rates between North and South, which feature so prominently in some recent models. Income elasticities of export demand seem to favour differential growth rates, as different countries specialize in different products which have different income elasticities of demand. Finally, the models allow for decreasing, constant and increasing growth in the terms of trade, and may therefore provide a good basis for empirical research. In this sense, we hope that the models presented may be viewed as a step towards an improved basis of formal theorizing for empirical research.

Falling net barter terms of trade (NBTT) as shown in Gillis *et al.* (1992) have different interpretations, depending on the application of either the vent-for-surplus model or the Prebisch-Singer growth model. The vent-for-surplus solution for the terms of trade (B.5'') suggests that wages grow more slowly than productivity. The Prebisch-Singer solution (B.9) suggests that export growth $\rho\hat{Z}$ is slower than supply growth $b+\epsilon(1-\beta)$ in autarchy. Empirical tests of the employment and terms-of-trade equations of the vent-for-surplus model and of equations (B.9) to (B.11) of the Prebisch-Singer model could perhaps show whether any of the models seem convincing from an econometric point of view. Testing price equations will lead to the difficulties of obtaining quality adjusted price indices. The major question will be whether or not they play an equally strong role in all types of products: imports and exports, primary and manufactures. Evans (1987) argues that there is no reason why there should be a difference between primary commodities and manufactures when correcting for quality changes. Bleany and Greenaway (1993) state that the opposite is more plausible. The contribution of this paper is theoretical and allows for increasing, constant and decreasing terms of trade, and therefore does not depend on the quality issue.

Income terms of trade (ITT) may be increasing, although NBTT are decreasing (Gillis *et al.*, 1992, chapter 15; Athukorala, 1993, p. 1611). However, the ITT concept is not as easily related to a growth theoretic framework as are NBTT. In the sequel, we show that falling NBTT in the context of the Prebisch-Singer model imply that the economy has a lower long-term growth rate than in autarchy.

Within the highly abstract framework of the last model, a comparison of autarchic and open economy growth rates for the case of falling NBTT may be drawn, as in figure 4, under the simplifying assumption that they prevail from the beginning. If trade is opened in period zero, output Y increases through additional investment, as the foreign K-sector is more competitive. These are short-term gains from trade. In the long run, growth rates are lower if the terms of trade are falling (recalling equation [B.9] and figure 3),

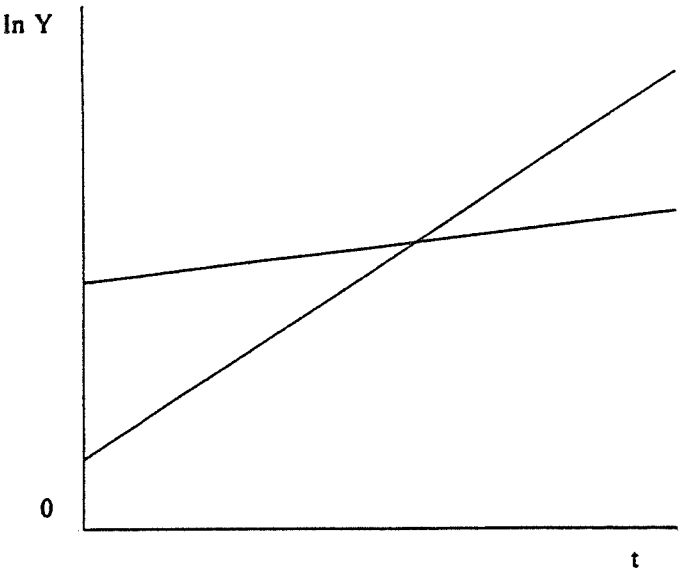

Figure 4
The steeper line indicates output growth in log-terms under autarchic growth. The flatter line indicates lower growth rates of the open Prebisch-Singer economy.

implying long-term losses from trade. For a high discount rate, short-run gains outweigh long-run losses. Under low discount rates autarchy is preferable. Historically, trade has been opened by means of colonialism, and it is not obvious what the discount rate was at the time of opening trade. The question then arises as to which policy measures going beyond the narrow framework of the model can ensure the participation of a country in the gains from trade.

C. Concluding remarks on economic policy and suggestions for further research

In this final section, we discuss (i) some issues concerning the robustness of the model, (ii) the role of tariffs and subsidies, and (iii) the impact of government policy on the specialization assumed in the model.

1. Robustness of the model results

Since the debt crisis, at least interest has shifted to the question whether theoretical results also hold when debt is introduced. It can be shown that all the results carry over to a more complicated model, with international indebtedness and a domestic factor consisting of a stock of domestic products produced by equation (B.1). Debt adjusts the domestic interest rate to the world interest rate, but does not change the growth rate results. In modern parlance, debt has level effects but no long-term growth rate effects. The simplicity of the formulas given here, however, will be lost when debt is introduced, because the dynamics and the solution technique become rather complicated but add nothing to the Prebisch-Singer issue.

The introduction of export demand elasticities has been achieved at the cost of cutting off the coun-

try that is exporting the capital goods. Assuming that imported capital goods are the *numeraire*, all variables are expressed in terms of capital goods that could be bought at the respective value. As a consequence, variables such as technical progress in capital goods production are only implicitly present. Their impact was explicit in two country models (Darity, 1990).

2. *Tariffs and subsidies*

The model discussed above has shown that even in the absence of luxury goods consumption, slow export growth may lead to slow growth of other variables. Whether tariffs and import substitution-based industrialization are a way out of the growth problem is dubious, because tariffs would probably have to increase over time - if helpful at all, in view of the possibility that they encourage the development of competing (synthetic) substitutes. Moreover, if luxury goods imports are reduced by tariffs or taxes, resources tend to shift to the import-competing sector. Prebisch criticized this policy, arguing that it discriminated against exports (1961, p. 5). Instead, he favoured a different type of import-substitution industrialization policy than the present one. New export goods in particular should have been promoted more strongly. Is this not exactly what the NICs did at a later stage?

Such a policy may lead to a shift of resources to products with higher income elasticities. However, it is questionable whether we may say much more about it than did Prebisch (1961, p. 5): "This is admittedly a problem for which there is no simple practical solution, but it is undoubtedly true that the lack of subsidy policy, especially for new exports ... [has] caused ... countries to miss export opportunities." The critical question nowadays is whether or not there should be other subsidies than those for R&D.

3. *The government impact on specialization*

The key to economic policy measures from the point of view of the model presented above is how we explain capital goods importation. This kind of specialization is often said to be due to the colonial heritage. But to judge by the survival of this heritage, there must be something efficient about it, except for the possibility that there are Matthew's conditions yielding convex transformation curves and lock-in on the inefficient side of specialization. For example, learning effects produce a lock-in on the wrong end, as in the models of Eaton and Panagariya or Kemp (Bhagwati and Srinivasan, 1983, chapter 26). So the task for future research will be to explain the efficiency of capital goods importation.

It may be tempting to recommend to the developing countries the "reduction of the need for imported capital goods" (Taylor, 1981, p. 601). But to make this recommendation, we need to know under what conditions the importation of capital goods is efficient. Griffin and Gurley (1985, pp. 1089-1143) argue that decreasing terms of trade lead to increasing relative prices of capital goods, and therefore provide an incentive to start up a capital goods sector. However, we know from Ricardian trade theory that relative productivities matter. For each price path, one can therefore imagine a path of relative labour productivities such that capital goods production does not become profitable, because productivity in that sector is growing at a low rate relative to others. It may be recalled that within the framework of sound microeconomic theory only externalities and public goods justify government interference in the market allocation mechanism, if the latter works under competitive conditions and insurance problems are not of immediate relevance to the specific problem discussed. The question therefore is what influence do externalities and public goods have on this kind of specialization (import of capital goods)?

In the development literature, it was Schultz (1964 and 1981, pp. 4-12) who laid the greatest emphasis on public goods. In his theory, public goods are mainly necessary for human capital production, which in turn enhances technical progress. Schultz' ideas may turn out to be useful here in explaining the specialization problem. Let us suppose that capital goods are produced and that they are relatively intensive in human capital; that the scarcity of human capital, representing technology in the Ricardian model here, may - owing to the lack of such public goods as "basic research" and "basic education" - make the production of capital goods too expensive to become internationally competitive; and that import of capital goods is finally caused by tax resistance, which leads to a scarcity

of public goods and human capital. This may be an interesting working hypothesis for the future. If it should turn out to be correct, the only way for a reduction of the need for imported capital goods would be a democratization process which diminishes tax resistance and increases investment in public goods to enhance human capital. This should not be confused with direct investment in schooling of all kinds. Such an interference with the market allocation mechanism which does not limit itself to public goods may clearly lead to what is now well known as "skilled unemployment". Of course, any other investment in public goods which have proven to be a bottleneck is welcome as well, especially if it increases technical progress. As long as this is not relevant, it is important to invest in those public goods which decrease the production costs of capital goods. The role of sector-specific infrastructure has also been emphasized by Evans (1987, pp. 665/6) and Bardhan (1982, p. 170), the latter emphasizing the role of the social class structure as well as of the State.

Up to now there seems to have been a dichotomy in development economics: some have emphasized internal factors in explaining underdevelopment, others external factors. If the working hypothesis presented here turns out to be correct, the two views may be reconciled: internal factors (lack of public goods) may be responsible for the lack of international competitiveness, leading to the import of capital goods; while external factors (low export elasticities) may be important because of this lack of competitive ability.

The final outcome of this line of thought may be that it is the sector-specific infrastructure which determines the comparative (dis)advantage of goods. This disadvantage leads to the import of capital goods, which is at the heart of the Prebisch-Singer view of growth.

Annex I

Equation (B.11) may be written as a linear function of ρ:

$$\hat{w} - \hat{p} = -[\beta\epsilon + b\eta]/[-\eta(1-\beta)+\beta] + \rho\beta\hat{Z}/[-\eta(1-\beta)+\beta]$$

Inserting $\hat{Z} = \epsilon + b/(1-\beta)$ yields:

$$\hat{w} - \hat{p} = -[\beta\epsilon + b\eta]/[-\eta(1-\beta)+\beta] + \rho\beta[\epsilon + b/(1-\beta)]/[-\eta(1-\beta)+\beta]$$

The slope is:

$$\beta[\epsilon + b/(1-\beta)]/[-\eta(1-\beta)+\beta]$$

$$= \begin{cases} \epsilon + b/(1-\beta) & \text{if } \eta = 0 \\ \beta[\epsilon + b/(1-\beta)] & \text{if } \eta = -1 \\ 0 & \text{if } \eta = -\infty \end{cases}$$

The slope becomes flatter as exports become more price-elastic. The vertical intercept is:

$$-(\beta\epsilon + b\eta)/[-\eta(1-\beta)+\beta]$$

$$= \begin{cases} -\epsilon & \text{if } \eta = 0 \\ b - \beta\epsilon & \text{if } \eta = -1 \\ b/(1-\beta) & \text{if } \eta = -\infty \end{cases}$$

The vertical intercept becomes larger as exports become more price elastic. For each η, there is a straight line that must pass through a point with ordinate $b/(1-\beta)$ at $\rho=1$ because of equation (B.11'). This annex is summarized in figure 2.

Annex II

$\hat{P}$ may be written as a linear function of ρ after insertion of $\hat{Z} = \epsilon + b/(1-\beta)$:

$$\hat{P} = -[b + \epsilon(1-\beta)]/[-\eta(1-\beta)+\beta] + \rho[b/(1-\beta) + \epsilon](1-\beta)/[-\eta(1-\beta)+\beta]$$

The slope is:

$$= \begin{cases} [b/(1-\beta)+\epsilon](1-\beta)/\beta & \text{if } \eta = 0 \\ [b/(1-\beta)+\epsilon](1-\beta) & \text{if } \eta = -1 \\ 0 & \text{if } \eta = -\infty \end{cases}$$

$$[b/(1-\beta)+\epsilon](1-\beta)/[-\eta(1-\beta)+\beta]$$

The slope is larger if exports are less price elastic. The vertical intercept is:

$$-[b + \epsilon(1-\beta)]/[-\eta(1-\beta)+\beta]$$

$$= \begin{cases} [b + \epsilon(1-\beta)]/\beta & \text{if } \eta = 0 \\ [b + \epsilon(1-\beta)] & \text{if } \eta = -1 \\ 0 & \text{if } \eta = -\infty \end{cases}$$

The vertical intercept is less negative if exports are more price-elastic. If the price elasticity of exports is minus infinity, the $\hat{p}$ -line becomes

identical to the horizontal axis. This annex is summarized in figure 3.

Notes

1 Prebisch (1950, pp. 1-22, and 1959, pp. 251-273) at UN/ECLAC and later at UNCTAD.
2 Myrdal (1956), then at UNECE.

References

ARDENI, P.G. and B. WRIGHT (1992), "The Prebisch-Singer hypothesis: A reappraisal independent of stationarity hypothesis", *Economic Journal*, Vol. 102, No. 413 (July).

ATHUKORALA, P. (1993), "Manufactured exports from developing countries and their terms of trade: A re-examination of the Sarkar-Singer results", *World Development*, Vol. 21, No. 10.

BARDHAN, P.K. (1982), "Unequal exchange in Lewis-type world", in Gersovitz *et al.* (eds.), *The Theory and Experience of Economic Development* (London: George Allen and Unwin).

BARDHAN, P.K. and S. LEWIS (1970), "Models of growth with imported inputs", *Economica*, November.

BARROS, A.R. and A. AMAZONAS (1993), "On the deterioration of the net barter terms of trade for primary commodities", *UNCTAD Review*, No. 4.

BHAGWATI, J.N. and T.N. SRINIVASAN (1983), *Lectures on International Trade* (Cambridge, MA and Cambridge, UK: MIT Press).

BLEANY, M.F. (1993), "Manufactured exports of developing countries and their terms of trade since 1965: A comment", *World Development*, Vol. 21, No. 10.

BLEANY, M.F. and D. GREENAWAY (1993), "Long-run trends in the relative price of primary commodities and in the terms of trade of developing countries", *Oxford Economic Papers*, No. 45.

BRECHER, R.A. and E.U. CHOUDHRI (1982), "Immiserizing investment from abroad: The Singer-Prebisch Thesis reconsidered", *Quarterly Journal of Economics*, February.

BURGSTALLER, A. (1985), "North-South trade and capital flows in a Ricardian model of accumulation", *Journal of International Economics*, Vol. 18.

BURGSTALLER, A. and N. SAAVEDRA-RIVANO (1984), "Capital mobility and growth in a North-South model", *Journal of Development Economics*, Vol. 15.

CUDDINGTON, J.T. and C.M. URZUA (1989), "Trends and cycles in the net barter terms of trade: A new approach", *Economic Journal*, Vol. 99.

DARITY, W., Jr. (1990), "The fundamental determinants of the terms of trade reconsidered: Long-run and long-period equilibrium", *American Economic Review*, September.

DONGES, J.B. and J. RIEDEL (1977), "The expansion of manufactured exports in developing countries: An empirical assessment of supply and demand issue", *Weltwirtschaftliches Archiv*, Vol. 113.

ERNST, D. (1973), "Entwicklung durch importsubstituierende Industrialisierung", *Das Argument*, Vol. 79.

ESFAHANI, H.S. (1991), "Exports, imports and economic growth in semi-industrialized countries", *Journal of Development Economics*, Vol. 35, No. 1.

EVANS, D. (1987), "The Long-run determinants of North-South terms of trade and some recent empirical evidence", *World Development*, Vol. 15.

FAINI, R., F. CLAVIJO and A. SENHADJI-SEMLALI (1992), "The fallacy of composition argument: Does demand matter for LDC manufactured exports?", *European Economic Review*, Vol. 36, No. 4 (May).

FINDLAY, R. (1970), *Trade and Specialization* (Harmondsworth, UK: Penguin).

____ (1980), "The terms of trade and equilibrium growth in the world economy", *American Economic Review*, June.

____ (1981), "The fundamental determinants of the terms of trade", in S. Grassman and E. Lundberg (eds.), *The World Economic Order: Past and Prospects* (London: Macmillan Press).

____ (1983), "Growth and development in trade models", in R.W. Jones and P.B. Kenen (eds.), *Handbook of International Economics*, Vol. 1, chapter 4 (Amsterdam: North-Holland).

GILLIS, M., D.D. PERKINS, M. ROEMER and D.R. SNODGRASS (1992), *Economics of Development*, third edition (New York and London: W.W. Norton and Co.).

GRIFFIN, K. and J. GURLEY (1985), "Radical analysis of imperialism, the third world, and the transition to socialism", *Journal of Economic Literature*, Vol. 23, No. 3 (September).

HENTSCHEL, J. (1992), *Imports and Growth in Highly Indebted Countries: An Empirical Study* (Berlin, Heidelberg, New York: Springer Verlag).

HOFFMANN, U. and D. ZIVKOVIC (1992), "Demand growth for industrial raw materials and its determinants: An analysis for the period 1965-1988", *UNCTAD Discussion Paper*, No. 50.

JORGENSON, D.W. (1961), "The development of dual economy", *Economic Journal*, Vol. 71, June.

KRAVIS, I.B. (1970), "Trade as a handmaiden of growth", *Economic Journal*, December.

LEWIS, W.A. (1954), *Economic Development with Unlimited Supplies of Labour* (Manchester, UK: Manchester School of Economics and Social Studies).

LINNEMANN, H. (1993), "Internationale handel en economische groei in ontwikkelingslanden", *Maandschrift Economie*, Vol. 57.

MANESCHI, A. (1983), "The Prebisch-Singer Thesis and the 'widening gap' between developed and developing countries", *Canadian Journal of Economics*, Vol. 16, No. 1 (February).

MOLANA, H. and D. VINES (1989), "North-South growth and the terms of trade: A model on Kaldorian lines", *The Economic Journal*, Vol. 99, June.

MYRDAL, G. (1956), "Development and underdevelopment", National Bank of Egypt Fiftieth Anniversary Commemoration Lectures, Cairo; reprinted in J.A. Pincus (ed.), "Reshaping the world economy: Modern economic issues", *Spectrum Book*.

NGUYEN, T.-H. (1981), "Trends in terms of trade of LDCs", *Journal of Economic Studies*, Vol. 8, No. 2.

PREBISCH, R. (1950), "The economic development of Latin America and its principal problems", *Economic Bulletin for Latin America*, Vol. 7, No. 1 (reprinted in February 1962).

____ (1959), "Commercial policy in the underdeveloped countries", *American Economic Review*, Papers and Proceedings, Vol. 59, No. 2 (May).

____ (1961), "Economic development or monetary stability: The false dilemma", *Economic Bulletin for Latin America*, Vol. 6, No. 1 (March).

SACHS, J. (ed.) (1989), "The international financial system", *Developing Country Debt and Economic Performance*, Vol. 1 (Chicago: University of Chicago Press).

SAPSFORD, D., P. SARKAR and H.W. SINGER (1992), "The Prebisch-Singer terms of trade controversy revisited", *Journal of International Development*, No. 4, May-June.

SARKAR, P. and H.W. SINGER (1993), "Manufacture-manufacture terms of trade deterioration: A reply", *World Development*, Vol. 21, No. 10.

SCHULTZ, T.W. (1964), *Transforming Traditional Agriculture* (Newhaven, Conn.: Yale University Press).

____ (1981), "Knowledge is power in agriculture", *Challenge*, Vol. 24, No. 4 (September/October).

SEERS, D. (1962), "A model of comparative rates of growth in the world economy", *The Economic Journal*, Vol. 72, No. 285 (March).

SENGHAAS, D. (1982), *Von Europa Lernen, Entwicklungs-geschichtliche Betrachtungen*, edition Suhrkamp, Vol. 134.

SINGER, H.W. (1950), "The distribution of gains between investing and borrowing countries", *American Economic Review*, Vol. 40, No. 2.

SÖDERSTEN, B. (1980), *International Economics*, second edition (London: Macmillan Press), chapters 9-12.

____ (1981), "Comments" (on Findlay), in Grassman and Lundberg (eds.), *The World Economic Order: Past and Prospects* (London: Macmillan Press).

SOLOW, R.M. (1956), "A contribution to the theory of economic growth", *Quarterly Journal of Economics*, Vol. 50, No. 1 (February).

SPRAOS, J. (1983), *Inequalizing Trade* (Oxford: Clarendon Press, in cooperation with UNCTAD).

STERN, R.M., J. FRANCIS and B. SCHUMACHER (1976), *Price Elasticities in International Trade* (London: Macmillan).

TAYLOR, L. (1981), "South-North trade and Southern growth: Bleak prospects from the structuralist's point of view", *Journal of International Economics*, Vol. 2.

THIRLWALL, A.P. (1983), "Foreign trade elasticities in centre-periphery models of growth and development", Banca Nazionale Del Lavaro, *Quarterly Review*, September.

VERSPAGEN, B. (1993), *Uneven Growth between Interdependent Economies* (Aldershot, UK, and Brookfield, USA: Avebury).

ZAREMBKA, P. (1972), *Toward a Theory of Economic Development* (San Francisco: Holden-Day).

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