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**MODELLING THE POLICY CHALLENGES  
CONFRONTING GLOBALISING DEVELOPING  
COUNTRIES**

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## **Abstract**

The paper models the policy challenges facing globalizing developing countries. Models from the pure theory of international trade, the small open economy model, growth accounting, the Solow-Swan model, the gravity model, models of portfolio diversification and currency crises models are reviewed to distil policy guidelines to promote the globalization of developing countries. The overriding objective of promoting the globalization of developing countries is to reduce poverty and income inequality between and within countries. Pro and anti-globalizers are currently locked in a heated controversy as to whether the latest wave of globalization has bucked the past trend of increasing poverty and income inequality in developing countries. Anti-globalizers lament that protracted waves of globalization have failed to extricate developing countries from the structural malaise that traps them in a vicious circle of poverty. They advocate the radical reshaping of the international financial architecture to make globalization work for the developing countries by reducing their vulnerability to recurrent financial crises and crisis contagion. The paper concludes by reviewing the geography and institution school research that offers new policy vistas for promoting globalization in developing countries.

### **Keywords:**

Developing Countries. Globalization. Macroeconomic Models. Policy.Growth. Poverty. Income Inequality. Currency Crises. International Financial Architecture.

### ***JEL classification:***

E61, F11, F32, F43, G11, O11, O47

# MODELLING THE POLICY CHALLENGES CONFRONTING GLOBALIZING DEVELOPING COUNTRIES

## *1. Introduction*

Economic globalization can be defined as the dynamic process of integrating a national economy with the global economy through economic forces such as: 1. Trade in goods and services. 2. Revolutionary changes in information and communication technology (ICT). 3. Cross-border capital flows. 4. Labor migration. Much of the debate on the *pros* and *cons* of globalization has focused on the interaction between the economic and non-economic forces such as :1. Cultural homogenization. 2. Global Warming. 3. Politics and Social Justice 4. War on terror.

From a historical perspective we can assert that the process of globalization has occurred in three major waves and each wave has been driven by a different engine which has on occasions gone into reverse gear inflicting global economic havoc (Table I).

The paper focuses reviews mainly the impact of the last wave (Wave III) of globalization on developing countries (DCs). Pro-globalizers have trumpeted the last wave for the first time has bucked the trend of rising poverty and income inequality in DCs mainly due to the rapid growth in mega Asian economies like China and India (Dollar 2001). The DCs exhibit structural characteristics that differ markedly from those prevailing in advanced countries (ACs) as reflected the prosperity indicators listed in Table II. Some high-income DCs have achieved yearly per capita income growth rates of more than 5% , that is, double the growth rates of high-income ACs and they have been catching-up with the living standards of the rich countries during Wave III of globalization. But many low-income DCs have been lagging behind as the process of globalization appears to have by-passed them exacerbating the structural malaise that is trapping them in a vicious cycle of poverty and income inequality. But anti-globalizers lament that despite three decades of rapid globalization poverty facts and stats belie the euphoric claims of the pro-globalizers as more than one billion people in DCs languish in extreme poverty, surviving on less than one \$US a day. Less than 25% of the world's rich enjoy more than 75% of the world's wealth and 40% of the world's poor have less than 5% of the world's wealth. Over 30 thousand children die daily due to poverty. (Table II).

The paper aims to steer clear of the acrimonious debate that is raging between *pro* and *anti* globalizers and take a “cool look” at the formidable policy challenges facing DCs by using a series of macroeconomic models. Here the dilemma that confronts the policy modeller is analogous to the response that a group of hot-air balloonists who had lost their way, got from a farmer. When the balloonists asked the farmer where they were the farmer gave a technically correct answer that was practically useless to get the balloonists out of the woods. Therefore, the policy insights that can be distilled from macro-models must be interpreted with care to make them pragmatic.

The paper is organized as follows: Section II reviews models of pure theory of international trade that shed light on the benefits of free trade based on comparative advantage and factor endowments. Trade creates winners and losers requiring the implementation of income redistribution policies to maximize the gains from trade liberalization. Section III demonstrates using the small open economy model how DCs can benefit from intertemporal trade by borrowing and lending in the global capital market. Section IV uses the mechanics of growth accounting to highlight that technological progress as estimated by the Solow residual is the key driver of economic growth and policies that promote technological progress in DCs offer rich growth dividends. Section V outlines the Solow-Swan model that predicts absolute convergence or the catch-up by the rapidly growing DCs of the per capita income levels or living standards of the ACs. However, when the large pool of ACs and DCs are analysed convergence is conditional rather than absolute indicating that rich and poor countries converge to their own high steady state per capita incomes. The alleged divergence between rich and poor convergence clubs has fuelled the acrimonious debate between pro and anti globalizers. Section VI uses the Solow-Swan model to address the issue of increasing saving in DCs to increase the steady state capital stock. The analysis reveals that increase in the steady state capital stock has only level effect and not a growth effect on per capita income. Section VII reviews the endogenous growth model where capital is defined broadly to incorporate human capital. Human capital exhibits constant returns to scale resulting in perpetual growth of per capita income. Therefore, policies that nurture human capital could play a key role in promoting growth in globalizing DCs. Section VII deploys the gravity model to explain how the revolutionary changes in information and communication technology has conquered the tyranny of distance and promoted both trade in goods and services and assets between ACs and DCs generating mutual benefits. Section VIII analyses the rationale underpinning models of international portfolio diversification that maximize risk adjusted returns. Section IX reviews a variety of generic models of currency crises that are triggered by profligate fiscal policies, self-

fulling panic and moral hazard in DCs. Policies to reduce the vulnerability of DCs to currency crises and crises contagion require a multi-pronged policy response. Section X reviews critically the proposals to reshape the international financial architecture to reduce the vulnerability of DCs to recurrent currency crises and crisis contagion that retards the process of globalization. The paper concludes reviewing some of the formidable policy challenges that ‘fear of floating’, ‘sudden stop’ and ‘original sin’ have entrapped DCs in a vicious structural malaise of poverty. It then evaluates the merits of new policy insights offered by geographical and institutional paradigms to promote globalization and growth of DCs.

## ***II. Models of Pure Theory of International Trade***

Trade liberalisation or the removal of tariff and non-tariff barriers is one of the major forces that have propelled the economic integration of nations or globalization. The models of pure theory of international trade establish analytically that free trade is best because it maximises national and global welfare. The Ricardian two country x two commodity x one factor model demonstrates how each country by specializing for export its comparative advantage good can maximize national and global welfare (Ricardo 1817)<sup>i</sup>. The Heckscher-Ohlin (HO) two country x two commodity x two factor model illustrates that income of owners of the abundant factor that is used intensively in the export commodity increases while the owners of the scarce factor suffer a decline income. Free trade produces winners and losers and if the winners can compensate losers and still be better off then free trade is best. However, in practice protectionism is rampant as special interest groups that can loose from free trade take collective action and lobby politicians to advance their gains at the expense of national welfare. A recent example of the lobbying by special interest groups in ACs has scuttled the 9<sup>th</sup> round of Multilateral Trade Negotiations (MTN) that aimed to scale down massive farm subsidies given to the farm lobbies in ACs by demanding that DCs should reciprocate by dismantling their trade barriers .These demands run counter to the spirit of the Doha development round which aimed to give farmers in DCs some reprieve from the massive dumping of subsidised agricultural products from ACs with devastating effects on domestic agriculture in DCs.

The benefits of free trade were clearly illustrated by the spectacular growth rates achieved by the Asian miracle economies or a group of High Performance Asian Economies that switched from an

inward looking import substituting industrialization (ISI) strategy to an export oriented industrial (EOI) strategy {World Bank., 1993 #16}.

### ***III. The Small Open Economy Model***

The Small Open Economy (SOE) or the Mundell-Fleming model adjusts the domestic interest rate to the given world interest rate, implying perfect capital mobility. The model illustrates how intertemporal trade by DCs could accelerate their globalization. Such intertemporal trade allows a DC to run a CAD in one period provided it can generate future trade surpluses to repay fully its foreign debt rendering the CAD sustainable. The SOE model also predicts that starting from a CA balance, a domestic fiscal expansion that reduces national saving will create a CAD, fiscal expansion abroad will generate a CA surplus and an outward shift in the investment schedule will generate a CAD<sup>ii</sup>.

In Australia in the mid-1980s when the CAD as ratio of GDP reached 5%, double the historical average, the incumbent Treasurer warned that Australia was turning into a 'banana republic' and urged the implementation activist policies to rein in the high CAD. A group of eminent Australian economists (Makin-Pitchford-Corden) argued that the high CAD was the residual outcome of rational private sector decisions and as such policy action to reduce the CAD was misplaced. It took more than two decades for Australian policymakers such as the Reserve Bank of Australia (RBA) to realise the futility of targeting the reduction of the high CAD and abandoned the practice in 2003. The polemics of the sustainability of Australian thigh CAD has been revisited in {Karunaratne, 2007 #8}.

### ***IV. Growth Accounting***

The neoclassical production function which is the cornerstone of the Solow-Swan model (Solow 1956, Swan 1956) can be transformed into a growth accounting equation which <sup>iii</sup> shows that the growth of real output is explained by technological progress and a weighted average of labor and capital inputs, where the weights correspond to the relative income shares of the factors of production. All the components of the growth accounting equation, except technological progress, can be estimated from National Accounts data and an estimate of technological progress can be

obtained as a residual, known as the Solow residual. Empirical studies show that the Solow residual or technological progress has been the major driving force of growth, followed by labor and capital inputs, in that order. Therefore, policies that aim to maximize growth in DCs should promote technological progress by adapting imported best practice technology from ACs. Empirical analysis of sources of growth of the Asian Tiger economies has revealed that growth was fuelled by factor inputs or 'perspiration' rather than by technological progress or "inspiration". Since factor inputs such the stock of physical capital are subject to diminishing marginal productivity, it has been predicted that high growth rates of Tiger economies will fizzle out {Krugman, 1994 #19; Young, 1995. #20}.

The Solow-Swan model provides additional insights on the role played by the saving rate in promoting the increase in per capita real output. In a closed economy, with no government, the steady state level of per capita output and capital occurs when change in the capital stock is zero. This occurs when the saving rate just offsets the requirements of new investment to equip new workers from population growth and replace equipment worn out by depreciation. In this model as long as the saving rate exceeds investment expenditure per capita income and capital will increase until they reach the steady state level. At the steady state level of capital only the level of capita real output showing only a *level effect* without any per capita income *growth effect*. The absence of the growth effect is attributed to the diminishing marginal productivity (MPK) of physical capital<sup>iv</sup>.

Benevolent policymaker will aim at maximising consumption or welfare at steady state level of capital defined as the Golden Rule level of capital. The Golden Rule level of capital occurs when the marginal product of capital (MPK) equals the sum of the rates of growth of population plus depreciation. Most economies start with less capital than the Golden Rule level and in order to achieve the Golden Rule level policies should aim to reduce current consumption so that consumption of future generations will be increased. Such Golden Rule policies are revives the biblical decree: "that you should do unto others what you would have them do unto you." {Phelps, 1961 #21}.

The Solow-Swan model offers conflicting perspectives on the interactions of population growth and the rate of capital accumulation. According the Malthusian perspective population growth will condemn an economy to an eternal cycle of poverty and misery (Galor and Weil 2000). But the

optimistic Kremerian perspective, regards population growth as the pre-requisite for promoting technological innovation and new ideas that will deliver unbridled prosperity {Kremer, 1993 #22}

### ***V. Absolute and Conditional Convergence***

The Solow-Swan model predicts absolute convergence, or that poor DCs with low per capita income will grow rapidly and catch-up with high per capita income levels of rich ACs. The prediction of absolute convergence is not supported for the pool of both ACs and DCs. The empirical results from the pooled sample demonstrate that rich and poor countries converge to their own high and low level steady per incomes forming rich and poor country convergence clubs.<sup>v</sup> (Barro and Sala-i- Martin 1995). Anti-globalizers allege that rapid globalization has witnessed the divergence between the rich and poor country conditional convergence clubs indicating the increase global income inequality rather than the catching-up of rich countries per capita incomes by poor countries as predicted by the absolute convergence hypothesis.

The Solow-Swan model predicts that long-run growth depends on exogenous technological progress. However, it fails to explain the determinants of exogenous technological progress. New or endogenous growth models step into the breach and offer a valid explanation of the phenomenon of perpetual growth by endogenizing the exogenous technological change in the Solow-Swan model

### ***VI. Endogenous Growth Models***

The endogenous growth models abandon the assumptions of diminishing marginal productivity of physical capital, competitive markets and exogenous technological progress. The endogenous growth or AK models differ radically from the Solow-Swan model in two main respects: first, it discards the assumption of exogenous technological progress and second, it abandons the assumption of diminishing returns to capital and supplants it with constant returns to scale. In the manipulation of the AK production function reveals that growth rate of output will increase as long as the product of the saving rate and technological progress exceeds depreciation. Thus the AK model predicts perpetual growth even when exogenous technological progress is absent<sup>vi</sup>(Romer 1986, Lucas 1988)

Endogenous growth models define capital more broadly to include knowledge and human capital that generate positive externalities or what Isaac Newton referred to as ‘standing over shoulder externalities’ which could exceed the negative externalities or ‘stepping over toes externalities’ (Mankiw 2007: 238). Therefore, policies that promote technological progress that generate social benefits that exceed private benefits should be supported. This implies that DCs should subsidize R&D and education that generate net positive social benefits.

### ***VII. The Gravity Model***

The revolutionary changes in Information and Communication Technology (ICT) during Wave III of globalization has witnessed the dramatic reduction in the transaction costs of communication and transport costs. The widespread use of telematics (computers, satellite, and fibre-optics) has established a new connectivity among countries creating a borderless world or a flat earth (Friedman 2006). The gravity model illustrates how trade between rich ACs and poor DCs has been stimulated because the ITC revolution has conquered the ‘tyranny of distance’ or costs of transport and communication.<sup>7</sup> The widespread adoption of the new ICT in countries like Australia as revealed by the computerisation and robotification of production has increased productivity and contributed to the emergence of the ‘new economy’ in Australia (Karunaratne 2006). However, the ITC revolution has widened the digital divide between rich and poor countries and so far largely served the corporate interests of ACs. The potential benefits of the ICT revolution to DCs remains yet to be tapped by designing policies that will deliver long distance education, telemedicine and financial and banking services in a cost effective manner.

### ***VIII. Models of Portfolio Diversification***

Trade between ACs and DCs can generate three different types of gains. Trade in goods and services for other goods and services goods and services would deliver gains by specialisation according to the principle of comparative advantage. Trade in goods and services for assets or future goods and services deliver the benefits of intertemporal trade. Trade in assets for assets offer the scope for increasing returns from diversification of risk adjusted international asset portfolios. The economic rationale for portfolio diversification was summed by the late James Tobin in his

guideline “do not put all your eggs in one basket” The gains from portfolio diversification by the home and foreign country arises due to risk minimization as measured volatility of the assets<sup>vii</sup>. By diversification of asset portfolios internationally an investor can reduce risks further because business cycle effects of different countries are not synchronized and this converts systematic risks to non-systematic risks increasing the risk adjusted returns from international portfolio diversification<sup>8</sup>. Empirical evidence reveal that international portfolio diversification through capital mobility has increased rapidly through international capital flows, but they are sub-optimal when analysed from the high risk adjusted returns that could be gained. (Table IV).

The degree of international portfolio diversification has been evaluated using the correlation between saving rate and investment rate. Higher the correlation lower is the degree of cross-border capital flows and international portfolio diversification (Feldstein and Horioka 1980). Moreover, the foreign exchange market is a key mechanism that promote the efficient allocation of capital internationally. If the foreign exchange market is functioning efficiently the foreign exchange rate will reveal all the available information through price of foreign exchange. The efficiency of the foreign exchange market has been evaluated using three tests relating to the uncovered interest parity (UIP) condition, the risk adjusted interest parity condition and models of exchange rate forecasting. The three tests fail to provide conclusive support for the liberalization of capital controls. Therefore should promote policies that support the continuation of capital controls by DCs (Krugman and Obstfeld 2009:610-617).

### ***IX. Models of Currency Crises***

Globalisation and the cross-border hyper mobility of capital have increased the vulnerability of DCs to currency crises due to sudden reversal of capital inflows. At least three generic models have been stylised to describe how speculative attacks forced a collapse of the exchange rate peg posing formidable policy challenges to DCs that have liberalized the capital account.

The first-generation models pioneered by Krugman (1979) highlight that currency crises have occurred because governments have pursued profligate fiscal policies that are inconsistent with maintaining a pegged exchange rate regime. The *second-generation* models demonstrate that currency crises can occur even if government follows sound macroeconomic policies due to self-fulfilling speculation and panic that result in multiple equilibria causing the collapse of the

exchange rate peg (Obstfeld 1996). The *third-generation models* stylised on the basis of Asian currency crisis highlight the role played by moral hazard due to implicit guarantees and the prospect of tax-payer funded bail-outs as the cause of currency crises <sup>viii</sup>(Obstfeld 1996, Sarno and Taylor 2002).

Currently the sub-prime mortgage crisis that has resulted in a global credit crunch displays the underlying causes of moral hazard due to prospect of government bailouts, lack of prudential regulation of non-bank financial institutions (NBFS) and self-fulfilling panics that occurred in the three generic models of currency crises recounted above. Besides, the major culprit behind the sub-prime mortgage crisis is the proliferation of securitization or the smart repackaging of risky derivatives by (NBFS) and resale of these sub-prime securities to super funds and other mutual funds increasing the risks of their asset portfolios. The contagion from the sub-prime mortgage crisis poses a threat not only to the stability of the US economy but to the systemic stability of entire global financial system. Therefore, some have argued that these financial institutions have to be bailed out at tax-payers expense because they are 'too big to fail'. The sub-prime mortgage crisis has occurred due to a cocktail of deficiencies that were present in other generic crises and they include lax regulatory supervision, prospect of tax-payer funded bail out of moral hazard behaviour by risk-taking hedge funds and other NBFS.

#### ***X. Reshaping the International Financial Architecture (IFA)***

The recurrent crises and crisis contagion have led some reformists to recommend the implementation of a series of prophylactic measures to immunise DCs from the economic ravages that can emanate from the Asian type of currency crisis.<sup>ix</sup>

Besides, more radical proposals to reshape the IFA advocate that: i. The IMF's wrong counter cyclical adjustment assistance policies should never be repeated in crisis ravaged DCs aggravating the economic hardships caused by recessionary scenarios . ii. The IMF suffers from a democratic deficit as ACs have rigged the voting powers of these supranational institutions to subserve their corporate interests rather than the development goals of DCs they suppose to serve. iii. The IMF and the World Bank have lost the plot in engaging in structural reform of DCs and these institutions should be reshaped to focus on their original mission goals to overcome temporary financial imbalances in DCs. Iv. The establishment of international bankruptcy laws similar to

those embodied in US Chapter Super 11 to provide orderly relief to DCs that are victims of global systemic failures that are not of their own making. v. The establishment of short-term debt to reserve ratios equal to unity to insulate against sudden capital flow reversals is an rip-off of DCs by ACs and should be jettisoned.vi. The reform of the global reserve system by introducing ‘global greenbacks’ to finance global public goods to promote to promote development and eradicate poverty and making globalization work for DCs.(Stiglitz 2006). Other exasperated sceptics argue that the IMF and the World Bank have become incubators for moral hazard problems that threaten the financial stability of international financial system and therefore the IMF and World Bank should be abolished (Niskanen 1999).

### ***XI. Concluding Observations.***

A major explanation as to why poor or low-income DCs have either lagged behind or gone into reverse gear during successive waves of globalization is that these countries are bogged down in a chronic structural malaise that increases the risk of default on foreign debts and repels foreign investment inflows by undermining their profitability.

The risk of default on foreign debts by DCs can cause foreign lenders to recall their short-term debts and cease new lending to DCs, precipitating a debt crisis due to the operation of a sequence of events defined as a *sudden stop* (Calvo). The only way the DCs can avoid default of foreign debts is by generating CA surpluses to repay the foreign debt while simultaneously restoring the CA to balance. The risk of default on debt repayments is further compounded by ‘original sin’ which compels DCs to borrow in currencies of the lenders currency thereby conferring an enormous advantage on the AC lenders.<sup>x</sup>

DCs can finance their CADs or foreign debt through debt or equity instruments. The repayments on debt finance are fixed and do not vary with the business cycle fluctuations. However, in equity finance of CADs the foreign lender is entitled to a net return on its lending that fluctuates with the business cycle. Therefore, policies that promote equity finance rather than debt finance of CAD are recommended on the grounds that they reduce the vulnerability of debtor DCs to the vagaries of the business cycle,

The structural malaise that has trapped DCs in a vicious circle of poverty retarding their capacity to harness the benefits of globalization sparked off a debate between the Geography School pioneered

by Diamond (1997) and the Institution School pioneered by Acemoglu et al.(2001) as to whether impediments from geography or the lack of institution that has entrapped DCs in a vicious circle of poverty and caused the benefits of globalization. These rival paradigms offer policy insights to unshackle DCs from the structural malaise that retards their globalization and poses challenges to policy designers promoting the rapid globalization of DCs. The proponents of the Geography paradigm hypothesize that DCs are trapped in a vicious circle of poverty and miss out on the benefits of globalization because of the deleterious effects of the geographical factors such as climate, tropical diseases and lack of openness to trade. The proponents of the rival Institution paradigm hypothesizes that DCs stagnate in poverty because of the lack the proper institutions to enforce the rule of law and property rights. Thereby they create a veritable breeding ground for corruption that undermines private enterprise and innovation. The resolution of whether the Geography paradigm or the Institutional paradigm offers unambiguous policy guidelines to eradicate poverty through effective globalization have grabbed the attention of policy designers promoting the rapid globalization of DCs. The resolution of this complex policy issue is currently being addressed, inter alia, by the application of relevant econometric techniques<sup>xi</sup>. If policy designers assume that the institutional paradigm is on the right track to promote poverty eradication through globalization then nurturing of human capital through education and training should be prioritized so that institutions that are designed to enforce the rule of law and property rights can have the human capital to administer these institutions effectively. The harnessing of symbiotic forces of globalization for to lift DCs out of the poverty trap require the proper sequencing of measures to nurture human capital and establish institutions to make globalization work for DCs through proper policy design.

**Table I. Waves of Globalization**

Wave	Engine of globalization
Wave I: 1870-90	European colonization of DCs
Reversal 1914-30	WW I, Protectionism & Great Depression
Reversal 1939-1945	WW II: Collapse of the international monetary system
Wave II: 1960-1980	Dramatic expansion of trade among ACs
Wave III: 1980-2008	Capital flows and financial integration

Source: Adapted from Dollar (2001)

**Table II Indicators of Economic Prosperity**

Income Group (2000)	GDP p.c (2000US\$)	Life Expectancy (Years)	Annual Growth Rate. (1960-2000) (Estimate)
Low-income	481	60	0.3
Lower middle-income	1,14	73	2.0
Upper middle-income	4,80	74	5.0
High-income	28,242	82	2.5

Source: World Bank

**Table III Poverty Facts and Stats**

	Indicator of Developing Country Poverty
1.	50% of the world population (3billion) live on less than 2 dollars a day
2.	80 % of the world' population live in countries where income inequality is widening
3.	20% of the world's richest enjoy 75% of the global wealth while 40% of the world's poorest account only 5% of the world's wealth.
4.	30,000 children die every day due to poverty (UNICEF)
5.	28% of children in DCs are underweight or stunted

6.	72 million children of primary school age do not attend school, 57% are girls.
7.	Over 1 billion people entered the new millennium illiterate (unable read and write)

Source: Adapted from Shah, A. (2008)

**Table IV. Percentage of Assets (A) and Liabilities(L) as a Ratio of GDP for a Sample of ACs**

Country	1993 (A/Y)	2004 (A/Y)	1993(L/Y)	2004 (L/Y)
Australia	13	77	52	137
Canada	24	101	70	114
UK	152	208	136	369
USA	29	84	25	107

Source: Lane, P.R. and Milesi-Ferretti , G.M. (2007)

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<sup>i</sup>The Ricardian Model

The above model is a 2 country x 2 commodity x 1 factor model. It demonstrates that both countries can by specializing in the production of the commodity in which each country has a comparative advantage. The numerical example given below clarifies the theory of comparative advantage and mutual gains from trade.

The units of labor (hours) required to produce to produce Cheese © and Wine (W) in the Home and Foreign country (notated by an asterisk \*) is tabulated below:

Country	Cheese ©	Wine (W)
Home	$a_{LC} = 1$ hour per pound	$a_{LW} = 2$ hours per gallon
Foreign	$A^*_{LC} = 6$ hours per pound	$a^*_{LW} = 3$ hours per gallon

The relative price of cheese  $P_C/P_W$  must lie between the opportunity cost of producing cheese in the two countries, that is:  $a_{LC}/a_{LW} = 1/2 < P_C/P_W < a^*_{LC}/a^*_{LW} = 2$ .

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Assuming that at the world equilibrium a pound of cheese exchanges for a gallon of wine in the world market, the relative price of cheese is given by  $P_c/P_w = 1$ . Since a pound of cheese sells for the same price as a gallon of wine, both countries will specialize. Home produces a pound of cheese using only  $\frac{1}{2}$  the labor hours required to produce a gallon of wine. Foreign produces a pound of cheese using twice (2) the labor hours required to produce a gallon of wine. Therefore Home workers can gain  $\frac{1}{2}$  gallon more of wine from trading 1 pound of cheese for 1 gallon of wine than by producing wine domestically. Similarly Foreign workers can gain  $\frac{1}{6}$  gallons more wine by trading which gives  $\frac{1}{3}$  gallons of wine for  $\frac{1}{3}$  pounds of cheese rather than getting  $\frac{1}{6}$  gallons of wine for  $\frac{1}{6}$  pounds of cheese by domestic production. The gain for Foreign workers from trading in wine for cheese is  $(\frac{1}{3} - \frac{1}{6}) = \frac{1}{6}$  gallons of wine. This example reveals that each country can use labor twice as efficiently by engaging in trade rather than engaging in direct production. The one factor Ricardian model demonstrates that both countries can gain from trade (consume more cheese and wine) rather than by autarkic production.

Source: Krugman and Obstfeld 2009 37-38

The HO model is a 2 country x 2 commodity x 2 factor model that is based on a number of simplifying assumptions that both countries have: identical technology or production functions, constant returns to scale in production, different factor intensities, homothetic tastes and preferences, perfect competition, factor mobility intranationally but not internationally, no transport costs and no protection. The HO model postulates that a country will export the commodity that uses intensively its relatively abundant factor of production and import the commodity that uses intensively its relatively scarce factor of production.

The factor price equalization theorem, a corollary of the HO theory predicts that in the long-run trade will result in a tendency to equalize factor prices in both countries. However in the short-run factors may be "stuck" or specific to industries and owners of the relatively abundant factor may suffer while the owners of relatively scarce factor may benefit.

The Stolper-Sameulson theorem, assuming full employment both before and after trade, postulates that trade leads to increase in the price of the abundant factor and a fall in the price of the relatively scarce factor resulting in the rise in real income of the owners of the abundant factor and fall in the real income of the scarce factor. Because of the favourable income distributional effects the owners of the relatively abundant factor favour free trade and owners of the relatively scarce factor lobby for protection or trade restrictions. The abundant factor becomes winners and owners of the scarce factor losers due to trade.

In the long-run, factors will move between industries and the Factor Price Equalization Theorem predicts that the earning of owners of factors will be equalized. But, in the short-run factors could be specific or "stuck" in an industry and the owners of the abundant factor that is used in cloth production may suffer while owners of labor or workers engaged in food production may gain. In the short-run the losers from trade will lobby for protection or trade restrictions.

Trade can result in conflict between the winners and losers. However, policies could be implemented for gainers from trade to compensate the losers and still be better off themselves, then trade is potentially a source of gain for everyone. The fundamental reason why trade generates potential benefits for each country is because it expands the economy's choices allowing for the possibility of redistributing the income so that everyone can gain from trade.

(Sources: Appleyard et al. 2006 : 125-136, Krugman and Obstfeld 2009:72-75)

ii The Small Open Economy (SOE) Model

$Y = (C - T) + I + (T - G) + NX$  (1) National Income Accounting Identity.

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Where Y: output, C: consumption, T: taxes. G: government purchases, NX: net exports.

Rearranging (1) we obtain from the accounting identity that national saving (S), the sum of private and government saving, minus investment(I) is equal to the trade balance (NX) or net exports as shown in (2).

$$S - I = NX \quad (2)$$

A model of the SOE is constructed from (2) using the three assumptions: (1)  $Y = Y^e$  is fixed by factor inputs and technology (2). C is a positive function of disposable income (Y-T) and (3) I, investment, is negative function of interest rate  $r$  which equals the world interest rate ( $r^*$ ) giving:

$$(Y - C - (Y - T)) + (G - T) - I(r^*) = NX \quad (3)$$

The equation above reveals that difference between national saving and investment determines the trade balance.

In a closed economy the real interest rate adjusts to ensure that  $S=I$  always, But in a SOE the world interest rate ( $r^*$ ) is determined in the global financial market and if national saving (S) exceeds investment it manifests as a trade surplus which implies that SOE a net capital outflow as the SOE is lending abroad. If  $S - I$  and  $NX$  are negative a trade deficit occurs and it implies that there is a capital inflow as the SOE is a net borrower from the global financial market.

Intertemporal Trade in a two-period Fisher model

Given Y: Output, C: Consumption, r: real interest rate for borrowing and lending in the global capital market in period 1.

$$C_1 + C_2/(1+r) = Y_1 + Y_2/(1+r) \quad (1) \text{ Intertemporal Budget Constraint (IBC)}$$

A SOE can run a current account deficit (CAD) in period 1 by borrowing at the given world real interest rate ( $r$ ) provided in repays fully the foreign debt and interest in period 2.

We assume in period 1, foreign debt  $B_1 = 0$  and at end of period 2,  $B_3 = 0$ , ruling out uncollected foreign debt. Therefore,

$$\begin{aligned} CA_2 &= Y_2 + rB_2 - C_2 == Y_2 + r(Y_1 - C_1) - C_2, \\ &= - (Y_1 - C_1) = - B_2 = - C A_1 . \end{aligned}$$

The third equality in the chain follows from the IBC.

Over any given period a SOE's a cumulative CA balance equals the change in net foreign assets.

In the two period model with initial and terminal assets equal to zero:  $CA_1 + CA_2 = 0$

### iii Growth Accounting

We begin with the production function that explains that the level real output or real GDP (Y) of a country in terms of technological progress (A), and level of inputs of capital (K) and labor (L):

$$Y = AF(KL) \quad (4.1)$$

We can transform levels terms in the above equation to growth rates of Y, A, K and L giving the following growth accounting equation:

$$\Delta Y/Y = \Delta A/A + \alpha \Delta K/K + (1-\alpha) \Delta L/L \quad (4.2)$$

---

The above equation states that growth rate of output or real GDP ( $\Delta Y/Y$ ) can be explained by the growth rate of technology ( $\Delta A/A$ ) and the weighted average of the growth rates of capital ( $\Delta K/K$ ) and labor ( $\Delta L/L$ ), where the weights ( $\alpha$ ) and  $(1-\alpha)$  are respective labor shares of income accounted for by capital and labor inputs, respectively. The growth rates of output and factor inputs can be estimated from national income accounts data and technological progress can be obtained as a residual after rearranging the estimated equation (4.2). The residual which measures technological progress or total factor productivity is referred to as the Solow residual. Empirical studies have shown the growth rate of output is driven mainly by technological progress, labor inputs and capital inputs, in that order of importance.

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$$Y = AF(KL) \quad (4.1)$$

We can transform levels terms in the above equation to growth rates of  $Y$ ,  $A$ ,  $K$  and  $L$  giving the following growth accounting equation:

$$\Delta Y/Y = \Delta A/A + \alpha \Delta K/K + (1-\alpha) \Delta L/L \quad (4.2)$$

The above equation states that growth rate of output or real GDP ( $\Delta Y/Y$ ) can be explained by the growth rate of technology ( $\Delta A/A$ ) and the weighted average of the growth rates of capital ( $\Delta K/K$ ) and labor ( $\Delta L/L$ ), where the weights ( $\alpha$ ) and  $(1-\alpha)$  are respective labor shares of income accounted for by capital and labor inputs, respectively. The growth rates of output and factor inputs can be estimated from national income accounts data and technological progress can be obtained as a residual after rearranging the estimated equation (4.2). The residual which measures technological progress or total factor productivity is referred to as the Solow residual. Empirical studies have shown the growth rate of output is driven mainly by technological progress, labor inputs and capital inputs, in that order of importance.

iviv

#### iv The Solow-Swan Model

The role of saving in increasing per capita output is analysed further in the Solow-Swan model. The production function is expressed in intensive form where the lower case letters refer to variables in per capita terms as shown below:

$$y = f(k). \quad (5.3)$$

Because of the operation of diminishing marginal productivity of physical capital (MPK) the slope of the curve flattens as  $k$  increases and the economy reaches a steady state or long-run equilibrium when there is no change in the capital stock ( $\Delta k=0$ ) and saving and investment required to equip new workers and replace worn out machinery ( $sy$ ) is offset by depreciation ( $\delta k$ ) and growth rate of population ( $nk$ ) as summarised in the key equation below for a closed economy with no government:

$$\Delta k = sy - (n + \delta)k \quad (5.4)$$

When the change in the capital stock is zero ( $\Delta k=0$ ) we derive the following balance relationship in which the steady state level of per capita capital ( $k^*$ ) and output  $f(k^*)$ :

$$sy = sf(k^*) = (n+\delta)k^* \quad (5.5)$$

If an economy starts with a per capita capital stock ( $k_0$ ) which is less than the steady state capital stock ( $k^*$ ), because the saving rate ( $sy$ ) exceeds the expenditure required to meet the costs of population growth and depreciation ( $(n+\delta)k$ ), the capital stock  $k_0$  will continue to rise along with output  $f(k)$  until it reaches the steady state level ( $k^*$ ). The Solow-Swan model predicts that policies that promote higher saving rates leads to increase in the level of per capita output only temporarily and when the economy reaches a new steady state increase in saving rate has no effect on the level of per capita income. Policies that increase the saving rate

that increases the level of per capita output is said to have only a *level effect*. If such policies increase the growth rate of per capita output then we obtain a *growth effect*. The reason why the economy reaches a per capita income level in the short-run wherein the saving rate has no effect is due to the operation of diminishing marginal productivity (MPK) of physical capital., the level of per capita output will increase and then decline as the saving rate falls to zero in the short-run.

#### v Convergence

The Solow-Swan model predicts absolute convergence, which implies that poor countries that grow fast will catch-up or converge to the per capita income levels of rich countries. In analysing convergence we analyse the transition of initial level of capital per worker  $k(0)$  to the steady state value  $k^*$ . We have established that the steady state value  $k^*$  depends positively on the saving rate(s) and the level of technology (A) and negatively on the rate of depreciation ( $\delta$ ).

In the Solow-Swan model the steady state level of capital ( $k^*$ ) depends positively on the saving rate ( $s$ ) and technological progress (A) and negatively on rate of depreciation ( $\delta$ ) and population growth ( $n$ ), while initial level of labor input  $L(0)$  has no effect on  $k^*$  as defined by equation (6.6) of the model. Furthermore, empirical studies reveal that the assumption that steady state capital ( $k^*$ ) is similar in broad range of countries is not consistent with observed facts.. In a large range of dissimilar economies convergence appears to be conditional rather than absolute as  $k^*$  depends negatively on the initial level of capital  $k(0)$  and positively on the steady state level of capital  $k^*$  is defined by equation given below:

$$\Delta k/k = \Phi(k(0), k^*) \quad (6.1)$$

The negative effect of  $k(0)$  corresponds to lower levels of initial capital and the positive effect of  $k^*$  occur due to higher savings rate ( $s$ ), higher levels of technological progress (A) and lower rates of population growth ( $n$ ). (Barro 2006: 89). The empirical evidence lend support to the predictions of conditional convergence where the rich countries converge to a higher level of steady state per capita income, while poor countries converge to a lower level of steady state per capita income resulting in convergence clubs (Barro and Sala-i-Martin 1995).

The mechanics of conditional convergence fails to explain the long run growth of ACs on a perpetual basis. The assumption of exogenous technological progress links long run growth rate of per capita output or income to technological progress. The growth accounting equation can be used to demonstrate that per capita output grows ( $\dot{y}/y$ ) because of growth rate of technological progress ( $g$ ) and growth rate of per capita output ( $\dot{k}/k$ ). We demonstrate the derivation the above result using the growth accounting equation given below:

$$\begin{aligned} \Delta Y/Y &= \Delta A/A + \alpha \Delta K/K + (1-\alpha) \Delta L/L \quad (6.2) \\ &= g + \alpha \Delta K/K + (1-\alpha) n, \text{ where } g = \Delta A/A \text{ and } n = \Delta L/L \end{aligned}$$

We can substitute the growth rate of per capita output given by:  $\dot{y}/y = Y/Y - n$  (6.2) and rearranging obtain the required result showing growth or per capita output depends on the growth rate of technological progress ( $g$ ) and growth of per capita output as shown below::

$$\dot{y}/y = g + \alpha [\Delta k/k] \quad (6.3), \text{ since } [\Delta K/K - n] = [\Delta k/k].$$

The Solow-Swan model explains growth rate of per capita output in terms of exogenous technological progress but does not explain the determinants of technological progress. The, new or endogenous growth models are designed to address this issue.

#### vi Endogenous Growth Models

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The Solow-Swan model fails to explain the phenomenon of perpetual growth highlighted by conditional convergence, because it is based on the assumption of constant returns to scale to capital broadly interpreted to encompass human capital. The endogenous or AK models proposed by Romer (1986) and Lucas (1988) abandon the restrictive assumptions of the Solow-Swan model of diminishing marginal productivity of physical capital. In the endogenous growth model output (Y) increases at a constant rate (A) with each increasing unit of capital (K) as defined below:

$$Y = AK \quad (7.1)$$

The AK model production function differs from the Solow-Swan model production function where the latter abandons diminishing returns to physical capital. Capital accumulation can be defined as before where the change in the capital stock (K) is equal to the difference between investment (sY) minus depreciation (δK) as given below:

$$\Delta K = sY - \delta K \quad (7.2)$$

Rearranging after combining (7.2) and (7.1) we obtain:

$$Y/\Psi = \Delta K/K = sA - \delta \quad (7.3)$$

The above equation shows that the economy grows (Y/Y) for ever as long as  $sA > \delta$  even in the absence of exogenous technological progress.

#### vii Model of Portfolio Diversification

If an investor has the prospect of investing in a portfolio of assets A and B with share of the asset in the portfolio of a and b. The return on the portfolio of assets I ( $R_p$ ) is a weighted average of the returns of assets A and B with shares a and b, respectively:

$$R_p = aR_a + bR_b$$

The risk of the portfolio of assets can be measured by the variance of the returns on the portfolio given by:

$$V(R_p) = a^2 V(R_a) + b^2 V(R_b) + ab \text{Cov}(R_a, R_b)$$

If the variance of the return on one asset is higher than that of another asset, the covariance term will be negative and this will reduce the overall variance and therefore risk of the asset portfolio.

Diversification of asset portfolios does not eliminate systematic risk, such as domestic business cycle effects that affects all assets. However, since business cycle effects differ in different countries, diversification of asset portfolios internationally can reduce systematic risks by converting them to non-systematic risks. Therefore, investors can reap additional gains by diversifying their asset portfolios across countries, besides diversification across industries.

(Source: Melvin, M. 2004: 109-113)

Evaluating the efficiency of the Foreign exchange market

The efficiency of foreign exchange market has been evaluated using: i. The interest parity condition. ii. Correlation between national saving and investment (Feldstein and Horioka 1980).ii. Exchange rate forecasting (Meese and Rogoff 1983).

#### viii Models of Currency Crises

In the Krugman first-generation model all variables except the interest rate is in logs.,

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$\mu^d \cdot p = \lambda i$  (1) Demand for real money balances ( $m^d \cdot p$ ), where  $p$  is the log of the price level and  $i$  is the interest rate is based on the assumption that income is constant.

where  $p$  is the log of the price level and  $r$  is the domestic interest rate.

$\mu^s = (d + r)$  (2). Money supply is the sum of domestic credit ( $d$ ) and reserves  $r$ .

$m^s = m^d = m$  (3) Money market equilibrium

$s = p - p^*$  (4) Uncovered interest rate parity (UIP).

$s = p - p^*$  (5) Purchasing power parity.(PPP)

Both UIP and PPP assuming perfect foresight, defining the exchange rate as the units of domestic currency per unit of foreign currency .Foreign variables are notated by an asterisk (\*).

After setting  $s = \bar{s}$  and  $\dot{s}=0$  and substituting equation (1) in equations (2) to (5) we obtain:

$\dot{s} = d - p^* + \lambda i^* + \lambda \dot{s}$  (6) which stipulate from (1) –(5) that the shadow exchange rate:

$\dot{s} = d - p^* + \lambda i^* + \lambda \dot{s}$  (7)

$\dot{s} = d - p^* + i^* + \dot{s}$  (8), which is the result of substituting the instantaneous rate of devaluation immediately after a speculative attack giving  $\dot{s} = \gamma$ .

$\dot{s} = \gamma$ , this equation is derived after differentiating with respect to time. .

$\Delta \mu^\sigma = \Delta \rho$  (10)

$\Delta \mu^\delta = -\Delta \gamma$  (11)

$\Delta \rho = -\lambda \psi$  (12)

$\rho_0 - \gamma T = -\Delta \rho$  (13), the right hand side gives the level of reserves before the launch of the speculative attack that is completely exhausted by the attack.

$T = (\rho_0 - \gamma T) / \gamma$ , (14), gives the unique timing of the speculative attack. The above equation also indicates that higher the stock of reserves and the lower the rate of credit expansion, the greater the time lag before the launch of an attack.

Source: Sarno and Taylor , 2002:245-248.

<sup>ix</sup> Reshaping the International Financial Architecture (Prophylactic measures).

The recurrent financial crises and crisis contagion have led to proposals for reshaping the IFA by implementing prophylactic or preventive measures to safeguard the economy from recurrent currency crises and crisis contagion based on lessons of the Asian currency crisis. Some of these prophylactic measures are listed below:

- I. The adoption of an appropriate exchange rate regime.
- ii. Build up of a strong banking and financial system.
- iii. The proper sequencing of trade and capital account liberalization.
- iv. The recognition of danger of crisis contagion. The prophylactic measures to immunise the DC economies from the ravages of currency crises. These preventive measures include: i. Greater transparency in IFA decision-making procedures. ii. Establishment of sound banking and financial systems
- iii. Enhanced credit lines.
- iv. Increase in the equity/debt flow ratios. Cynics contend that even with prophylactic measures crises would still recur.

Source: Krugman and Obstfeld 2009: 652-653.

<sup>x</sup> **The structural malaise** that has entrapped in a vicious circle of poverty can be attributed to: i. Excessive government control of the economy. ii. Printing money and collecting revenue by an inflation tax (seigniorage). iii. Operation of fragile financial institutions bereft of prudential supervision and therefore prone to moral hazard lending.

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iv. The 'fear of floating' and maintaining exchange rates at disequilibrium levels to dampen high inflation and reduce exchange rate volatility. v. High dependence on resource exports. vi. High levels of corruption and the existence of large underground economy. (Krugman and Obstfeld 2009: 625-628).

The operation of the structural malaise explains the puzzle as to why capital does not flow from rich to poor DCs despite the marginal productivity offered to investments in DCs (Lucas 19 ). Moreover the operation of the DC structural malaise make AC lenders prone to self-fulfilling panics similar to bank runs when there is a whiff of risk of DC default on foreign debt repayments and they engage in sudden stops compounded by the original sin as explained below.

#### Fear of floating

A insidious feature of the structural malaise gripping a DC open economy arises from the 'macroeconomic policy trilemma or the 'impossible trinity' where policy makers are compelled to choose only two of the three options: i. Monetary policy autonomy. ii. A fixed exchange rate regime or iii. Free capital mobility. Many DCs until the Asian currency crisis had shown a 'fear of floating' and limited currency fluctuations over long-periods undermining the DCs international competitiveness and macroeconomic stability (Calvo and Rhinehart 2000).

#### Sudden Stop

Fear of default on the repayment of foreign debt by DCs, could panic foreign lenders to recall the repayment of their short-term loans and stop any new lending to DCs. If the foreign debt or CAD as ratio of GDP is equal to 5%, to avoid risk of default a DC will have to increase S or compress I so generating CA surpluses so that  $CA = S - I > 0$ . Larger the short-term foreign debt the larger will be the risk of DC defaulting on debt repayments causing foreign lenders to precipitate a 'sudden stop' of lending to DCs (Calvo )

#### Original Sin

DCs are required to borrow in foreign currency, while ACs insists that their debts should be denominated in their own foreign currency. DCs are net debtors in foreign currency and a devaluation of their domestic currency in foreign currency terms increases the value of foreign debt transferring wealth from DCs to rich lenders in ACs . The denomination of DCs debts in terms of the AC lender's currency confers an enormous advantage on ACs and a disadvantage on DCs, dubbed the 'original sin' (Eichengreen and Hausman 1999) .

For DCs subject to the original sin, a fall in export demand has the opposite effect since they are net debtors in the major foreign currencies. A depreciation of the domestic currency, therefore, results in the transfer of wealth from DC borrowers to rich AC lender by increasing the domestic currency value of the foreign debt burden. This amounts to a negative insurance.

<sup>xi</sup> **Geography vs. Institutions.** An Instrumental variable facilitate the identification of whether Geography or Institutional paradigm is on the right track The proponents of the Geography paradigm contend that geographical factors influenced institutional factors and affect current per capita income implying that causality runs from geographical factor to changes in per capita income. Acemoglu et al. have identified an instrumental variable in the form of European mortality from the colonies. The colonial mortality rate qualifies as a valid instrumental variable for institutions, as it is correlated with current per capita income but not with the geographic variable.

Source: Krugman and Obstfeld 2009: 633-634