**International Trade Policy and Global Growth: A Structuralist-Keynesian Perspective**

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## Abstract

In this paper we argue that structuralist ideas are particularly useful for discussing global growth in times of crisis. Two are the main points of the paper. The first one is that specific policies for promoting structural change in the periphery at both the domestic and international levels are necessary for increasing the participation of the periphery in world trade. Automatic or implicit reciprocity ensures that more exports from the periphery will lead to more imports, and thereby neither growth nor exports would suffer in the centre. In addition, we stress the inter-relation between fiscal policies and industrial and technology policies aimed at structural change in the periphery. The two policies should be combined to avoid external disequilibrium and protectionist responses.

## Introduction

The current international crisis has encouraged expansive fiscal policies in several countries and calls for avoiding an escalation of protectionism. In addition, there is a broad consensus suggesting that, if the deepening of the crisis is to be at least mitigated, a coordinated international response is required. This implies not only rethinking the rules governing international finance (perhaps the most urgent challenge to be addressed in the next years) but also those that organize international trade.

In this paper we suggest that the structuralist perspective, and in particular the ideas of Raul Prebisch and the Economic Commission for Latin America and the Caribbean (ECLAC) on international trade and development, could be particularly useful for devising a new set of policies in which concerns with global growth and distribution are paramount. The starting point of Prebisch (1962, 1963) and ECLAC (1955) is to acknowledge the existence of persistent asymmetries between developed and developing economies as regards technological capabilities and the pattern of specialization. They suggest that these asymmetries must be taken into account in the discussion of the new forms of governance for the financial and trade systems. We develop the strcuturalist approach with a view to highlighting the complementary between policies for structural change and those aimed at managing the aggregate effective demand. We argue that, to be effective, these policies should be combined and go hand by hand in an international economy with heterogeneous actors, particularly in the context of a global crisis.

Two are the main points of the paper. The first one is that it is necessary to look at global structural change, trade and growth as co-evolving processes driven by different rates of innovation and diffusion of technology. International trade is the handmaiden of growth, as Diaz-Alejandro (1982) convincingly put it. But as Prebisch did note, in a world marked by technological asymmetries, the beneficial effects of trade would reach the periphery in just a very limited form. Countries whose productive structures are concentrated in few commodities with low income-elasticity of the demand for exports would be unable to sustain or expand their participation in global trade flows

(McCombie and Thirlwall, 1994)[1]. The low dynamism of their exports would inhibit their capacity to import[2]. In an interdependent international economy, this means less growth in the periphery and less demand for centre exports. Asymmetries are therefore not inconsequential for global growth.

This produces a kind of paradox, in which a too specialized productive structure reduces the potential for trade. To understand why it is necessary to recall that intra-industry specialization requires countries with similar, advanced technological capabilities. A high specialization along inter-industry lines with little accumulation of knowledge hampers the ability of the country to specialize along intra-industry lines. Specialization in commodities, to the extent that reveals weak technological capabilities, compromises trade, while the diversification of the productive structure towards more technology-intensive goods enhances it. This is a basic structuralist point: more trade requires structural change in the periphery, and a complementary process of structural change in the centre. Such inter-related processes would not emerge spontaneously from market forces, but requires deliberated policies in both poles of the system.

The second point has to do with the role of fiscal policy in promoting growth and its relation with the productive structure. A policy which solely focuses on technological learning and efficiency may lead to higher unemployment, and not to higher growth, if it is not complemented by a parallel rise in effective demand (Cimoli and Porcile, 2009b). Part of the increase in demand would come out of exports, and part from the workings of the foreign trade multiplier, but an active fiscal policy should be in place as well to keep aggregate demand in line with the growth potential. Inversely, if the fiscal policy is used as the only instrument to sustain demand, without diversifying exports and improving international competitiveness, then growth will be checked by external disequilibrium. This kind of pure Keynesian policy will not be sustainable and is bound to collapse in the long run.

The paper is organized in three sections, besides the introduction and a concluding section. Section I briefly the presents structuralist ideas on trade, growth and

[1] See Dosi *et al* (1990), Rodriguez (2006) and Cimoli and Porcile (2009a)
[2] Prebisch also observed that this kind of specialization would prevent the periphery from benefiting of technical change in the exporting sector, as the terms of trade would gradually deteriorate. A recent reappraisal of the terms of trade debate is Ocampo and Parra (2005).

international cooperation, and discusses their policy implications. Section II develops these ideas within the framework of a Balance-of-Payments constrained growth model (based on McCombie and Thirlwall, 1994), and discusses the effects of alternative industrial and fiscal policies. Section III extends the basic Keynesian model with a view to including the technological dimension, drawing from the literature on international technological catching up and technological competitiveness (Dosi *et al*, 1990; Patel and Pavitt, 1998; Araujo and Lima, 2007; Cimoli and Porcile, 2009a). This extension allows for a more rigorous analysis of the conditions that produce consistency between policies for structural change (industrial and technological policies) and those aimed at managing effective demand (fiscal policy).

## I. Trade and Growth in the Centre-Periphery System

### *I.1. Technology and the Formation of the Centre-Periphery System*

Structuralist ideas on trade and development have been frequently misread. They have been considered unfavorable or even hostile to international trade, a perspective which is not supported by a first-hand reading of Prebich and ECLAC works. The main concern of these authors is with the implications for growth of the wide technological asymmetries that exist between the two poles of the international system, centre and periphery. Structuralists argued that the correction of these asymmetries will lead to more trade, not less, and that changing the pattern of specialization should be actively pursued by policy-makers. This section briefly summarizes some of the key points raised by structuralist authors[3].

The analysis begins with an undifferentiated international economy, which does not present significant differences in technology and productivity across regions. At a certain point in time technical change accelerates in the centre, gradually transforming its productive structure, which becomes diversified and homogeneous. The centre is *diversified* in the sense that presents a large number of sectors and activities, and *homogeneous* in the sense that labor productivity is fairly similar across them. At the

[3] This section follows mainly Prebisch (1962, 1963, 1981) and Rodriguez (1980, 2006). Please not that many of the points that will be discussed in this paper have as well been raised by authors coming from different school of thoughts and theoretical persuasions. Our focus on structuralism should not be seen as a dismissal of these contributions.

same time, technology only diffuses at a very slow rate towards other regions, where penetrates in a highly localized form (chiefly in a few exporting activities). This gives rise to the *specialized* and *heterogeneous* productive structure that characterizes the periphery. There are less sectors and activities, and they exhibit major differences in labor productivity, as technical change leaves untouched large traits of the production system. Such differences are the basis of the idea of having a dual economy in the developing countries, with a significant share of employment allocated in archaic and subsistence sectors[4].

Figure 1 presents a stylized description of the evolution of the centre-periphery system. Each box represents one of the two economies, centre and periphery. In both boxes labor productivity ($\pi$, left vertical axis) is plotted against the number of sectors (N, abscise axis), which are ordered as a monotonically increasing function of labor productivity, represented by the dotted line. Sector N=1 is the one with the highest labor productivity, while the last sector $N^j$ (which is $N^C$ in the centre and $N^P$ in the periphery) has the lowest labor productivity. At the same time, in the same box, the participation in total accumulated employment ($0 < E \leq 1$, where $E_i = \sum_{i=1}^{N^J} Ni$) is represented in the right vertical axis and plotted against the number of sectors of the economy. As the number of sectors increases, so does accumulated total employment. Figure 1 thus plots two variables, labor productivity (left vertical axis) and accumulated employment (right vertical axis), as a function of the number of sectors in the economy.

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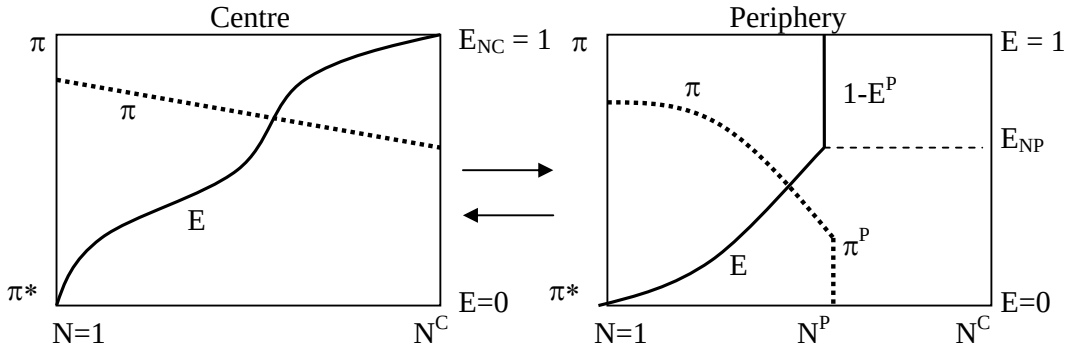
Two features in figure 1 are particularly interesting. First, productivity in the centre declines smoothly with the number of sectors, in such a way that the difference in productivity between sectors 1 and $N^C$ (the last sector of the centre economy) is small. On the other hand, productivity declines rapidly in the periphery because technical progress is highly localized in the export activities and it does not percolate to the rest of the economic structure. As a result workers employed in the "last" sector of the periphery ($N^P < N^C$) have productivity levels which are much lower than those employed in the export sectors. This gives rise to a heterogeneous economic structure, in which substantial part of the workforce remains in low-productivity jobs and just a small group

[4] For a discussion of the concept of structural heterogeneity, cf. Pinto (1970). See also Cimoli et al (2005).

in the high-productivity ones. Moreover, since $N^P$ is much lower than $N^C$, the degree of diversification of the productive structure of the periphery is clearly hampered.

The continuous line shows the evolution of the accumulated participation in total employment as N increases. It can be seen that the centre is able to employ all its labor supply in modern activities, since when $N=N^C$ then $E_{NC}=1$. But in the periphery there still remains a substantial part of the workforce unemployed when $N=N^P$. In other words, not all the workforce will find a job in the modern sector in the periphery and therefore part of it and $(1 - E_{NP})$ is bound to be allocated in subsistence activities. Therefore there are two sources of heterogeneity in the periphery. First, there are large differences in productivity between people employed in the export sector and in the last "modern" sectors. Secondly, there is a large part of the peripheral workforce still allocated in the subsistence sector, either urban or rural, either formal or informal. This contributes to explain why heterogeneity and income inequality are so pervasive in the periphery as compared to the centre.

**Figure 1. The Centre and Periphery Economic Structures**




**Variables**

$\pi$ = Labor productivity (pointed line)
E =accumulated participation in total employment (continuous line)

N= Number of sectors ranked as a monotonically decreasing function of labor productivity
$N^C$ = Total number of sectors in the centre
$N^P$ = Total number of sectors in the periphery
$E_{NP}$ = Total employment in the modern sector of the periphery (the residual, $1-E_{NP}$is allocated in the subsistence sector)
$E_{NC}$ = Total employment in the modern sector of the centre, which equals 1(there is no subsistence sector in the centre)
$\pi*$ = Labor productivity in the subsistence sector of the periphery
$\pi^P$ = Labor productivity in the sector number $N^P$ in the periphery

*I.2. Asymmetries and International Trade Policy*

Why does international trade fail to encourage a more even diffusion of technology across regions and within the periphery? Structuralists identify strong inertial forces in the pattern of specialization and several barriers to technical change in the periphery subsistence sectors. They argue that market forces alone would be unable to correct these asymmetries and would reproduce them in different forms and in a wider scale. When Prebisch and ECLAC presented their first contributions, in the late forties and

early fifties, there were no solid microeconomic foundations for the study of innovation and diffusion of technology that could be used to rigorously support their claims about barriers to the transformation of the productive structure (Cimoli and Porcile, 2009b). But they proved to be rather consistent with the microeconomic theories of inflexibility, information asymmetries and leads and lags in learning developed since the late seventies, particularly by the evolutionary school (Dosi, 88). To a large extent the new growth, trade and economic geography theories that flourished in the past twenty years are based on the avenues opened up by the microeconomics of increasing returns and path-dependency (Arthur, 1994; Krugman, 991).

The persistence of technological asymmetries (as reflected in the technology gap) implies that the periphery specializes in goods that are less intensive in technology and, in general (except for some periods of good luck in the commodity lottery), with low income-elasticity of the demand for exports. At the same time the periphery displays a high income-elasticity of the demand for imports. These differences between the income-elasticity of exports and imports have as a consequence that growth will be constrained by the availability of foreign exchange. The periphery needs to grow at very high rates to be able to transfer the labor force underemployed in low-productivity sectors towards higher-productivity sectors. This is the only form of overcoming heterogeneity in labor productivity. But external disequilibrium sets a limit to growth and as a consequence a substantial share of labor is forced to remain in the subsistence sector.

The need to speed up growth and absorb the underemployed gives rise to another key tenet of the structuralist school, the idea that the periphery offers *automatic or implicit reciprocity* to the centre. In effect, each additional unit of foreign exchange the periphery obtains from international trade will be transformed into additional imports of capital and high-tech goods form the centre. These imports are indispensable for sustaining higher rates of investment and growth. Automatic reciprocity implies that the periphery will not accumulate reserves, but convert all its foreign exchange into growth.

A corollary of the external constraint in the periphery is that the participation of the periphery in international trade is to a large extent a function of its capacity to export. The limits to trade do not emerge from protection, but from the fact that the periphery

lacks the technological capabilities required to participate more actively in the process of increasing division of labor at a world level, based on intra-industry trade. Protection is the result of the failure to absorb technology and raise competitiveness and will fall as new export opportunities arise. If the centre facilitates manufacturing exports from the periphery, this will lead to higher global growth, with no costs in terms of growth and exports for the centre.

The stylized relations sketched above of course do not consider the complex process of mutual structural adjustment in centre and periphery that is necessary for this positive-sum game to work. As the periphery diversifies and changes its pattern of exports and imports, so should change that of the centre. The parallel and complementary processes of structural change in both poles would not always run smoothly. Thus, the construction of institutions capable of coordinating and facilitating these adjustments is a crucial concern of the structuralist approach to international trade policy (Ocampo, 2005). International cooperation is deemed critical to surmount the tensions and difficulties that accompany the mutual transformation of productive structures.

The idea that Prebisch and ECLA opposed trade emerged mainly from the identification of structuralism with import-substituting industrialization. But Prebisch in different moments made it clear that import-substitution was a second-best avenue for industrialization, which should be embraced solely when for some reason it would not be possible to diversify exports. In his own words (Prebisch, 1981, pp.184-85):

"*Trade is an essential condition for development since it provides the necessary goods that a periphery country cannot produce because of lack of natural resources or lack of technological and economic capabilities. It has to export to be able to buy these goods (…) Yet primary production is normally insufficient to play this role (…) Therefore exports of manufactures become a necessity. But in this point emerges a serious barrier, since the centers are generally unwilling to take peripheral manufactures at the rate required by development (…) There are two forms of correcting the disparity of elasticities [between peripheral exports and imports]: one is exporting new goods along with those traditionally exported (…); the other is to encourage the expansion of domestic production. The first alternative is to be preferred. But if this option is not available, then the second one should be adopted to foster development"*.

Thus, industrialization is seen as the form of both correcting the differences in the income elasticities of the demand for exports and imports and reducing technological asymmetries between centre and periphery. But for advancing in this direction there should be international cooperation to facilitate the diversification of exports and technical change in the periphery. Prebisch himself devoted considerable efforts since the mid-sixties for institution building, as Director of UNCTAD, with the objective of reshaping the rules of trade in a favorable direction for peripheral exports. Although he had little success in this, the key problems of institution building and of defining new sets of rules at a global level gradually received more attention from both policy-makers and theorists[5]. Our previous analysis suggests that for fostering openness these rules should necessarily take into account the heterogeneity that characterizes the international system. A purely market-led approach to international relations will fail to explore all the potential for trade. More trade and laissez-faire policies may move in opposite directions when there are structural barriers to diversification.

The need of active government intervention to support the expansion of trade is not confined to international rules. The economic history literature in both developed and developing countries confirms that without active domestic policies trade would be compromised[6]. In the case of the developing countries, the evidence points out a positive association between industrial and technology policies and an increasing participation in world trade. The case of the SE Asian countries, as opposed to the Latin American case, provide a clear-cut example of how trade and growth can be enhanced by active industrial and technology policies (ECLA, 2007). The more intense transformation of the structure of exports towards high-tech sectors allowed the Asian region to increase its share in world trade, while the opposite occurred in Latin America, which remained by large as an exporter of commodities and low-tech industrial goods (Fransman, 1986; Lall, 1997; Cimoli *et al*, 2009).

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[5] In a pioneer work, Kindleberger (1986) suggested that governance in international relations is a public good produced at a sub-optimal level. Keohane (1984) argued that institutions for global cooperation are required to raise the supply of international public goods, such as stable set of rules for multilateral trade.

[6] Kindleberger (1978 and 2000, chapter 7), for instance, gives support to this view in his historical account of the origins of free trade in England, which was associated with the approval of new laws for protecting the poor. Katzenstein (1985) found convincing evidence from his studies of the small open European economies that openness required strong policy intervention in the domestic economy in order to sustain growth and equity. Otherwise, mounting pressures in favor of protectionism would hamper integration to the international system.

In sum, protectionism is the outcome of policies that foster growth without a parallel effort for changing the pattern of specialization and improving international competitiveness. Rapid growth in a commodity-specialized economy will sooner than later meet the external constraint. This led Prebisch and ECLAC to stress the importance of having policies that encourage the diversification of exports towards technology-intensive sectors with higher income elasticity of demand. Changing the pattern of specialization would allow the periphery to increase its participation in global trade without compromising growth in the centre. In the wake of the recent crisis, many countries have resorted to fiscal policy to avoid a steeper fall in economic activity. We argue that it is also necessary not to neglect the importance of the technology and industrial policy.

In the next section we develop the structuralist approach within the framework of a Keynesian-Schumpeterian model of growth. The model allows for a rigorous discussion of the conditions necessary for automatic reciprocity and shows the interaction between fiscal policy and structural change. We believe it offers a contribution to the modeling of heterodox ideas and exploring their implications for the international political economy.

## II. Fiscal Policy, Structural Change and Automatic Reciprocity

### *II.1. A Two-Country Dynamic Keynesian System: the MT Model*

Our starting point is the two-country BOP-constrained growth model suggested by McCombie (1988) and McCombie and Thirlwall (994, chapter 7), which we will call MT model. It begins with conventional Keynesian equations for country 1 (periphery) and 2 (centre):

(1) $Y_1 = C_1(Y_1) + I_1(Y_1) + Z_1(Y_1) + X_1 - M_1(EP_2 / P_1)$

(2) $Y_2 = C_2(Y_2) + I_2(Y_2) + Z_2(Y_2) + X_2 - M_2(P_1 / EP_2)$

Consumption (*C*), investment (*I*) and government spending (*Z*) have two components, one of which is autonomous and the other depends on income (see the mathematical appendix for details). In turn the quantity of exports (*X*) depends on the real exchange rate and on the other country's GDP. Formally:

$$(3)\ X_i = \left(\frac{P_j E}{P_i}\right)^{\phi_1} \left(Y_j\right)^{\pi_j}$$

In equation (3) $\phi_1$ is the price elasticity of the demand for exports of country *i* and $\pi_j$ the income elasticity of the demand for imports of country j. *E* is the nominal exchange rate (units of currency of country *i* per unit currency of country *j*), while $P_i$ and $P_j$ denote domestic and foreign price levels. It should be recalled that in a two-country model, exports from one country are imports from the other ( $X_i = M_j$ ), and hence the income elasticity of the demand for imports in country $j, \pi_j$, corresponds to the income elasticity of the demand for exports of country *i*.

The condition for current account equilibrium in both countries is given by:

$$(4)\ P_i X_i = P_j E M_i$$

Taking logs in equations (1), (2) and (3), differentiating with respect to time, and assuming that purchasing power parity holds (and hence the real exchange rate is about constant in the long run), then we have[7]:

$$(5)\ y_1 = \alpha_1 a_1 + \beta_1 \pi_2 y_2$$

$$(6)\ y_2 = \alpha_2 a_2 + \beta_2 \pi_1 y_1$$

Small letters represent proportional rates of growth (for instance, $p = (dP/dt)(1/P)$ is domestic inflation). In equation (4), $y_1$ is the rate of growth of the periphery, $\pi_2$ is the income elasticity of the demand for imports in country 2, $\pi_1$ is the income elasticity of the demand for imports in country 1, and $y_2$ is the rate of growth of country 2. The

[7] Cf. the mathematical appendix.

coefficients $\alpha$ and $\beta$ are related to the share in total GDP of the different components of effective demand. Thus, equation (5) gives the rate of growth of the periphery as a function of the growth rate of its autonomous expenditure and the growth rate of exports. Symmetrically, equation (6) provides the rate of growth of country 2 as a function of the growth rate of its own expenditures and exports. By log-differentiating equation (3) we get:

(7) $x_i = \phi_i (p_j - e - p_i) + \pi_j y_j$

In equilibrium, with a constant real exchange rate $\left(p_j - e - p_i = 0\right)$, the rate of growth of exports of *i* should equal the rate of growth of imports of *i*:

(8) $x_i = \pi_j y_j^* = m_i = \pi_i y_i^*$

This condition can be rewritten to obtain the equilibrium rate of growth the two countries as follows:

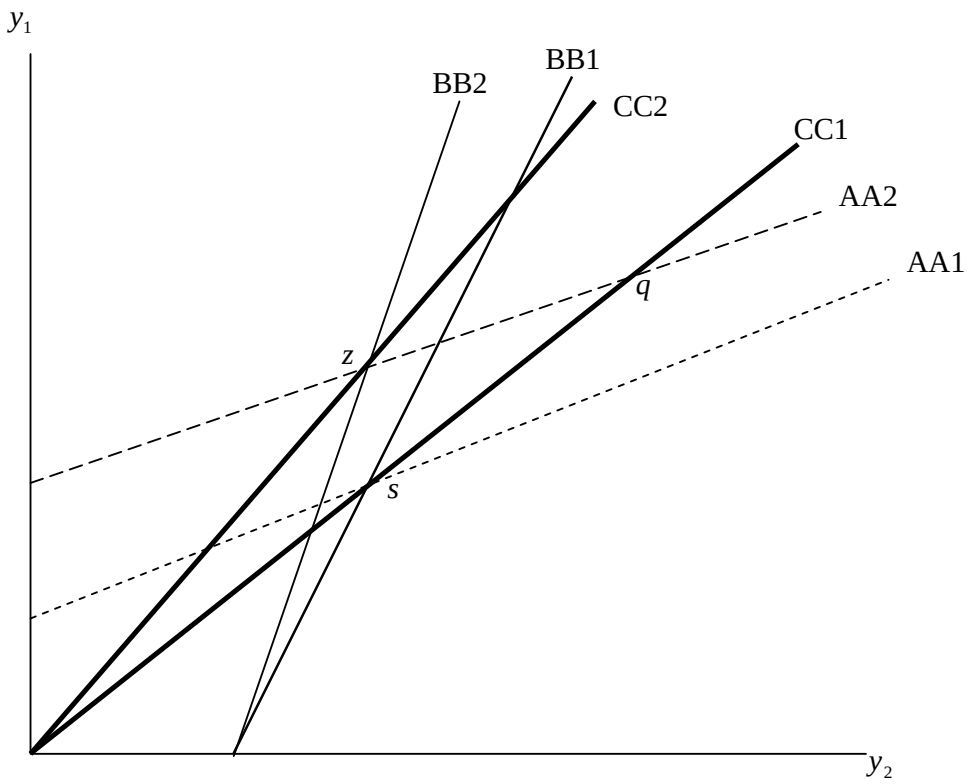
(9) $y_i^* = \frac{\pi_j}{\pi_i} y_2^*$

Figure 2 uses the diagrams suggested by McCombie and Thirlwall to illustrate the problems of international coordination in the two-country model. Initially both economies are in equilibrium at point *s*. In effect, in *s* the effective rate of growth of country 1 (curve AA1, which corresponds to equation 5) cuts the effective rate of growth of country 2 (curve BB, which corresponds to equation 6) and the condition for equilibrium in current account (curve CC1, which corresponds to equation 9). Country 1 is the developing economy and hence the declivity of curve CC (the elasticity ratio $\pi_2 / \pi_1$) is less than the unity: country 1 grows less than country 2 in equilibrium (Rodriguez, 1977; Thirlwall, 1979).

If country 1 increases the rate of growth of autonomous expenditures, the curve AA1 moves to AA2 and the system moves to point *q*, which is not an equilibrium (country 1

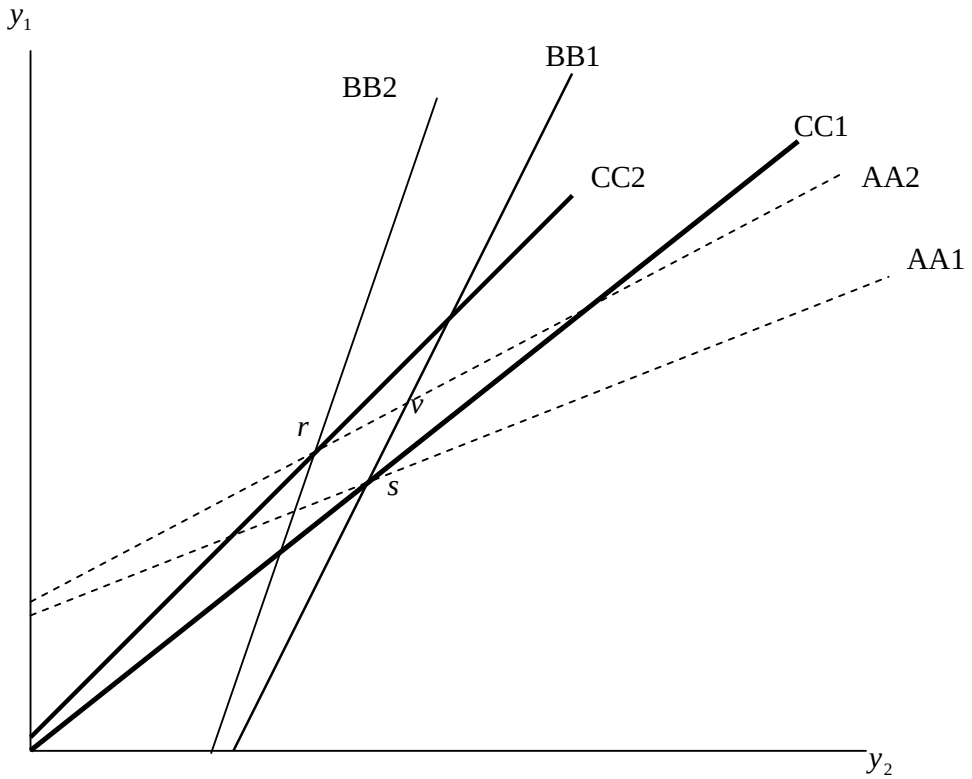
has a deficit). If there is a coordinated expansion, country 2 will increase its autonomous expenditure and a new equilibrium will be achieved in *q*, in which both countries grow at higher rates. This is the case in which both countries adopt Keyensian policies and manage effective demand to stimulate growth. Coordination makes possible that a more active fiscal will not lead to external disequilibrium. But if country 2 refuses to increase its autonomous expenditure (coordination failure), hence country 1 will have to cut its own expenditure and return to point *s*.

**Figure 2. Growth, Fiscal Policy and Structural Change**




**Note**. CC: current account equilibrium locus; AA: effective rate of growth of country 1 as function of growth in country 2; BB: effective rate of growth of country 2 as a function of growth in country 1. If country 1 increases the rate of growth of autonomous expenditure (from AA1 to AA2) and country 2 follows suit, equilibrium will occur at point *q*. If country 2 does not increase the growth of autonomous expenditure, there will be a deficit in country 1, which could only be corrected by structural change (shifting CC1 to CC2). The combination of expansionist fiscal policy plus structural change in point *z* implies higher growth in the periphery and the same rate of growth in the centre as in point *s*.

**Figure 3. The Mercantilist Scenario**




**Note**. CC: current account equilibrium locus; AA: effective rate of growth of country 1 as function of growth in country 2; BB: effective rate of growth of country 2 as a function of growth in country 1. Structural change in the periphery changes the declivity of the curves AA, BB and CC. The current-account-equilibrium curve shifts from CC1 to CC2. If the periphery (country 1) does not change the rate of growth of autonomous expenditure, the centre will have a deficit (point *v*). Sooner or later country 2 will have to reduce its autonomous expenditure and the equilibrium will occur at *r*, where both countries grow at lower rates.

Still, if country 1 encourages structural change and redefines its pattern of specialization, the curve CC1 will shift to CC2 (as $\pi_2/\pi_1$ increases). In this case, structural change makes the fiscal expansion viable. At the end of the day, the new pattern of specialization plus fiscal expansion have led to higher growth in country 1 with the same rate of growth in country 2, as represented by point *z* in Figure 1[8].

[8] This will be formally demonstrated below. The constant rate of growth of country 2 is the vertical line at $\bar{y}_2$. In the example, we assumed that structural change only affected $\pi_1$ and left $\pi_2$ untouched: this is the reason why only the inclination of the effective growth rate of country 2 is altered from BB1 to BB2, while the declivity of AA is the same in AA1 and AA2.

Of course, if the periphery follows a mercantilist approach, focusing solely in raising its competitiveness without any concern with effective demand, the result will be different (see Figure 3). A mercantilist approach implies increasing competitiveness (a higher $\pi_2/\pi_1$ ratio, moving CC1 to CC2) without increasing the autonomous expenditure (the declivity of AA changes, but the intercept is the same). In this case a deficit will be imposed on country 2 (point *v*). If as a consequence country 2 adopts a recessive approach to restore external equilibrium, reducing the growth of its autonomous expenditure, BB shift to the left ad the system will move to point *r*, where both countries grow at lower rates than in the original situation.

In sum, both a purely pro-competitiveness policy and a purely activist fiscal policy will be self-defeated. Structural change and the management of effective demand should go together in order to sustain global growth. A "pure" structural change approach may produce a mercantilist drive in trade policy, while "pure" fiscal policy would be unable to overcome the external constraint. We will now look at this result in a more formal way, which is the subject of the following sub-section.

### *a) A Dynamic Keynesian-Schumpeterian Model with Structural Change*

In this section we will extend the MT dynamic two-country model with a view to considering the evolution of the technology gap and structural change, and their relation with the fiscal policy. Two are the key assumptions of the extended MT model, drawn from the structuralist tradition presented above. First, income elasticities are a function of the technology gap: the higher the technology gap, the higher (lower) will be the income elasticity of the demand for imports (exports) of the periphery. This relation is based on the role played by technological asymmetries in leads and lags in innovation and learning -- and therefore in international competitiveness. The second assumption is that automatic reciprocity applies. In other words, the periphery will not adopt mercantilist policies: it will use all its foreign exchange in fostering growth. Both assumptions can be formalized as follows:

(10) $\pi_1 = \gamma G$

(11) $\dot{a} = \zeta\left(y_1^* - y_1\right)$

Equation (10) states that the income elasticity of the demand for imports of the periphery increases linearly with the technology gap, defined as the ratio between technological capabilities in the centre and the periphery, $G = \left(T_2/T_1\right)$. To keep the model simple, we assumed that the gap only affects $\pi_1$, while $\pi_2$ is exogenously given. Equation (11) embodies the principle of automatic reciprocity: when effective growth is lower than the rate of growth consistent with current account equilibrium, then autonomous expenditure will be increased in the periphery. Various factors contribute to such an outcome. The availability of foreign exchange may stimulate the animal spirits of investors, make it easier to import the required capital goods and raise the confidence of consumers. In addition, the fact that the external constrain is alleviated will encourage the government to pursue a more active fiscal policy aimed at reducing unemployment and absorbing underemployment in the modern sector. Note, in addition, that the policy rule implied by equation (11) is not "populist" (in the sense of being unsustainable), to the extent that government expenditures will just complement the opportunities for growth that are consistent with the external equilibrium.

We also need an equation for the evolution of the technology gap – which drives competitiveness. The simplest one is the linear catching up model proposed by Fagerberg (1988, 1994)[9]. In this model, the higher the technology gap, the higher the rate at which the periphery will catch up. The rationale for this is that the technological distance between two countries is a measure of the existing opportunities for imitation by the laggard country, allowing for faster learning. As catching up proceeds and the technology gap is closed, then learning opportunities recede and the accumulation of capabilities in the periphery loose momentum.

Formally:

(12) $\hat{G} = u - vG$

[9] For more detailed discussion see Narula (2004). Verspagen (1993) and León-Ledesma (2002) discussed this topic BOP-constrained growth models.

where $\hat{G}$ is the rate of growth of the technology gap *G*, *u* the exogenous rate of technical change in country 2 (centre) and *v* is the learning parameter of the periphery, which depends on its efforts for adopting, adapting and improving foreign technology (see Lundvall, 1992; Freeman, 1995; Metcalfe, 1995).

It is easy to see that equations (11) and (12) form a dynamic system in which the technology gap and autonomous expenditures are endogenously determined. To solve the system we have to rewrite equation (11) as a function of *G* and $a_1$. Using equation (6) in (5):

$$(13)\ y_1 = \alpha_1 a_1 + \beta_1 \pi_2 \left(\alpha_2 a_2 + \beta_2 \pi_1 y_1\right)$$

And using equation (10) in (13), after some algebraic manipulation, we get:

$$(14)\ y_1 = \frac{\alpha_1 a_1 + \beta_1 \pi_2 \alpha_2 a_2}{1 - \beta_1 \beta_2 \gamma G \pi_2}$$

This is the effective rate of growth of country 1. But it has to be compatible with equilibrium in current account. The latter can be found using (6) and (10) in (9):

$$(15)\ y_1^* = \left(\frac{\pi_2}{\gamma G}\right)\left(\alpha_2 a_2 + \beta_2 \gamma G y_1^*\right) = \left(\frac{\pi_2}{\gamma G}\right)\left(\frac{\alpha_2 a_2}{1 - \pi_2 \beta_2}\right)$$

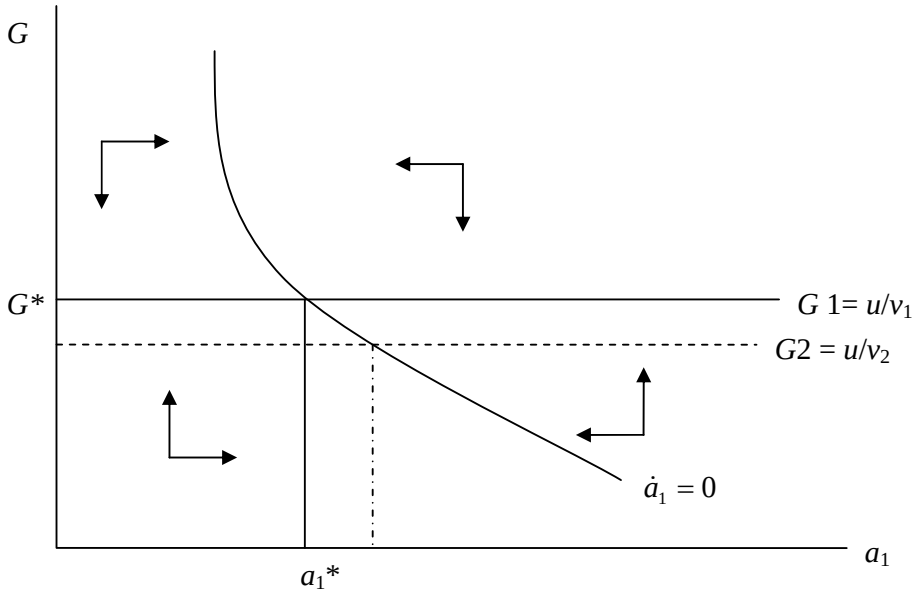
Finally, using (14) and (15) we can rewrite the differential equation (11) as follows:

$$(16)\ \dot{a}_1 = \zeta\left[\left(\frac{\pi_2}{\gamma G}\right)\left(\frac{\alpha_2 a_2}{1 - \pi_2 \beta_2}\right) - \frac{\alpha_1 a_1 + \beta_1 \pi_2 \alpha_2 a_2}{1 - \beta_1 \beta_2 \gamma G \pi_2}\right]$$

Figure 4 presents the phase diagram of the system of differential equations. It can be seen that the system is stable (see also the appendix). As an exercise in comparative dynamics, the effects of an increase in the periphery efforts at catching up with the centre (a rise in the learning parameter *v*, from $v_1$ to $v_2$) are presented. Such an increase

brings about higher international competitiveness (a lower $G$) and therefore more space for an active fiscal policy in the periphery (a higher $a_1$).

**Figure 4. Equilibrium and Stability: Effects of the Industrial and Technology Policies**




In equilibrium $\hat{G} = \dot{a}_1 = 0$ and hence:

(17) $G^* = \frac{u}{v}$

(18) $a_1^* = \frac{\pi_2 \alpha_2 a_2 [1 - \beta_1 \gamma (u/v)]}{\alpha_1 \gamma (u/v)(1 - \beta_2 \pi_2)}$

With the equilibrium values of $G$ and $a_1$ we can find the rates of growth of country 1 and country 2. We first use the result $G^* = (u/v)$ in equation (15) to obtain $y_1^*$:

(17) $y_1^* = \frac{\pi_2 \alpha_2 a_2}{\gamma (u/v)(1 - \beta_2 \pi_2)}$

To find the equilibrium growth rate of country 2 we use equation (17) in equation (9):

(18) $y_2^* = \frac{\alpha_2 a_2}{1-\beta_2 \pi_2}$

There are two key results that emerge from equations (17) and (18) which are worthwhile stressing.

First, the rate of growth of the periphery depends on the autonomous expenditure of the centre and on its own efforts for technological catching up as compared with the innovation activity of the centre. But this does not mean that autonomous expenditure in the periphery is inconsequential. On the contrary, these equilibrium values are based upon the assumption that fiscal policy in the periphery always adjust so as to make the BOP-constrained rate of growth binding. *In the model $a_1$ is an endogenous variable that always fills in the gap between effective growth and potential growth*. This is what prevents an export-led policy from becoming mercantilist or a mere substitute of the expansion of domestic demand. In our model the role of exports (and structural change) is to open up space for a steady rise in domestic demand. They are complementary in the sense that both types of policies should go band by hand, and their positive effect on global growth would only occur when they are combined. Pure fiscal policies leading to external disequilibrium, or a mercantilist policy imposing a trade deficit on other countries, are very likely to be self-defeating and elicit a protectionist response.

Secondly, for a given economic structure the rate of growth of the centre solely depends on its own autonomous expenditure. This is a crucial asymmetry between the two poles of the system in the model. To the extent that the periphery offers automatic reciprocity, the centre will not suffer from the Balance of Payments constraint. If the centre grows at higher rates and imports more from the periphery, the latter will *pari passu* guarantee the demand for centre exports that inhibits the appearance of external disequilibrium. In this specific sense, the centre can choose its rate of growth according to its domestic objectives – for instance, full employment or a certain inflation target – while the periphery depends on the rate of growth of the centre[10]. The centre will be policy-constrained or supply-side constrained, while the constraint of the periphery will be related to the evolution of its capacity to import. At variance with the centre,

[10] This is consistent with Prebisch's suggestion that growth in the periphery is a reflection of growth in the centre.

autonomous expenditure in the periphery must lie within the boundaries defined by technology and competitiveness. As a corollary, industrial policy and conventional macroeconomic policies should be regarded in the periphery as two-sides of the same equation, none of which could be looked at in isolation.

Thirdly, a reduction of the technology gap produces higher growth in the periphery without affecting growth in the centre. This means that active industrial and technology policies in the periphery contribute both to increase global growth and improve income distribution across countries. In effect, the relative rate of growth of the periphery in equilibrium is given by:

$$(19)\ \frac{y_1^*}{y_2^*} = \frac{\pi_2}{\gamma(u/v)}$$

A lower technology gap increases the periphery relative growth rate and may contribute to reduce international differences in income per capita through time.

The international political economy that emerges from the two-country model does comply with structuralist views as regards the role of international cooperation. The centre may facilitate periphery exports without compromising its own growth objectives. The periphery, in turn, should strengthen its system of innovation and at the same time combine fiscal and industrial policies to keep the rule of automatic reciprocity working. Of course, a coordinated Keynesian expansion of international effective demand stimulates growth in both poles of the system. The recent international crisis has indeed encouraged this type of response. On the other hand, there has been little attention to the problems of redefining the pattern of specialization of developing economies, which as mentioned is the other side of the global growth equation.

The simple model presented above is useful to clarify the basis for a positive sum game in a centre-periphery system. However, there are major barriers that make a move in this direction a very complex and difficult process, which we briefly list below. First, centre and periphery are not homogeneous blocs. Some centre countries will be BOP-constrained, even if this constraint is not binding for the aggregate, and they will tend to adopt restrictive policies to check imbalances. In the periphery, in turn, some countries

may be supply-side constrained and fail to speed up growth, even if international competitiveness allows them to do so. Secondly, in an interdependent economy, structural change in the periphery means by force structural change in the center. Although the political costs of specializing along intra-industry lines are in general less than the costs of inter-industry specialization, tensions and conflict are inevitable in the adjustment process, with the consequent pressures to increase trade barriers. Thirdly, we have assumed a constant real exchange rate in the long run, but short run and medium run oscillations will affect competitiveness, growth and unemployment, placing more pressure and uncertainty on international trade. Last but not least, the model does not consider distortions stemming from international cycles of financial liquidity and lending, which impress major fluctuations on the BOP constraint in ways fairly independent of technology and trade.

**Concluding Remarks**

The challenge of development is to transform a specialized, heterogeneous economic structure into a diversified, homogeneous one by reducing technological asymmetries both with respect to the centre and within the periphery structure itself. This requires diffusing technological progress so as to incorporate new sectors and reduce inter-sectoral disparities, raising productivity levels and changing the pattern of specialization. As the external constraint is overcome, faster growth will allow for a decline in unemployment and underemployment in the subsistence sector. Based on technological learning, openness and growth will be related to an improving income distribution.

Trade can be a valuable handmaiden in the process of structural change. This handmaiden will be of course “in distress” (as Diaz-Alejandro put it) in a world of rising protectionism. But it will also be in distress in a world in which the asymmetries between centre and periphery are not taken into consideration. In particular, for avoiding a protectionist tide in the periphery, it is necessary to encourage the diversification of its exports. As specialization increasingly proceeds on intra-industry basis, trade will be expanded and the periphery will become more integrated to the international system. No fair account of the post-war global economy could ignore the major, inter-related transformations that occurred in the economic structures of the

centre and some periphery countries. The divergent trajectories of Asia and Latin American illustrate very well the importance of structural change: while Asia radically transformed its pattern of specialization and increased its participation in world trade, the export structure of Latin America remained highly concentrated in commodities, with a stagnant participation in world trade.

More trade will not come out of the unimpeded working of market forces. It requires deliberate institution-building in which both domestic and international policies are crucial. The international experience shows successful cases in which active industrial and technology policies redefined the pattern of specialization. Latin America has in general lacked policies for enhancing technological capabilities, and resorted mainly to protectionism in some periods, passive openness in others. On the other hand, protection was a transitory devise in the case of Asia, where the policy focus lied on technological catching up.

As the Keynesian literature correctly points out, the various variables affecting growth should be studied through their effects on effective demand. Structural change only brings about growth if it boosts effective demand. In terms of the model developed in this paper, the fiscal policy in the periphery is managed with a view to filling in any gap between actual growth and the BOP-constrained growth. There is no contradiction between export growth and the expansion of the domestic market. A sustained increase in domestic autonomous expenditure could not be achieved unless higher competitiveness eases the external constraint. And in turn demand management prevents industrial policy from becoming just a mercantilist, beggar-your-neighbor strategy.

The model suggests that a Keynes plus Schumpeter policy-mix contains the ingredients required for catching up. On he other hand, the combination of orthodox monetary and fiscal policies, plus a static Ricardian approach to trade, which has been so frequent in Latin America, may bring abut stability but would lead to international divergence and less trade in the long run. We argue that there exists an alternative stable equilibrium which is Pareto-preferable to the one observed in the recent Latin America economic history. Times of crisis invite to rethink accepted paradigms. The intellectual legacy of structuralism, with its emphasis on automatic reciprocity and the co-evolution of the

centre-periphery productive structures, could contribute to designing new rules and policies concerned with higher growth and a better income distribution at a global level.

## Mathematical Appendix

1. The Basic model

The model is suggested by McCombie and Thirlwall (1994, chapter 7). The basic initial equation for country $i$ (where $i$ = 1,2) is:

(A.1) $Y_i = C_i + I_i + Z_i - X_i + M_i(EP_j / P_i)$

Each expenditure item has an autonomous and an induced component:

(A.2) $C_i = \overline{C}_i + \delta(Y_i - T_i)$

(A.3) $T_i = \tau Y_i$

(A.4) $I_i = \overline{I}_i + \theta Y_i$

(A.5) $Z_i = \overline{Z}_i + \zeta Y_i$

Collecting terms:

(A.6) $A_i = \overline{C}_i + \overline{I}_i + \overline{Z}$

(A.7) $B_i = (\delta(1-\tau) + \theta + \zeta)Y_i$

Using (A.2)-(A.5) in (A.1) and then log-differentiating the result with respect to time:

(A.8) $y_i = \omega_{Ai} a_i + \omega_{Bi} b_i + \omega_{Xi} x - \omega_{Mi} m_i$

Small letters are proportional rates of growth and greek letters represent the share in total expenditure of each component of demand (vg, $\omega_{Ai}$ is the share of autonomous

demand in total expenditure). We assumed that purchasing power parity and hence $(p_j - e - p_i = 0)$. Recalling that the rate of growth of induced expenditure equals the rate of growth of GDP, then $a_i = y_i$:

(A.8) $y_i = \alpha_i a_i + \beta_i \pi_j y_j$

In equation (A.8) we have $\alpha_i = \frac{\omega_{Ai}}{(1 - \omega_{Bi} + \omega_{Mi}\pi_i)}$ and $\beta_i = \frac{\omega_{Xi}}{(1 - \omega_{Bi} + \omega_{Mi}\pi_i)}$.

2. Equilibrium and Stability in the Model with Technical Change

The system of differential equations is the following:

(A.9) $\hat{G} = u - vG$

(A.10) $\dot{a}_1 = \zeta\left[\left(\frac{\pi_2}{\gamma G}\right)\left(\frac{\alpha_2 a_2}{1 - \pi_2\beta_2}\right) - \frac{\alpha_1 a_1 + \beta_1\pi_2\alpha_2 a_2}{1 - \beta_1\beta_2\gamma G\pi_2}\right]$

The Jacobian matrix is:

(A.11) $J = \begin{bmatrix} -v & 0 \\ \frac{\zeta\delta(a_1)}{\delta G} & -\zeta\frac{\alpha_1}{1 - \beta_1\beta_2\pi_2\gamma G} \end{bmatrix}$

Since the trace of the Jacobian (A.11) is negative ($-v - \zeta\frac{\alpha_1}{1 - \beta_1\beta_2\pi_2\gamma G} < 0$) and the determinant is positive ($v\zeta\frac{\alpha_1}{1 - \beta_1\beta_2\pi_2\gamma G} > 0$), it is straightforward that the system is stable.

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