The transition to a globalized economy: Poverty, human capital and the informal sector in a structuralist CGE model

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Abstract

Recent econometric evidence suggests that trade liberalization has an elusive relationship to growth and income distribution. This paper provides an explanation for these results via numerical simulations of a dynamic structuralist CGE. The conclusion is that if families become too poor to finance human capital accumulation, or the state too stingy to supply it at a reasonable cost, exports of skill-intensive goods can become uncompetitive and the transition to openness may involve increasing poverty, unemployment and stagnation. The model design incorporates an informal sector as well as accumulation of human capital. The paper simulates two trajectories, a "green" path in which per capita income grows steadily with a rapid rate of human capital accumulation and a reduction in the level of economic informality. A second, or "red" path is also possible, however, with a growth rate that is much lower, an expanding informal sector and an inadequate rate of human capital formation.
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1. Introduction

The standard Heckscher–Ohlin–Samuelson model suggests that countries with large reservoirs of surplus labor should produce and export goods intensive in their most abundant factor, unskilled labor. But recent econometric evidence suggests that pro-globalization trade policy has a tenuous relationship to growth and income distribution (Easterly, 2001; Spilimbergo et al., 1999; Edwards, 1997). One explanation is that liberalization of the capital and current account was not accompanied by a broad set of policies addressing a number of development issues simultaneously (Rodrik, 1999). Brasili et al. (2000) and Roland-Holst (2003) show that successful globalizers move up a ladder of comparative advantage, with rapid shifts in their trade patterns, as both human and physical capital accumulate. In contrast, policymakers who see openness as an end in itself may be disappointed in the return to their efforts to respect the constraints imposed by the world financial and trading community.

Indeed how these constraints are perceived by policymakers is the central issue addressed here. The model is a dynamic structuralist computable general equilibrium (CGE) model with an informal sector. It is used to evaluate the longer term consequences for growth distribution, human capital formation and poverty of two stylized 20-year trajectories for a hypothetical small, open lower middle-income developing country with segmented labor markets. In the first, the policy requirements imposed by globalization are perceived to be strict: the nominal exchange rate appreciates to contain inflation, interest rates are kept high to maintain foreign exchange reserves and attract foreign direct investment and fiscal discipline is maintained via a tight constraint on government spending, with public sector investment adjusting to maintain the target PSBR to GDP ratio. In the second trajectory, trade reform is combined with a slightly more expansionary macro policy: the nominal exchange and interest rates are managed and government investment is aimed at lowering educational costs. Simulations show how relatively small differences in the macro policy component can cumulatively cause large differences in overall economic performance in the medium run. The results are also consistent with a J-curve effect of trade liberalization on growth found by Greenaway et al. (2002).

The paper is organized as follows: Section 2 is devoted to a theoretical elaboration of the adjustment mechanisms of the model. The third section presents empirical results of the effects of globalization on two stylized trajectories, with sensitivity analysis on some key parameters. A fourth section offers some conclusions on what can be learned from the simulations. A complete listing of the equations of the model together with the social accounting matrix (SAM) is presented in Appendix A.

2. Model

In addition to the usual features of dynamic structuralist CGE models, the model of this paper incorporates an explicit informal sector.[1] Nontraded goods sectors have

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[1] See Gibson and Kelley (1994) for a discussion of the theoretical approach employed here. For an interesting neoclassical CGE with an informal sector for Mexico, see Maechler and Roland-Holst (1995) and for a structuralist model for South Africa, see Schaefer (2002).

associated informal sectors that absorb surplus labor during recessionary periods and supply labor in periods of expansion. This treatment is consistent with the stylized fact of large shifts in the composition of employment from formal to informal activity during the 1990s compared with the 1980s as in Horton et al. (1994), Riveros (1990) and as modeled formally by Agénor and Aizenman (1999).

The framework also incorporates a household decisionmaking model for human capital accumulation. There is a growing body of literature that links macroeconomic conditions to decisions about schooling and human capital formation.[2] Labor supply is based on an implicit model in which families face a liquidity-constrained trade off between educating their children and current consumption needs. Families without liquid assets react to real income shocks by withdrawing their children from school.[3] The implications for the labor market are twofold: total supply increases and the downstream relative supply of skilled labor is reduced. Tax revenues will usually fall and if the government chooses to reestablish fiscal balance by reducing public sector investment in education, health and other social services, the private opportunity cost of capital accumulation will rise (Janeba, 2000; Das, 2001).

An export orientation is assumed to promote productivity growth in the model as well as a skill bias in the sense that climbing the ladder of comparative advantage requires an increase in the relative demand for skilled versus unskilled labor (Harrison and Hanson, 1999). This might be due to importing relatively cheap capital goods from developed countries in which skilled labor is relatively abundant or outsourcing of tasks that are skill intensive in developing countries yet intensive in unskilled labor in developed economies (Epifani, 2003). An outward orientation is generally regarded as having accelerated productivity growth in East Asian countries and elsewhere (Bayoumi et al., 1999; Kraay, 1999) but Clerides et al. (1998) found no such effect in a sample of Latin American countries.[4] Sensitivity analysis shows that the model conclusions are robust to both assumptions. The purpose of these additional features not normally found in CGE models is, of course, to enhance realism (Gibson, 2003).

2.1. The data and the structure of the CGE model

The model is a system of dynamic equations, which describes the structure and behavior of major macroeconomic variables. The theoretical perspective is structuralist, following Taylor (1983, 1990) in that a number of specific characteristics of the

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[2] See for example, Rucci (2003), Thomas et al. (2003); Beegle et al. (2003) and Jacoby and Skoufias (1997).

[3] Rucci (2003) shows the effect in Argentina is more pronounced for low-income families with older children in secondary school. The opportunity cost of education is the highest for these cases. Thomas et al. (2003) provide similar results for Indonesia. Although these studies refer to the effect of a crisis on schooling, there is no reason to think that the processes described require an extraordinary shock.

[4] Epifani (2003) surveys the micro level data to find indirect evidence of trade-induced productivity gains, but mainly due to shifts in output share reallocation and self-selection.

economy are built into its algebraic statement.[5] No attempt will be made to present a comprehensive account of all the equations of the model.[6] The SAM is compiled for two sociolinguistic classes and the social structure is further subdivided in the model according to location, rural versus urban (see Appendix A).

For nontraded goods, there are two productive processes, formal and informal.[7] Let the index i refer to the set, n, of goods of the model and j to the set, m, of processes. Formal processes are denoted by the set $f \in m$ and informal processes by the complement of f. The labor index is l, defined over skilled and unskilled labor, while households are indexed by h. With $X = \{x_j\}$ as the vector of output, we have:

$$BX = AX + C + I + G + E \tag{1}$$

where $A = \{a_{ij}\}$ and $B = \{b_{ij}\}$ are input and output matrices. Final demand consists of consumption $C = \{c_{ih}\}$, for each of the four social classes denoted by index h. Consumption demand is determined by a linear expenditure system (Lluch et al., 1977), typical of this class of models (Taylor, 1990). Investment by origin i and destination j is $I = \{i_{ij}\}$. It is comprised of private (including foreign), household and government investment. Government consumption is denoted by $G = \{g_i\}$ and exports, net of competitive imports, is given by $E = \{e_i\}$.

Capacity or potential output, Q_j, is given by a production function

$$Q_j = Q_j(K_j) \tag{2}$$

with K_j as the sector specific capital stock.[8] The rate of capacity utilization, u, is defined by:

$$u_j = X_j / Q_j. \tag{3}$$

Assume $u_j = 1$ for each informal sector, that is for $j \notin f$. The formal agricultural sector is also assumed to operate at full capacity with exports filling the gap between production and domestic demand while non-agricultural exports depend on growth in capacity and the real exchange rate, e_{rj}:

$$e_{rj} = eP_j^* / P_j. \tag{4}$$

Here e is the nominal exchange rate, P^* is the foreign price and P are the production prices of the exporting (formal) sectors, given by:

$$P_j = P\left(\tau_j, t_j, t_j^*, w_l, l_{lj}, e, m_j, P_0\right) \text{ for } j \in f \tag{5}$$

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where τ_j is a given mark-up and the indirect tax rate is t_j. The tariff rate is t^*. The wage rates for skilled and unskilled labor are given by w_l and the respective labor coefficients by l_{lj}, where the subscript indexes the labor category. Noncompetitive intermediate imports are denoted by m_j and P_0 is the import price. Nominal wages adjust according to the degree of excess labor demand, but with a lag. The real wage for either category of labor is not determined until prices emerge from the general equilibrium of the system. Productivity growth depends on capacity utilization and the share of sectoral value added exported, as discussed above.[9]

Private accumulation is given by:

$$I_j = I_j\left(u_j, \frac{\pi_j}{i^r}, I_g, \hat{p}\right) \text{ for } j \in f \tag{6}$$

where i^r is the real rate of interest, π_j is the rate of profit and I_g is public sector investment measured as a share of GDP. The investment function incorporates an accelerator dependent upon u_j as well as "crowding out" in the second argument and "crowding in" via the third. The last argument is inflation, $\hat{p}$, a proxy for uncertainty.

Accumulation of capital satisfies the usual stock-flow relationship:

$$K_{jt} = I_{jt} + (1 - \delta)K_{jt-1} \tag{7}$$

where K_{jt} is total capital invested at the beginning of the period t in sector j and δ is the rate of depreciation.

These equations are all standard in the structuralist literature.[10] The dynamics of the model unfold according to Eqs. (1)–(7). The simulations are run for a "medium to long run" of 20 periods.[11]

2.2. The informal sector

The literature on the informal sector does not speak with one voice. Early definitions of the informal sector variously referred to its legal status, registered or not, its size, measured in terms of number of employees or whether it collects and pays direct and indirect taxes (Rakowski, 1994). These definitions all share a lack of theoretical content, although more recent efforts to conceptualize the informal sector have focused on the process of wage determination such as in Agénor and Aizenman (1999).

In the present model, the informal sector acts as an employer of last resort, operating along side the formal sector. Not all branches of production have both formal and informal

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[9] At least for developed economies, the stylized fact is that labor productivity is pro-cyclical, increasing with capacity utilization (Rotemberg and Woodford, 1999). Overhead labor is perhaps the most common explanation for procyclical productivity but Rotemberg and Woodford produce many other arguments. These essentially boil down to convexities in labor cost structures leading to some factor substitution (capital for labor) and a rise in observed labor productivity.

[10] See for example Taylor (1990) or Gibson and van Seventer (2000).

[11] In order to arrive at a steady-state, the utilization of capacity must remain constant. This implies that the demand must grow at the same rate as capacity, Q_j. Given that private investment depends on public investment, the latter must also grow at the same rate. Since there is no mechanism which equilibrates these two growth rates in the model, there is no particular steady-state to which the model converges. See Gibson (2003) for a justification of this methodology.

producers (see the SAM of Appendix A) but in those which do, the informal sector sells its output at a price determined by the formal sector. Output of the latter is then residual to the production of the informal sector, which is itself determined by the supply of labor and (declining) level of productivity. By assumption, labor is not formally contracted in the informal sector. Income is then determined by the product of the formal price and output, less intermediate costs. This surplus is appropriated by the operator of the informal process who pays no taxes, direct or indirect. Since by definition, the informal sector always operates at full capacity, output is given by Eq. (2) above.[12]

The accumulation of capital in the *informal* sectors is given by the savings in the same sector:

$$I_j = S_j \text{ for } j \notin f \tag{8}$$

where S_j is savings in the jth informal sector. Under this specification, the capital market is bifurcated in that accumulation in each informal sector is limited by savings in that sector. No such self-financing limitation is imposed, of course, on the formal sector. The level of the informal capital stock affects the marginal productivity of labor as informal sector participation increases.

2.3. Human capital accumulation

In the model, family members are either employed formally or informally, or they are dependents. Dependents are engaged in the accumulation of human capital, whether they are themselves in school or are facilitating the process by supporting the collective educational attainment of the family. While dependents are sustained by family incomes, they provide some elasticity to the labor supply as potential entrants. The overall labor market constraint, normalized by the economically active population (EAP) of social class h, is

$$f_h + n_h + d_h = 1 \tag{9}$$

where f_h and n_h are formal and informal sector participation, respectively and d_h is the number of dependents. The decision facing the family unit is how to maximize family income over time. This is achieved by balancing current period employment and the accumulation of human capital that enables members to compete for skilled positions. Human capital can be accumulated in the model not only through formal education, technical schools or informal training and apprenticeships, but also by way of on-the-job training or "learning by doing" (LBD).[13]

Accumulated human capital determines the supply of skilled labor. The accumulation of human capital is governed by an equation similar to (7) above with an exogenously

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[12] There are some subtle implications of this treatment of the informal sector. First, there is little the formal sector can do to eliminate the informal sector. If the formal sector lowers its price in an effort to obtain a larger market share, the informal sector will match it and informal income will fall. Second, with a growing level of total demand, profits in the formal sector rise more than proportionately. The increase in formal production causes a rise in the demand for labor which then reduces informal sector participation. With less informal competition, output in the formal sector increases and with it the rate of profit. See Gibson and Kelley (1994) for more details.

[13] By assumption, LBD applies only to formal sector employment.

given rate of depreciation. Skilled labor supply, L_h^s, normalized by the EAP in each of the social classes, is then given as function of human capital accumulation:

$$L_h^s = L_0 \kappa_h^{\alpha_h} \tag{10}$$

where L_0 is a constant, κ_h is human capital of class h and α_h is a class-specific elasticity. Unskilled labor supply, L_h^u, is a residual, defined as the EAP less the normalized skilled labor supply, L_h^s[14]:

$$L_h^u = 1 - d_h - L_h^s. \tag{11}$$

Standard models of human capital accumulation show that agents allocate time between production and accumulation according to some discount rate as well as the relative productivities of schooling versus LBD (Lucas, 1988; Aghion and Howitt, 1998). The additional constraint here is that per capita family income, earned from formal sector employment, does not fall below some given sociobiological floor. The constraint is expressed in terms of an *income-dependency ratio*, R_h, defined as the percentage of the EAP that depends on formal sector income:

$$R_h = \frac{(1 - n_h)}{Y_h} \tag{12}$$

for social class h, with Y_h as total, real formal-sector income. If we take R_h as a sociologically given datum, Eq. (12) determines the level of participation in the informal sector. Taking account of (9), we rearrange (12) as an inequality:

$$d_h \leq (y_h R_h - 1) f_h \tag{13}$$

where $y_h = Y_h / f_h$ is per capita formal income of class h. Assuming the per capita incomes are known in both the formal and informal sectors, the familial objective is to maximize the discounted value of the utility of income:

$$\text{Max} \int_{t_0}^{\infty} U(Y_h) e^{-\rho_h t} dt \qquad \text{s.t. 9, 13, and } f, n, d \geq 0 \tag{14}$$

The maximum acceptable income-dependency ratio, R_h, and ρ_h, the discount rate, are taken as given and the utility function is assumed to have all the usual properties. Normally, one would think of R_h as a choice variable; as the family places higher value on future income, current sacrifice would increase. But the income-dependency ratio cannot increase indefinitely and is arguably a binding constraint in labor surplus economies. If this constraint does indeed bind, members accept any offer of formal sector employment, since with LBD, the long-term earning capacity of the family unit is maximized. There is also the added attraction of relative employment stability and other benefits, tangible and intangible, of formal sector employment.

An increase in the formal per capita income of the family unit, y, implies a fall in labor force participation and a rise in the rate of accumulation of human capital. This may

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[14] As in Skott and Auerbach (2002), unemployed skilled workers compete with unskilled workers for unskilled positions. They find that the distribution of income will worsen as a result.

come about either through an increase in the formal sector wage or employment. An increase in public sector expenditure that lowers the cost of education will also lead to a rise in the acceptable dependency ratio. This causes a decline in the labor force participation rate and a rise in the rate of accumulation of human capital as well. In the model, an increase in per capita income in the informal sector has no effect on labor force participation since informal workers are assumed to accumulate all the surplus above an implicit wage given by y_h. This determines informal savings in Eq. (8). The assumption is one of convenience since it implicitly avoids having to specify an investment function for the informal sector. The utility of future income from skilled labor, acquired in the formal but not the informal sector, also prevents migration from the formal to the informal sector.[15]

In the calibrated model below, the dependency constraint does indeed bind since there is excess supply of unskilled labor in the data base. The solution algorithm searches for a nonnegative solution for d in Eq. (13), for an n satisfying 9, such that the rate of human capital formation is maximized. In this way the CGE model mimics the solution to Eq. (14).

3. Simulations

In this section, we study two policy regimes in which the transition to openness is managed differently. The simulations are run over a period of 20 years, sufficient time to allow for different rates of human capital formation to impact unit labor costs. We see that the regimes produce two realistic trajectories, a "green" and a "red", in which the medium-term macro performance varies significantly. Sensitivity analysis is then undertaken to determine the robustness of the findings.

3.1. Simulation design

The selection of the parameter settings can be justified as follows. While both economies accept increased participation in the world economy as a near-term goal, the red is principally concerned to direct monetary, fiscal and exchange rate policy toward reducing risk premia and improving credibility as seen by foreign investors. Red policymakers fear a devaluation induced inflationary spiral and use the exchange rate as a nominal anchor to arrest historically high inflation, despite the cost to output and employment.[16] They also fear that devaluation will cause foreign capital already in the

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[15] In this way, the model avoids the complex intrafamilial decisionmaking process with regard to staying in school versus some more entrepreneurial activity with some expected rate of return. The model thus sacrifices some realism for tractability in assuming that informal sector participants are effectively separated from the family unit. They cease being dependents and earn income on their own until formal activity rises to the point that they can return to school or get a formal sector job.

[16] 1t is well known that a number of Latin American countries, as well as formerly Eastern Bloc countries, followed this path in the 1990s (Mussa et al., 2000). Many countries have recently floated, but the majority continue to try to stabilize their exchange rates through both direct intervention in foreign exchange markets as well as open market operations (Calvo and Reinhart, 2002).

Table 1
Parameter settings[a]

Policy response	Instrument	Green	Red
Investment climate	Real exchange rate	Constant	Appreciation
	Real interest rate	Decreases	Constant
Fiscal discipline	Govt. invest/GDP	Constant	Decrease
	Educational cost	Constant	Increase
	Direct tax rate	Increase	Larger increase
	Transfers to households	Increase	Constant

[a] All others held constant.

country to flee, possibly provoking a financial crisis. Further, inflation is seen as undermining the real incomes of the poor. Their weak export base is a product of the lack of real investment in the past. This may be perceived as a problem real devaluation is incapable of repairing, especially without the aid of foreign capital. Precisely when devaluation is needed the most, it appears to the monetary authorities that a stable exchange rate requires a high real interest rate no matter what the effect on the domestic economy. Red policymakers see fiscal discipline as essential to their program of attracting foreign investment. This means keeping the PSBR to GDP ratio under control and to achieve this, the government looks to public sector investment and transfers as the adjusting variables.[17]

The green trajectory pays more attention to fundamentals (Rodrik, 1999). Green policymakers recognize that if macroeconomic indicators are out of balance, capital inflow will be discouraged and if these indicators get out of balance quickly, capital may exit, also quickly. But green policymakers also recognize that the converse proposition is not necessarily correct and so try to stimulate domestic investment with a relatively low interest rate, avoid taxing exports with an overvalued exchange rate and direct fiscal policy toward maintaining family income adequate to the task of accumulating human capital.[18]

Table 1 describes the parameter settings for the two simulations. All parameters omitted from Table 1 are identical for both simulations. Tariffs are reduced equally. The

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[17] South Africa in the 1990s for example, did an admirable job bringing down the PSBR to GDP ratio, maintaining a stable exchange rate and deregulating its labor markets. Yet, the rate of capital inflow was less than 1% of GDP for 1994–2000, compared to three to 5% for countries in a similar risk category, because of the high crime rate, unemployment and disaffection of much of the black majority and HIV/AIDS. See IMF (2003) and Nattrass (2004). Similarly, Mexico while paying close attention throughout the nineties to its interest and exchange rate, has long neglected education and human capital formation.

[18] The World Bank notes that low income countries with stable macroeconomic indicators, such as Bolivia, Uganda, and Ghana, have attracted the largest increases in FDI during the boom years of the 1990s (WB, 2002). Choe (2003), however, shows that FDI Granger causes economic growth and vice-versa. Hausmann and Rojas-Suares (1996) agree with the bidirectionality, noting that foreign investors are usually looking for evidence of strong growth potential. As noted above, Easterly (2001) shows that for developing countries as a whole, the policy reforms of the late 1980s and 1990s did not result in an acceleration in growth.
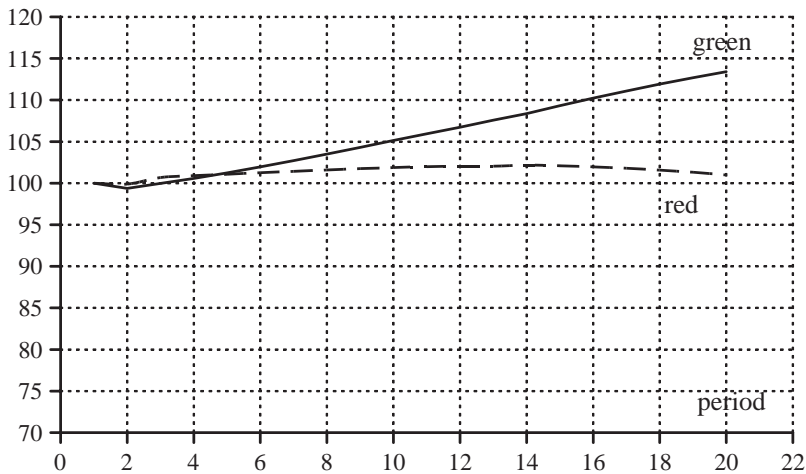
Fig. 1. GDP per capita, base=100.

magnitudes of the changes listed in the table are small in absolute value and are indicated in a footnote.[19]

The simulation design is intended to illustrate the inherent risks involved in an outwardly oriented development strategy that is not entirely successful. Of course if the policies of the red trajectory were successful in promoting foreign capital inflow that more than compensated for the damage these policies do to the domestic economy, the red path would come to look more like the green in the simulations to follow. This question is addressed below, via additional sensitivity simulations.

3.2. Results

Fig. 1 shows the evolution of real per capita GDP over time in both trajectories.[20] The solid-line green regime has embarked on a successful transition, out performing the dotted-line red by a significant margin. Moreover, the red trajectory appears to be stagnating.

One of the most interesting aspects of the red simulation is apparent from the initial 4 years. There the immediate performance is superior to the green trajectory and the crossover does not occur until the 5th year. This result is explained by the slower rate of human capital

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[19] In periods 2 through 5, the tariff reductions are 57.4% 27.4% 27.4% 16.9% of the base SAM level respectively. This conforms approximately to Paraguay's historical experience. The nominal exchange rate is adjusted in the green trajectory in line with inflation, but there is a one-half of 1% appreciation relative to the rate of inflation in the red trajectory (in other words, the red pass-through coefficient on inflation is 0.99 versus 1 for the green). The green real interest rate falls by 1% per period. Government investment in the green trajectory is 6.6% of GDP but this is linearly reduced to 5% of GDP in the red. The maximum dependency ratio increases by 4% per year in the red trajectory and decreases by 1% a year in the green. The direct tax rate rises by 4% per period in the red and by 3% in the green. Transfers remain constant in the red trajectory but are increased in the green by 3% per period.

[20] The convention is that the green trajectory is shown by a solid line while the red is dotted.

Table 2
Results of the simulations

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Average
Tariffs (% of GDP)																					
Green	1.35	1.38	1.40	1.41	1.43	1.44	1.46	1.47	1.49	1.50	1.52	1.53	1.55	1.56	1.57	1.58	1.59	1.61	1.62	1.63	1.5
Red	1.35	1.40	1.40	1.39	1.38	1.37	1.35	1.34	1.33	1.32	1.30	1.29	1.28	1.26	1.25	1.24	1.22	1.21	1.19	1.18	1.3
Real exchange rate (base year= 100)																					
Green	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100.0
Red	100	99.0	98.0	97.0	96.1	95.1	94.2	93.2	92.3	91.4	90.4	89.5	88.6	87.8	86.9	86.0	85.2	84.3	83.5	82.6	90.6
Real interest rate (%)																					
Green	23.3	23.1	22.9	22.6	22.4	22.2	22.0	21.8	21.5	21.3	21.1	20.9	20.7	20.5	20.3	20.1	19.9	19.7	19.5	19.3	21.1
Red	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
Real cost of education (base year= 100)																					
Green	100	99	98	97	96	95	94	93	92	91	90	90	89	88	87	86	85	84	83	83	90.6
Red	100	104	108	112	117	122	127	132	137	142	148	154	160	167	173	180	187	195	203	211	151.5
Govt. investment (base year= 100)																					
Green	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100.0
Red	100	98	97	96	94	93	91	90	89	87	86	85	83	82	81	80	79	77	76	75	86.3

Source: Model results.

accumulation. If schooling is too expensive to pursue, individuals then elect to enter the labor market, to be employed either as formal workers, or informally. In either ease, GDP increases. The first workers who enter the informal sector are of course the most the productive, given diminishing returns, and so per capita income can increase, although only briefly as shown in the diagram. Policymakers may be encouraged by the rise in the growth rate since it appears from the output data that the economy is doing well. Globalization appears to be working without excessive attention to public education, transfers or anti-poverty programs. But as the pace of human capital accumulation slows further, the informal sector swells, per capita output there falls and overall GDP growth is outpaced by population.

Table 2 summarizes the immediate effects of parameter changes introduced in the simulation. Tariff revenue as a percent of GDP fluctuates in both scenarios despite the fall in tariff rates. The real exchange rate appreciates in the red trajectory, while it remains constant in the green. The difference is slight in each period, but amounts to 17.4% by the end of the 20-year period. Table 2 shows that the red real interest rate remains constant in the effort to attract foreign capital. In the green trajectory, by contrast, the real interest rate falls.

Table 3 indicates that there are some danger signals associated with the rapid growth along the green path. While GDP growth averages 3.1% and employment increases 31.2% over the 20-year period, inflation is only reduced by one percentage point in the green versus 2.4 points in the red trajectory. On average the inflation rate is a percentage point above that of the red trajectory and shows an upward trend beginning in the 13th period. Part of the explanation lies in the wage adjustment equations and the fact that much of the deficit is assumed to be monetized. Initially, the green policymakers disregard a rising PSBR to GDP ratio in order to keep the rate of public sector investment constant as shown in Table 2. The red economy, by contrast, chooses to cut public investment. In this instance, however, the strategy fails; by the end of the simulated period, it is the green economy that has reduced the deficit ratio by the most. Observe that investment as a share of GDP does not differ much between the trajectories.

Openness has been achieved in both scenarios, and although the transition is less successful along the red than green path, there are clearly warning signs on the latter. Along both paths, imports as a fraction of GDP rise during the transition, broadly consistent with what has been observed during the initial phase of liberalization in many countries. Exports respond more slowly and the simulations attempt to capture this aspect of the transition in a relatively realistic way. The small country assumption applies to agriculture, while nonagricultural exports depend on large-country competitiveness. Thus, as demand expands, agricultural exports can fall if production does not keep pace. Since the price of agriculture is determined by a constant foreign price and the exchange rate, any tendency toward real appreciation will cause domestic consumption of agricultural goods to rise and exports, as a result, to fall. Fig. 2 shows the relationship of direct plus indirect agricultural and non-agricultural exports in both trajectories measured in billions of local currency units (LCU).[21] It is evident that along the green path, non-agricultural

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[21] The direct plus indirect exports, $\hat{E}$, was calculated by way of the Leontief inverse

$$\hat{E} = (B - A)^{-1} E$$

where B and A are the full output and input matrices of the base SAM, including formal and informal sectors, and E is the level of direct exports. Note that this treatment realistically implies that informal sectors export indirectly.

Table 3
Results of the simulations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Average
GDP per capita (% change)																					
Green	–	2.0	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.2	3.2	3.2	3.2	3.3	3.2	3.1	3.1	3.0	2.9	2.9	3.1
Red	–	2.5	3.4	2.8	2.7	2.7	2.7	2.7	2.6	2.6	2.5	2.4	2.4	2.3	2.2	2.2	2.1	2.0	2.0	1.9	2.5
Employment (base year = 100)																					
Green	100.0	101.0	102.2	103.6	105.1	106.6	108.2	109.9	111.6	113.3	115.1	116.8	118.6	120.4	122.2	124.0	125.8	127.6	129.4	131.2	114.6
Red	100.0	101.8	104.0	106.1	108.1	110.2	112.3	114.4	116.4	118.4	120.4	122.3	124.1	125.8	127.4	128.9	130.3	131.5	132.6	133.5	118.4
Inflation (%)																					
Green	9.1	8.5	8.2	8.0	7.8	7.7	7.6	7.6	7.5	7.5	7.5	7.5	7.6	7.6	7.7	7.7	7.8	7.9	7.9	8.0	7.8
Red	9.1	7.6	7.2	7.0	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.6	6.5	6.5	6.5	6.5	6.5	6.6	6.6	6.6	6.8
Productivity growth (% change)																					
Green	–	1.0	2.0	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.7	1.6	1.6	1.6	1.5	1.5	1.6
Red	–	0.7	1.3	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	1.1	0.9	1.0	1.0	1.1	1.1	1.2	0.9
PSBR/GDP (% of GDP)																					
Green	6.5	6.7	6.8	6.8	6.9	6.9	6.9	6.9	6.9	6.8	6.8	6.7	6.6	6.5	6.4	6.2	6.1	5.9	5.8	5.6	6.5
Red	6.5	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	6.2
Govt. savings/GDP (%)																					
Green	0.2	0.0	− 0.1	− 0.2	− 0.3	− 0.3	− 0.3	− 0.3	− 0.3	− 0.2	− 0.2	− 0.1	0.0	0.1	0.2	0.4	0.5	0.7	0.8	1.0	0.1
Red	0.2	0.1	0.0	− 0.1	− 0.2	− 0.3	− 0.4	− 0.4	− 0.5	− 0.5	− 0.6	− 0.6	− 0.7	− 0.7	− 0.7	− 0.7	− 0.8	− 0.8	− 0.8	− 0.8	− 0.5

Investment/GDP (%)

Green	25.8	27.6	28.5	28.9	29.3	29.4	29.6	29.6	29.6	29.6	29.6	29.5	29.4	29.3	29.1	29.0	28.8	28.7	28.5	28.4	28.9
Red	25.8	30.2	30.8	30.8	30.7	30.5	30.3	30.1	29.9	29.7	29.4	29.2	28.9	28.7	28.4	28.2	27.9	27.6	27.4	27.1	29.1

Govt. employment/GDP (%)

Green	3.6	3.6	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.3
Red	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.8	3.8	3.9	4.0	4.1	4.1	4.2	3.7

Export/GDP (%)

Green	33.4	32.0	31.4	31.0	30.7	30.5	30.4	30.4	30.4	30.5	30.5	30.6	30.8	31.0	31.2	31.4	31.7	31.9	32.2	32.4	31.2
Red	33.4	30.3	29.7	29.5	29.3	29.2	29.1	29.1	29.0	28.9	28.9	28.8	28.8	28.7	28.7	28.7	28.6	28.6	28.6	28.6	29.2

Import/GDP (%)

Green	37.7	38.4	38.6	38.8	38.8	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.8	38.8	38.7	38.7	38.6	38.6	38.6	38.7
Red	37.7	39.2	39.3	39.2	39.0	38.8	38.6	38.4	38.2	38.1	37.9	37.7	37.5	37.4	37.2	37.0	36.9	36.7	36.6	36.4	37.9

Foreign savings/GDP (%)

Green	4.3	6.4	7.3	7.8	8.2	8.4	8.5	8.5	8.5	8.5	8.4	8.3	8.1	7.9	7.6	7.3	7.0	6.7	6.4	6.1	7.5
Red	4.3	8.9	9.6	9.7	9.7	9.6	9.5	9.4	9.2	9.1	9.0	8.9	8.8	8.6	8.5	8.4	8.2	8.1	7.9	7.8	8.7

Gini

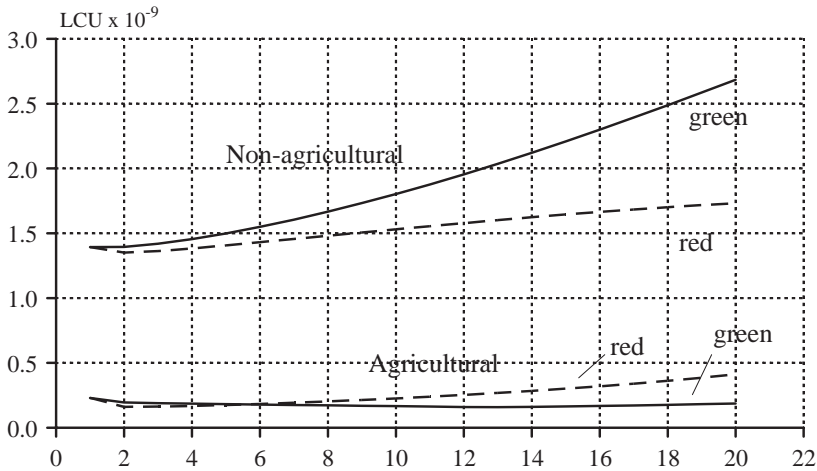|																				
Green	0.31	0.31	0.31	0.31	0.32	0.32	0.33	0.33	0.34	0.35	0.35	0.36	0.37	0.37	0.38	0.39	0.39	0.40	0.41	0.41	0.4
Red	0.31	0.31	0.31	0.32	0.32	0.33	0.34	0.34	0.35	0.35	0.36	0.36	0.37	0.37	0.38	0.38	0.39	0.39	0.40	0.40	0.4

Source: Model results.

Fig. 2. Direct and indirect exports.

exports rise at an increasing rate while agricultural exports stagnate and then begin to rise slowly. Along the red path, the mix is different. Nonagricultural exports increase, but at a decreasing rate. They are hurt by the strong exchange rate and the shortage of skilled labor, as discussed in detail below. Agricultural exports, on the other hand, are rising at an increasing rate, which in turn vindicates the red policymakers' (incorrect) view that the transition is being managed properly.

Fig. 3 shows the evolution of participation in the educational sector in both trajectories, illustrating the effect of the assumed macroeconomic policies on the accumulation of human capital. The number of informal participants rises steadily in the red trajectory as both cause and effect of its weaker economic performance. In the green, however, the informal sector initially swells but then begins to contract in the 8th period. By the end of the simulated period, households in the red trajectory have abandoned formal educational programs and are committed to immediately remunerative activity whether formal or informal.

Fig. 4 shows the corresponding excess supply of skilled labor in the model. We saw from Table 3 above that total employment over the two trajectories is approximately the same, but the composition is different.[22] By the end of the simulated period, employment of skilled labor along the green path is 13% higher than along the red. Initially the green trajectory shows higher excess supply of skilled labor, but by the 6th period, it is overtaken by the red trajectory. The growth in green demand is sufficient to reduce the excess supply of skilled labor despite the rapid rate of human capital accumulation shown in Fig. 3 above. Note in Fig. 4, that by the 17th period, the differential in the rate of human capital accumulation causes the two trajectories to reverse themselves. Thereafter, the red trajectory shows more of a bottleneck for skilled labor than the green, despite the faster

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[22] The slight superior employment performance of the red trajectory is due to the more rapid productivity growth associated with higher exports in the green (see sensitivity analysis below).
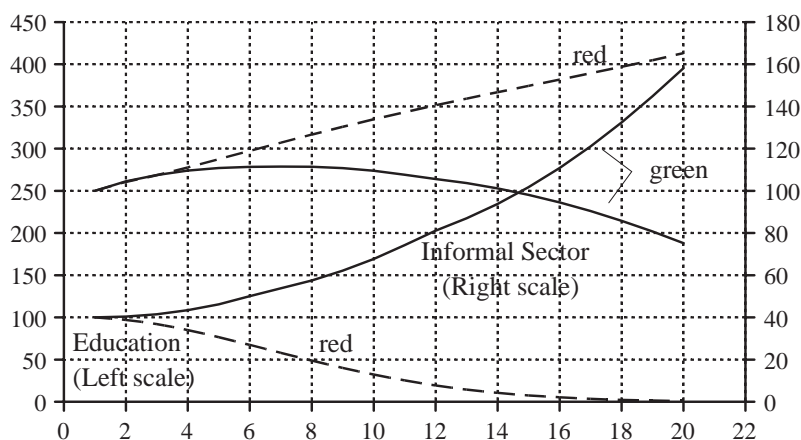
Fig. 3. Education and informal sector, base=100.

growth in exports in the green. Additional data (not shown) confirms that skilled labor unit labor costs are uniformly higher in the red relative to green paths and the difference increases at an increasing rate.

Critics of globalization argue that the process is often accompanied by rising levels of inequality and poverty.[23] The last line of Table 3 confirms that the Gini does indeed rise in both trajectories in an approximately equal fashion. Fig. 5 shows how three measures of poverty evolve over the two trajectories.[24] The headcount is based on a relatively high definition of 60% of the average per capita income in the base year with a 1% growth rate thereafter. The slower growth of the red trajectory results in a slightly higher headcount than on the green path, that is until the 13th period. At this point, slow red growth in the demand for labor, both skilled and unskilled, causes the informal sector to swell to the point that average per capita income there falls below the poverty level and there is an uptick in the headcount. The very process by which a transitionary economy becomes less competitive serves at the same time to worsen poverty levels.

The distribution of income is another matter. As the red economy becomes more informal, the distribution of income improves slightly. But the progress is illusory, of course, a leveling from above that reduces the dispersion of incomes. Moreover, sensitivity analysis shows that if the supply of labor becomes more elastic with respect to human capital formation, or a high dependency ratio becomes more acceptable, the distribution of income can substantially worsen in the red trajectory relative to the green.[25] With more human capital available in the green, yet a growing informal sector in

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[23] See Taylor and Vos (2000) and Ganuza and Taylor (1998) and Rodrik (1997).

[24] This Gini is only for the four classes in the model and does not reflect any within class variability and, therefore, cannot be compared with any published Gini.

[25] On the other hand, excess supply of skilled labor might well generate some pressure for the government to become an employer of last resort, diverting resources from government investment.
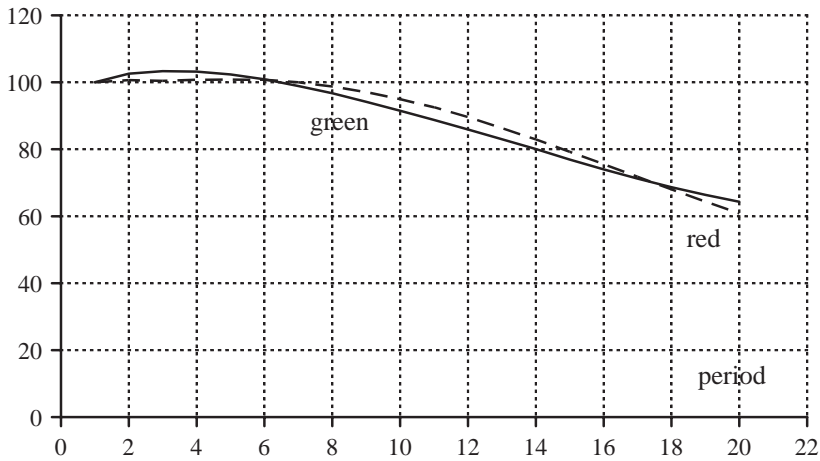
Fig. 4. Excess supply of skilled labor, base=100.

the red, the ratio of the wage of skilled to unskilled labor rises in the red and falls in the green. Excess supply of skilled labor declines in both trajectories over the simulated period but the excess supply of unskilled labor rises. As a result, the endogenous skilled–unskilled wage differential increases in both, but more slowly in the green trajectory. The same sensitivity analysis shows that a more rapid rate of human capital accumulation can easily cause a flat or declining ratio of the wage of skilled to unskilled labor in the green trajectory, especially when output increases rapidly. In the longer run, when the Lewis turning point is reached, and the excess supply of unskilled labor is reduced to zero, the skilled–unskilled wage gap can even reverse along the green path. On the red trajectory, skill bias is more pronounced.

Fig. 5. Poverty indices.

Table 4
Average per capita incomes

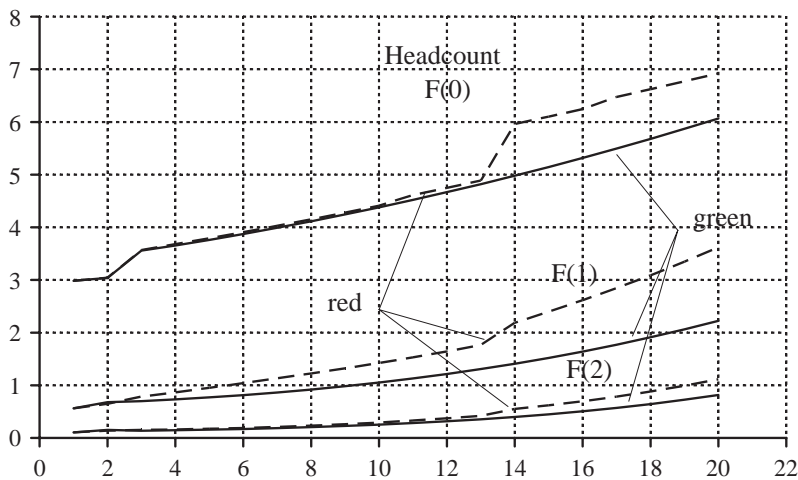|	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Average
Urban formal sector households (base= 100)																					
Green	100.0	99.9	101.1	102.3	103.6	104.7	105.8	107.2	108.5	109.8	111.0	112.1	113.1	114.1	114.9	115.6	116.2	116.7	117.2	117.5	110.1
Red	100.0	100.5	102.5	104.8	107.4	110.0	112.7	115.3	117.8	120.3	122.6	124.9	127.0	129.0	130.9	132.7	134.5	136.1	137.7	139.2	121.4
Urban informal sector (percentage of the urban formal sector)																					
Green	69.5	68.7	70.5	72.1	73.5	75.0	76.4	77.8	79.1	80.3	81.7	83.0	84.3	86.0	87.7	89.4	91.3	93.1	95.0	96.8	79.8
Red	69.5	68.3	69.6	70.4	70.9	71.4	71.8	72.3	72.8	73.3	73.9	74.5	75.1	76.0	77.0	77.9	78.9	79.8	80.8	81.7	74.5
Rural formal income (percentage of the urban formal sector)																					
Green	44.7	45.1	43.7	42.6	41.6	40.7	40.2	39.7	39.2	38.8	38.5	38.4	38.3	38.3	38.4	38.7	39.1	39.6	40.3	41.2	40.1
Red	44.7	44.7	43.1	41.5	39.8	38.1	36.6	35.1	33.8	32.7	31.6	30.7	29.9	29.1	28.4	27.8	27.2	26.6	26.1	25.5	33.1
Rural informal income (percentage of urban formal sector)																					
Green	58.1	58.8	57.9	57.4	57.1	56.9	57.0	57.1	57.1	57.3	57.5	57.9	58.3	58.8	59.4	60.2	61.1	62.3	63.6	65.3	57.2
Red	58.1	58.6	57.7	56.8	55.7	54.6	53.6	52.6	51.8	51.0	50.3	49.7	49.2	48.7	48.2	47.8	47.4	47.0	46.6	46.2	51.2

Source: Model results.

More detailed measures of the poverty gap, shown in Fig. 5 as $F(1)$ and the squared poverty gap, $F(2)$, indicate that when the depth of poverty is taken into account, the red trajectory does not fare well.[26] The reason is that the level of unemployment of skilled labor along the red path is high and as the unemployed crowd into the informal sector, per capita output falls due to diminishing returns to labor there. But both measures also increase in the green: there, human capital accumulation outpaces the demand for skilled labor with the result that wages are low. The higher inflation along the green trajectory also takes its toll. While low wages are responsible for the success of the green trajectory exports, as Fig. 4 indicates, low real wages, together with a relatively high (and arbitrary) definition of the poverty level, cause many families to slip below the line.[27]

Table 4 shows the evolution of the formal and informal incomes broken down according to rural versus urban. Urban formal sector employment is clearly more remunerative than the informal sector, as seen. This is especially true in the red trajectory. But notice that in the rural sector, where wages are the lowest and poverty most extensive, the relationship is the reverse. For the rural poor, it is more remunerative to participate in the informal sector in both trajectories. Since the model requires that formal sector employment be accepted if offered, it is possible that in the short run, smallholders abandon or sell their plots to participate in the less remunerative formal sector.[28]

From Table 4, we can draw two additional conclusions: first note that there is some potential for macroeconomic populism present in the red trajectory since per capita incomes in the urban formal sector are significantly higher there (due to lower inflation). This might give rise to political support for the regime as the transition to openness is managed. Second, in a successful transition to openness, there is less need for massive rural–urban migration. In the red trajectory urban formal sector income is rising but not in the green due to the need to support a higher number of dependents. The overvaluation of the exchange rate hurts rural incomes and as a result there is a strong incentive to migrate from the rural sector to join the urban formal sector in the red trajectory. In the green trajectory, by contrast, the rural–urban migration is not as attractive since there is rural–urban convergence. More detailed results (not shown) indicate that in green trajectory rural households, educational opportunities are still being pursued, human capital is accumulating, whereas in the red, all but the smallest fraction of rural households have dropped out to join the informal sector.

4. Sensitivity analysis

This section evaluates the empirical robustness of the two stylized development paths studied in the simulation results. Numerous additional simulations were run to evaluate the

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[26] These are common measures of the poverty gap $F(1)$, with a squared weight in $F(2)$. See Foster et al. (1984).

[27] Poverty, either headcount or as measured by $F(1)$ and $F(2)$, is not the same concept as R, the maximum income dependency ratio. This is set separately from the definition of poverty in the model and is determined by per capita income in the base year for each income class. More detailed results, not shown, indicate that individuals who fall below the headcount poverty line still accumulate human capital since they have not yet reached the maximum income-dependency ratio.

[28] The model does not track land sales, but it is clear that in many countries, agro-industrialization requires land concentration with the result of growing rural poverty. The results are consistent with this observation.

sensitivity of the main result of the model, namely that attention to demand and distributional equity can make a difference in the medium term competitiveness of the economy.[29] The general finding is that no one parameter drives the model and therefore changing any particular setting has a small impact on the character of the simulations. In every case, the effects of the parameter changes cause reasonable and explainable changes in the results of the simulations as depicted in the graphs above. Sensitivity experiments were run on both green and red trajectories, but for the most part only the effects on the red are reported. The relative positions of the two trajectories were not altered in any of the simulations.

4.1. Capital inflow in the red trajectory

There is nothing inherently wrong with the strategy of tight macromanagement leading to enhanced capital inflow. The point of the simulations is to show in a relatively realistic model just how risky the process might be. It may be objected that the original red trajectory is overly pessimistic. The "Capital inflow" column of Table 5 shows that a 5% autonomous increase in private investment would raise the average growth rate of the red trajectory by 0.29 percentage points (from 2.46% to 2.75%) closing the gap between the red and green trajectories by almost half. Investment as a share of GDP now exceeds the red trajectory, by 1.01% for the period average. Note however, that foreign savings is 0.65% higher for the period average than the red trajectory. As in all other simulations the trade deficit increases for several periods before it begins to decline. In general, faster growth delays the turning point for foreign savings, in part because of rising imports but also because the demand-side stimulus reduces agricultural exports in this scenario as more is consumed locally.

The added growth greatly improves the balance on public finances. The PSBR to GDP ratio falls by 0.39% as seen in the table. In effect this is what the red trajectory policymakers were hoping for all along. Inflation is only slightly higher (half a percentage point) and employment growth is marginally higher.[30] Poverty does not tick up as in the red simulation until three periods later (from the 13th to 16th). There is no significant impact on the Gini, however.

This demand-led strategy does not address the fundamental problem of long-term competitiveness of nontraditional exports because no attention to educational costs is paid. As a result, workers who cannot find employment even in the more dynamic economy are more likely to migrate to the informal sector. Thus, despite the faster growth, the informal sector only contracts by 0.01%. Since the informal sector contributes to GDP, part of the catch up shown in this simulation is due to the high opportunity cost of education. The average growth rate of the supply of skilled labor is essentially the same with foreign capital inflow, as seen in the table (2.24% in both compared with 2.86% in the green) and consequently unit labor costs are not much affected by the capital inflow. The result is that direct and indirect nonagricultural exports average only 59% of the green trajectory. The

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[29] A full discussion of all the details of the sensitivity analysis is beyond the space limitations of the paper. Details of the sensitivity simulations are available from the author on request.

[30] The level is even higher than in the green trajectory.

Table 5
Sensitivity analysis[a]

	Capital inflow[b]	Export productivity[c]	Skilled labor elasticity[d]	Educational costs[e]	Exchange rate[f]
GDP per capita growth (% change)	0.29	1.06	0.02	0.02	0.47
Employment growth (% change)	0.14	0.37	0.08	0.21	−0.47
Inflation (%)	0.52	0.62	−0.15	−0.10	0.76
Productivity growth (% change)	0.14	0.66	−0.06	−0.19	0.92
PSBR/GDP (% of GDP)	−0.39	−0.06	−0.11	−0.07	−0.99
Investment/GDP (%)	1.01	0.71	0.27	0.36	−1.85
Exports/GDP (%)	−0.28	1.67	−0.19	−0.18	3.24
Imports/GDP (%)	0.37	1.10	0.04	0.15	0.10
Foreign savings/GDP (%)	0.65	−0.57	0.23	0.33	−3.14
Informal sector growth (% change)	−0.01	0.00	0.00	0.00	0.03
Skilled labor growth (% change)	0.01	0.75	0.03	0.41	−0.01
ULC growth (% change)	0.05	−1.99	−0.16	−0.40	−0.97

Source: Models results.
[a] Increase or decrease in period average relative to the base run in the red trajectory.
[b] A 5% increase in autonomous investment.
[c] A doubling of the elasticity of productivity with respect to exports.
[d] A doubling of the elasticity of skilled labor supply with respect to human capital formation.
[e] No increase in the maximum dependency ratio in the red trajectory.
[f] Constant real exchange rate in the red trajectory.

transition to openness has not failed, it has just left the economy on a different rung of the ladder of comparative advantage.

4.2. Exports, productivity and skilled labor

A second set of sensitivity simulations were run exploring the effect of different parameter settings with respect to the effect of exports on productivity.[31] The results are shown in the "Export productivity" column of Table 5. It is evident that (like the green trajectory above) the red economy also enjoys a virtuous cycle in which higher exports improve productivity growth. As seen in the table, this in turn raises per capita incomes by more than one percentage point, which then allows for higher skilled labor supply. Private formal sector employment increases accordingly, as result of higher profits driving up capital accumulation and thus the demand for labor. Investment also increases and the economy embarks on faster growth path with some improvement on the fiscal deficit. Foreign savings decline by more than half a percentage point, but again there is no significant improvement in the rate of growth of skilled labor and virtually no change in the informal sector.[32] The relative skilled labor bottleneck in the red trajectory relative to the green advances by two periods.

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[31] Doubling the rate of productivity growth in general in the model had quantitatively similar effects and is therefore not reported.
[32] Faster growth increases the demand for skilled labor in both trajectories but more so in the green than the red. Higher formal per capita income there supports more dependents but this effect is not as pronounced in the red since the higher cost of education still encourages informal output.

The model is not very sensitive to how human capital translates into the skilled labor supply. Doubling this elasticity had little effect on the red trajectory as seen in the third column of Table 5. There is a small expansionary effect in GDP growth, but only in the second decimal place. Employment also increases, again marginally. This does not mean that skilled labor supply has no effect on the model; the expansionary effect of higher supply has been canceled out by the impact of lower skilled wages on demand, and ultimately, on further growth of human capital.

As seen above, the investment function depends on an accelerator, a crowding out and a crowding in term. Simulations were run in which all three parameters were doubled but the initial level of investment was held constant. Raising the accelerator causes more extreme behavior in the model, as investment reacts with more volatility to capacity utilization. There is a faster accumulation of human capital and more rapid depletion of the informal sector. Doubling the "crowding in" sensitivity has the opposite effect, causing investment to fall and the economy to slow down.[33] Demand for skilled labor falls faster than supply and, interestingly, the bottleneck in skilled labor never materializes.

4.3. Educational cost and exchange rate overvaluation

To investigate the effect of educational costs, consider the fourth column of Table 5 in which there is no increase in the maximum dependency ratio, but with all other red parameters fixed. This change has an immediate negative effect on output growth (not shown) since those who would have gone to the informal sector are now accumulating human capital. By the 13th period, however, the low educational cost growth rate surpasses that of the original red trajectory. Nonagricultural exports exceed the original by the 14th period. Although the absolute magnitudes are not large, the effects of lower educational costs are visible in skilled labor growth and the rate of decline of unit labor costs, as seen in the bottom two rows of the table.

The green and red trajectories differ in their approach to exchange rate management and the effects can be studied relaxing the overvaluation in the red trajectory. The final column of Table 5 shows the results of introducing a neutral exchange rate. Observe that this change restores about a half a percentage point of growth in per capita GDP. The rise in exports increases productivity growth by nearly a percentage point with consequent effects on employment. The growth of the informal sector is increased as a result, and skilled labor supply decreases, both marginally. The simulations suggest that while a stable exchange rate will redress balance of payments problems (foreign savings declines by more than three percentage points) longer term success requires direct attention to human capital formation. The shape of Fig. 3 for the red trajectory (not shown) is preserved. The last row shows that unit labor costs fall, again attributable to the decline in wages, but again to a counterproductive extreme, when the impact on demand and capacity utilization is taken into account.

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[33] The "crowding in" has a positive effect on the green trajectory (not shown). Doubling the "crowding out" sensitivity is expansionary in the green trajectory. In the red trajectory, there is no change in investment since the interest rate is held constant by assumption.

5. Conclusions

The CGE model of this paper provides some support for the hypothesis that a vicious cycle of stagnation and poverty can arise in the transition to a more globalized economy. We draw the following conclusions:

- If policymakers have a narrow conception of what makes the economy attractive to foreign investors, the transition to a more open economy may falter.
- Reducing government investment to bring government accounts into balance may increase the private cost of education and cause the rate of human capital formation to slow.
- Policies that abandon support for the poor run the risk of creating a bottleneck in the market for skilled labor and a consequent loss of competitiveness in the export market.
- Inequality is likely to increase even in a successful transition if it is based on a low unit labor cost competitive strategy.
- Headcount poverty in a properly managed transition is likely to be less severe. The poverty gap can become significant, especially when per capita income in the informal sector declines due to influx of labor there.
- In a successful transition to openness, there is no need for massive rural–urban migration; in less successful transitions, real-wage differentials may well attract significant migration, despite a lower probability of finding a job.
- If the red trajectory was more successful in attracting foreign investment it could more closely resemble the green as foreign investment replaces wage-driven export growth. The simulations of this paper are designed to emphasize the risks if policies designed to lure foreign capital are not entirely successful.
- Sensitivity analysis shows that no one parameter is responsible for the overall character of the model. This conclusion is not surprising, given the large number of parameters in any CGE model, but it is nonetheless of some comfort to be able to show that the basic results of the simulations above do not hinge on any one setting. On the other hand, changing the parameters that describe the differences in policy stances, exchange rate policy, and fiscal expenditure that changes the private cost of education, do have an important impact on the evolution of the model.

Acknowledgements

Appendix A. Equation listings and SAM

A.1. Sets

t Time
i, j Goods and sectors: agriculture, manufacturing, utilities, construction, commerce, transportation, finance, services

f	Formal sectors: agriculture, manufacturing, utilities, construction, commerce, transportation, finance, services
n	Informal sectors: agriculture, manufacturing, commerce, services
l	Labor skill categories: skilled, unskilled
k	Capital: formal, informal
h	Classes: Rural *Guaraní* and Spanish, Urban *Guaraní* and Spanish

A.2. Equations

1. Costs

$$c_j(t) = \sum_i P_i(t)A_{ij} + P^*(t)M_j^n(t)\left[1 + t^*(t)\right]$$

2. Prices of production of the formal sectors

$$P_j(t) = \left[1 + \tau_j(t)\right]\left[1 + t_j(0)\right]c_j(t) \text{ for } j \in f$$

3. Prices of production of the informal sectors

$$P_j(t) = P_i(t) \text{ for } i \in n \text{ and } j \in f \cap n$$

4. Price of production of agriculture

$$P_a(t) = e(t)P_a^*$$

5. Price of capital

$$P^k(t) = \frac{\sum_i P_i(t)[I_i(t) + \Omega_i(0)]}{\sum_i I_i(t) + \Omega_i(0)}$$

6. Rate of profit

$$\pi_j(t) = \frac{\{P_j(t)/\left[1 + t_j(0)\right] - c_j(t)\}X_j(t)}{P^k(t)K_j(t-1)}$$

7. Consumer price index

$$p^h(t) = \frac{\sum_i \sum_h P_i(t)C_{ih}(0)}{\sum_i \sum_h C_{ih}(0)}$$

8. Inflation

$$\hat{p}^h(t) = \frac{p^h(t)}{p^h(t-1)} - 1$$

9. Real interest rate

$$i_j^r(t) = i_j^n(t) - \hat{p}(t)$$

10. Exchange rate

$$e(t) = \tilde{e}\hat{p}(t)e(t-1)$$

11. Real exchange rate

$$e_j^r(t) = \frac{e(t)P_j^*(t)}{P_j(t)}$$

12. Income of factor labor

$$Y_l^L(t) = \sum_j w_{lj}(t)l_{lj}(t)X_j(t) + \sum_l \bar{w}_l^g(t)L_l^g(t)$$

13. Income from capital

$$Y^K(t) = \Gamma(t) + \sum_j \phi_j(t)$$

14. Firm income

$$Y_j^f(t) = \left\{ \frac{P_j(t)}{[1 + t_j(0)]} - c_j(t) \right\} X_j(t)$$

15. Government profits

$$\pi_j^g(t) = \sigma_j^g Y_j^f(t)[1 - t_j(t)]$$

16. Dividends

$$\phi_j(t) = Y_j^f(t)\left[1 - t_j(t)\right]\left[1 - s_j^f\right] - \pi_j^g(t) - w_j^*(0)$$

17. Firm savings

$$S_j(t) = s_j^f(t)\left[1 - \bar{t}_j(t)\right]Y_j^f$$

18. Household income

$$Y_h^h(t) = \sum_l \sigma_h^L(t)Y_l^L(t) + \sum_k \sigma_h^k(t)Y^K(t) + T_h^r(t)$$

19. Household expenditure

$$E_h(t) = [1 - \bar{t}_h(t)][1 - s_h(t)]Y_h^h(t)$$

20. Consumption

$$C_{ih}(t) = \theta_{ih}(t) + \frac{\mu_{ih}(0)}{P_i(t)}\left[E_h(t) - \sum_i P_i(t)\theta_{ih}(t)\right]$$

21. Household savings

$$S_h(t) = \sum_h s_h(t)[1 - \bar{t}_h(t)]Y_h(t)$$

22. Private investment (formal sector)

$$I_j(t)/K_j(t-1) = I_j(0) + \alpha_j u_j(t) + \beta_j\left(\pi_j - i_j^{\mathrm{r}}\right) + \gamma_j I^{\mathrm{g}}(t)/Y(t) - \nu_j \hat{p}(t)$$

23. Government investment

$$I^{\mathrm{g}}(t) = \bar{I}^{\mathrm{g}}\left[\sum_i P_i(t)I_i^{\mathrm{g}}(0) + \Omega_i^{\mathrm{g}}(0)\right]$$

24. Investment by origin

$$I_i(t) = \sum_j \zeta_i(t)I_j(t)$$

25. Government consumption

$$G_i(t) = \tilde{G}_i G_i(0)$$

26. Transfers

$$T_h^{\mathrm{r}}(t) = \tilde{T}_h^{\mathrm{r}} T_h^{\mathrm{r}}(0)$$

27. Income of government

$$Y^{\mathrm{g}}(t) = \bar{t}(t)\left[\sum_h Y_h^{\mathrm{h}}(t) + \sum_j Y_j^{\mathrm{f}}(t)\right] + \sum_j t_j(0)P_j(t)X_j(t)/\left[1 + t_j(0)\right]$$
$$+ t^* P^*(t)e_j^{\mathrm{n}}(t)X_j(t) + \pi_j^{\mathrm{g}}(t)$$

28. Government expenditure

$$G(t) = \sum_i P_i(t)G_i(t) + \sum_h T_h^{\mathrm{r}}(t) + \sum_l \bar{w}_l^{\mathrm{g}}(t)L_l^{\mathrm{g}}(t) + \Gamma(t)$$

29. Government savings

$$S^{\mathrm{g}}(t) = Y^{\mathrm{g}}(t) - G(t)$$

30. Fiscal deficit

$$\Upsilon(t) = I^{\mathrm{g}}(t) - S^{\mathrm{g}}(t)$$

31. Interest payments

$$\Gamma(t) = \Gamma(t-1) + \delta_\Upsilon(t-1)i^{\mathrm{n}}(t)$$

32. Tariffs

$$t^*(t) = \tilde{t}^* t^*(0)$$

33. Exports

$$E_i(t) = E_i(0)e^{\mathrm{r}}(t)^{\xi^{\mathrm{E}}(i)}\frac{Q_j(t-1)}{Q_j(0)}$$

34. Non-competitive imports

$$M_j^{\mathrm{n}}(t) = M_j^{\mathrm{n}}(0)\left[\frac{t^*(t)}{e_j^{\mathrm{r}}(t)t^*(0)}\right]^{\zeta^{\mathrm{m}}}$$

35. Competitive imports

$$M_i^{\mathrm{c}}(t) = M_i^{\mathrm{c}}(0)Y^{\mathrm{r}}(t)\left[\frac{t^*(t)}{e_j^{\mathrm{r}}(t)t^*(0)}\right]^{\zeta^{\mathrm{c}}}$$

36. Foreign savings

$$S^*(t) = P^*(t)\left[\sum_j I_j^*(t) + M_j^{\mathrm{n}}(t)X_j(t) + \Omega_i^*(0)\right.$$

$$+ \sum_i G_i^*(t) + M_i^{\mathrm{c}}(t) + \sum_h C_{ih}^*(t) + I^{\mathrm{g}*}(t) + \Omega_i^{\mathrm{g}*}(0)\Bigg]$$

$$- P_i(t)E_i(t) + w_j^*(0)$$

37. Demand

$$\sum_j B_{ij}X_j(t) = \sum_j A_{ij}X_j(t) + \sum_h C_{ih}(t) + I_i(t) + \Omega_i(0) + I_i^{\mathrm{g}}(t) + \Omega_i^{\mathrm{g}}(0)$$

$$+ G_i(t) + E_i(t) - M_i^{\mathrm{c}}(t)$$

38. Savings–investment

$$S^{\mathrm{h}}(t) + S^{\mathrm{g}}(t) + S^*(t) + \sum_j S_j(t) = \sum_i P_i(t)\left[I_i(t) + I_i^{\mathrm{g}}(t) + \Omega_i(0) + \Omega_i^{\mathrm{g}}(0)\right]$$

39. Nominal GDP

$$Y(t) = \sum_j P_j(t)X_j(t) - \sum_i P_i(t)A_{ij}X_j(t) - P_j^*(t)M_j^{\mathrm{n}}(t)X_j(t)$$

$$+ \sum_l \bar{w}_l^{\mathrm{g}}(t)L_l^{\mathrm{g}}(t)$$

40. Real GDP

$$Y^{\mathrm{r}}(t) = \sum_j X_j(t) - \sum_i A_{ij}X_j(t) - M_j^{\mathrm{n}}(t)X_j(t) + \sum_l L_l^{\mathrm{g}}(t)$$

41. Capacity utilization

$$u_j(t) = X_j(t)/Q_j(t-1)$$

42. Growth of capacity

$$\hat{Q}_j(t) = \frac{\hat{Q}_j(0) + k_j^{\mathrm{m}}\left[I_j(t) - \delta_j K_j(t-1)\right]}{Q_j(t-1)}$$

43. Capacity

$$Q_j(t) = \left[1 + \hat{Q}_j(t)\right] Q_j(t-1)$$

44. Stock of capital

$$K_j(t) = K_j(t-1) + I_j(t) - \delta_j K_j(t-1)$$

45. Productivity

$$\hat{\rho}_{lj}(t) = \hat{\rho}_{lj}(0) + \delta_{Ej}\hat{E}_j(t) + \delta_{uj}\left[u_j(t) - u_j(0)\right]$$

46. Labor coefficients

$$l_j(t) = l_j(t-1)\left[1 - \hat{\rho}_{lj}(t)\right]$$

47. Real wage

$$w_{lj}^{\mathrm{r}}(t) = \frac{w_{lj}(t)}{p^{\mathrm{h}}(t)}$$

48. Nominal wage

$$w_{lj}(t) = \left[1 + \delta_j^{\mathrm{w}}(t)\right] w_{lj}(t-1)$$

49. Nominal wage growth

$$\delta_{lj}^{\mathrm{w}}(t) = \delta_{lj}^{\mathrm{w}}(0) - \delta_{lh}^{\eta} \sum_h \eta_{lh}(t)$$

50. Average wage

$$\bar{w}_l(t) = \frac{\displaystyle\sum_j w_{lj}(t)l_{lj}(t)X_j(t)}{\displaystyle\sum_j l_{lj}(t)X_j(t)}$$

51. Average real wage

$$\bar{w}_l^{\mathrm{r}}(t) = \frac{\bar{w}_l(t)}{p^{\mathrm{h}}(t)}$$

52. Population

$$n_h(t) = n_h(t-1)[1 + \hat{n}_h(t)]$$

53. Labor force

$$\bar{n}_h(t) = \bar{n}_h(t-1)[1 + \hat{n}_h(t)]$$

54. Investment in human capital

$$I_h^h(t) = \kappa_h\left[n_h^{\mathrm{d}}(t-1) + \lambda_h(t)\right]$$

55. Learning by doing

$$\lambda_h(t) = \sum_l \lambda_h(0) n_{lh}^{f}(t)$$

56. Stock of human capital

$$K_h^{h}(t) = K_h^{h}(t-1)\left(1 - \delta_h^{h}\right) + I_h^{h}(t)$$

57. Skilled labor supply

$$L_h^{s}(t) = L_h^{s}(0) K_h^{h}(t-1)^{\zeta^{h}}$$

58. Unskilled labor supply

$$L_h^{u}(t) = \bar{n}_h(t) - L_h^{s}(t)$$

59. Formal employment

$$n_{lh}^{f} = \sigma_{lh} \sum_j l_{lj}(t) X_j(t)$$

60. Excess supply of labor

$$\eta_{lh}(t) = n_{lh}^{f}(t) - L_{lh}^{s}(t)$$

61. Dependency ratio

$$R_h = \frac{n_h^{d}(t)}{n_h^{f}(t)}$$

62. Informal participation

$$R_h = \frac{Y_h^{h}(t) - \sigma_h^{n}(t) Y^{K}(t)}{Y^{h}(t)}$$

63. Education

$$n_h^{d}(t) = \sum_l \eta_{lh}(t) - n_h^{n}(t)$$

64. Informal sector production function

$$X_j(t) = X_j(0)\left[N_h^{n}(t-1)\right]^{\zeta^{n}}$$

65. Objective function

$$\max \sum_h \left(n_h^{d}\right)^2$$

A.3. Definitions

Hat notation (^) is used for the percent rate of change or growth rate. Shares are denoted by σ and elasticities by ξ. Exogenous shift parameters wear tildes and asterisks indicate foreign. Time is denoted by (t) with (0) as the base state.

$Y_h^h(t)$	Household income
$\pi_j^g(t)$	Government profits
$w_j^*(0)$	Foreign factor payments
$\Gamma(t)$	Government interest payments
$E_h(t)$	Household expenditure
$C_{ih}(t)$	Consumption (* for foreign)
$\theta_{ih}(t)$	Consumption intercept
$\mu_{ih}(0)$	Marginal propensity to consume
$S_h(t)$	Household savings
$s_h(t)$	Household savings rate
$I_j(t)$	Private investment (* for foreign)
$\zeta_i(0)$	Private investment demand proportions
α_j	Accelerator in private investment function
β_j	Crowding out coefficient in private investment function
γ_j	Crowding in coefficient in private investment function
υ_j	Inflation coefficient in private investment function
$\tilde{I}^g(t)$	Policy shift variable on government investment
$\Omega_i(t)$	Change in private inventories (* for foreign)
$I^g(t)$	Government investment (* for foreign)
$\Omega_i^g(t)$	Change in government inventories (* for foreign)
δ_j	Depreciation
δ_{lh}	Distribution of formal sector employment to households
$G_i(t)$	Government consumption
$Y^g(t)$	Government Income
$G(t)$	Government expenditure (* for foreign)
$T_h^r(t)$	Transfers to households
$S^g(t)$	Government savings
$\Upsilon(t)$	Fiscal deficit (PSBR)
δ_Υ	Rate of roll-over of government debt
$\Gamma(t)$	Interest payments
$L_{\tilde{j}}^g(t)$	Government employment
$\sigma_{\tilde{j}}^g(0)$	Share of government profits in firm income
$\tilde{t}(t)$	Direct tax rate
$t(t)$	Indirect tax rate (* for tariff)
$E_i(t)$	Exports
$M_j^n(t)$	Non-competitive imports
$M_i^c(t)$	Competitive imports
$S^*(t)$	Foreign savings
$X_j(t)$	Gross value of production
$Y(t)$	GDP nominal

$Y^r(t)$	GDP real
$u_j(t)$	Capacity utilization
$Q_j(t)$	Capacity output
$n_h(t)$	Population
$\bar{n}(t)$	Labor force
$n_{lh}^f(t)$	Number of persons in formal employment
$n_h^n(t)$	Number of persons in informal sector
$n_h^d(t)$	Number of persons in education or job training
$L_l(t)$	Labor supply
$\eta_{lh}(t)$	Excess supply of labor
$I_h^h(t)$	Investment in human capital
$K_h^h(t)$	Stock of human capital
κ_h	Marginal efficiency of human capital investment
$y_h(t)$	Income per capita
$R_h(t)$	Maximum dependency ratio
$\lambda_h(t)$	Learning by doing
$K_j(t)$	Stock of capital
$l_{lj}(t)$	Labor coefficient
$w_{lj}(t)$	Nominal wage
$\rho_{jl}(t)$	Labor productivity

Superscripts h, f, and g refer to the institutions, households, formal firms and goverment

δ_{Ej}	Change in ρ_{jl} with respect to export growth for sector j
δ_{uj}	Change in ρ_{jl} with respect to capacity utilization for sector j
$w_{lj}^r(t)$	Real wage
$\delta_{lj}^w(t)$	Nominal wage change
δ_{lh}^η	Change in wages with respect to excess supply
$\bar{w}_l(t)$	Average wage
$\bar{w}_l^r(t)$	Average real wage
$i_j^n(t)$	Nominal interest rate for sector j
$i_j^r(t)$	Real interest rate for sector j
$e(t)$	Nominal exchange rate
$e^r(t)$	Real exchange rate
$\tilde{e}$	Pass through from inflation to nominal exchange rate
k_j^m	Marginal capacity output–capital ratio

Table 6 provides a break-down of the labor force and the SAM is in Table 7.

Table 6
Social structure (100,000s)

	Rural Guaraní	Rural Spanish	Urban Guaraní	Urban Spanish
Population	224	25	210	48
Labor force	180	20	160	37.5
Formal sector	90.8	11.3	104.2	30.1
Informal sector	85.6	6.9	43	3.6
Dependents	3.6	1.8	12.8	3.8

Source: Author's estimate based on BCP (1998).

Table 7
Social accounting matrix (Trillions of Guaranies of 1988)

| | Productive Sectors | | | | | | | | | | | | Total | Factors of production | | | |
| | Agriculture | | Industry | | | | Commerce | | | | Services | | | Labor | | Capital | |
	Formal	Informal	Formal	Informal	Utilities	Construction	Formal	Informal	Transport	Finance	Formal	Informal		Skilled	Unskilled	Formal	Informal
Agriculture-F	69.9	65.7	53.0	22.1		172.7			91.2		133.2	38.6	646.5				
Agriculture-N	0.5	48.1	29.1										77.8				
Industrial-F	0.1	0.4	0.6		29.4	93.8	0.3	0.5	6.0	0.3	5.5	1.7	138.6				
Industrial-N		0.1	0.3		0.0	19.3		0.1	1.2		2.1	0.9	24.0				
Utilities	2.3		8.1	1.0	177.8	19.3	9.0	9.8	5.7	22.1	31.7	4.1	290.8				
Construction						4.0	34.8			0.1	36.7	0.1	75.8				
Commerce-F	151.4		132.8	54.3									338.4				
Commerce-N	14.5	42.0	3.6										60.1				
Transport	1.6	4.5	1.3	0.1	17.0	20.7	36.6	16.9	7.1	5.7	4.1	0.3	115.7				
Finance	0.3	0.9	0.2		9.3	7.0	4.7	21.5	0.3	17.1	3.5	0.9	65.8				
Services-F	0.1	0.2	0.3		44.0	16.0	1.9	3.2	6.8	9.6	12.2	0.4	94.7				
Services-N		0.1	0.1		11.5	1.0	0.1	0.4	1.1	0.4	1.2	0.1	15.8				
Total	240.8	162.0	229.2	77.6	293.1	384.7	52.5	52.3	119.3	91.8	193.9	46.9					
Factors of production																	
Labor	92.7		208.8		15.0	55.5	142.7		42.5	21.1	275.4		853.6				
Skilled	4.6		73.1		4.9	11.1	28.5		17.0	10.5	82.6		232.5				
Unskilled	88.1		135.7		1	44.4	114.2		25.5	10.5	192.8		621.2				
Profit-formal	366.8		178.0		36.2	67.0	304.7		52.5	82.9	7.3		1095.3				
Profit-informal		301.1		66.3				171.3				27.8	566.5				
Institutions																	
Households														329.1	645.3	1096.7	566.5
Rural Guaraní														32.9	258.1	54.8	379.6
Rural Spanish														32.9	32.3	164.5	28.3
Urban Guaraní														9.9	342.0	32.9	141.6
Urban Spanish														253.4	12.9	844.4	17.0
Government	44.7	20.6	35.8		23.2	23.0	34.5		20.5	11.5	30.2		244.0				
Direct taxes	13.9		6.7		1.4	2.5	11.5		2.0	3.1	0.3		41.4				
Government profits					8.1				6.9		11.1		26.1				
Indirect taxes	30.9	20.6	29.1		13.7	20.5	23.0		11.6	8.3	18.8		176.5				
Foreign sector																	
Non-competitive imports	6.2	2.6	94.6			13.0	15.8		67.9		6.6		206.8				
Net interest	0.3		4.1			0.6	0.7		2.9		0.3		8.8				
Capital account																	
Savings	94.9	77.9	46.1	17.2	9.4	17.3	78.9	44.4	13.6	21.5	1.9	7.2	430.1				
Total	846.3	564.2	796.5	161.0	376.8	561.1	629.6	268.0	319.3	228.8	515.6	81.9	5349.1	329.1	645.3	1096.7	566.5

Source: BCP (1997, 1998, 1999). See Gibson and Molinas (2001).

Table 7 (*continued*)

	Institutions				Total cons	Govt.	Foreign Sector			Capital account				Total investment	Final demand	GVP
	Rural		Urban							Investment		Inventories				
	Guaraní	Spanish	Guaraní	Spanish			Export	Import	Net exports	Private	Public	Private	Public			
Agriculture-F	35.4	23.6	37.8	75.6	172.4	0.6	56.0	29.2	26.8						199.8	846.3
Agriculture-N	248.0	35.4	118.1	94.5	496.0		2.9	12.5	−9.6						486.4	564.2
Industriales-F	85.0	28.3	47.2	132.3	292.9	15.3	751.5	462.4	289.1	21.8	2.4	24.4	12.1	60.7	658.0	796.5
Industriales-N	49.6	7.1	23.6	56.7	137.0										137.0	161.0
Utilities	14.2	9.4	14.2	47.2	85.0	0.9									86.0	376.8
Construction	28.3	18.9	23.6	85.0	155.9	2.6				218.9	107.8			326.7	485.3	561.1
Commerce-F	42.5	40.2	66.1	141.7	290.5	0.7									291.3	629.6
Commerce-N	70.9	14.2	56.7	66.1	207.8										207.8	268.0
Transport	14.2	4.7	14.2	47.2	80.3	2.4	20.2	93.1	−72.9	148.3	45.5		93.1	193.8	203.6	319.3
Finance	42.5	23.6	23.6	94.5	184.2	0.3	34.1	55.6	−21.6				55.6		163.0	228.8
Services-F	56.7	23.6	28.3	85.0	193.7	6.8	277.9	57.5	220.4				57.5		420.9	515.6
Services-N	21.3	7.1	18.9	18.9	66.1										66.1	81.9
Total	708.6	236.2	472.4	944.7	2361.9	29.6	1142.6	710.2	432.3	389.0	155.8	24.4	12.1	581.3	3405.1	5349.1
Factors of production																
Labor					120.8											974.5
Skilled					96.7											329.1
Unskilled					24.2											645.3
Profit-formal					1.4											1096.7
Profit-informal																566.5
Institutions																
Households						58.8										2696.4
Rural Guaraní						23.5										748.9
Rural Spanish						5.9										263.9
Urban Guaraní						23.5										549.9
Urban Spanish						5.9										1133.6
Government	10.2	3.6	7.5	15.5	36.8											280.8
Direct taxes	10.2	3.6	7.5	15.5	36.8											78.2
Government profits																26.1
Indirect taxes																176.5
Foreign sector																
Non-competitive imports	1.0	0.3	5.8	14.9	22.0	58.7				174.3	49.1	2.7	1.3	227.5		515.0
Net interest																8.8
Capital Account																
Savings	29.2	23.7	64.3	158.5	275.7	115.5										808.7
Total	748.9	263.9	549.9	1133.6	2696.4	280.8	1142.6	710.2	523.8	563.2	204.9	27.1	13.4	808.7		

References

Agénor, P., Aizenman, J., 1999. Macroeconomic adjustment with segmented labor markets. Journal of Development Economics 58, 277–296.

Aghion, P., Howitt, P., 1998. Endogenous Growth Theory. MIT Press, Cambridge.

Banco Central del Paraguay (BCP), 1997. Boletín de Estadisticas Económicas.

Banco Central del Paraguay (BCP), 1998. Informe Económico, Primer Trimestre.

Banco Central del Paraguay (BCP), 1999. Boletin de Cuentas Nacionales.

Bayoumi, T., Coe, D., Helpman, E., 1999. R&D spillovers and global growth. Journal of International Economics 47 (2), 399–428.

Beegle, K., Dehejia, R., Gatti, R., 2003. Child labor, income shocks and access to credit, World Bank Policy Research Working Paper 3075.

Brasili, A., Epifani, P., Helg, R., 2000. On the dynamics of trade patterns. De Economist 148 (2), 233–257.

Calvo, G., Reinhart, C., 2002. Fear of floating. The Quarterly Journal of Economics 117 (2), 379–408.

Choe, Jong Il, 2003. Do foreign direct investment and gross domestic investment promote economic growth? Review of Development Economics 7 (1), 44–57.

Clerides, S., Lach, S., Tybout, J., 1998. Is Learning-by-Exporting Important? Micro-dynamic evidence from Columbia, Mexico, and Morocco. Quarterly Journal of Economics 113 (3), 903–947.

Das, M., 2001. How Does International Trade Influence Human Capital Accumulation? Syracuse University.

Easterly, W., 2001. The lost decades: explaining developing countries' stagnation in spite of policy reform 1980–1998. Journal of Economic Growth 6 (2), 135–157.

Edwards, S., 1997. Trade policy, growth, and income distribution. American Economic Review 87 (2), 205–210.

Epifani, P., 2003. Trade Liberalization, Firm Performance and Labor Market Outcomes in the Developing World What Can We Learn from Micro-Level Data? CESPRI-Bocconi University.

Foster, J., Greer, J., Thorbeeke, E., 1984. A class of decomposable poverty measures. Econometrica 52, 761–766.

Ganuza, E., Taylor, L., 1998. Política Macroeconómica, Pobreza, y Equidad en América Latina y el Caribe. In: Ganuza, E., Taylor, L., Morely, S. (Eds.), Política Macroeconómica y Pobreza en América Latina y el Caribe. Mundi-Prensa Libros, s.a., Madrid.

Gibson, B., 2003. An essay on late structuralism. In: Dutt, A., Ros, J. (Eds.), Development Economics and Structuralist Macroeconomics: Essays in Honor of Lance Taylor. Edward Elgar, Cheltenham, pp. 52–76.

Gibson, B., Kelley, B., 1994. A classical theory of the informal sector. Manchester School 62 (1), 81–96.

Gibson, B., Molinas, J., 2001. Liberalización Económica con Sesgo Urbano en Paraguay: Micro simulaciones del Efecto de los Cambios en el Mercado de Trabajo sobre la Distribución del Ingreso y Pobreza. In: Ganuza, E., Taylor, L., Vos, R. (Eds.), Liberalización de Balanza de Pagos, Crecimiento, Distribución y Pobreza en América Latina y el Caribe, Buenos Aires. EUDEBA, Argentina.

Gibson, B., van Seventer, D.E., 2000. A tale of two models. International Review of Applied Economics 14 (2), 149–171.

Greenaway, D., Morgan, W., Wright, P., 2002. Trade liberalization and growth in developing countries. Journal of Development Economics 67, 229–244.

Harrison, A., Hanson, G., 1999. Who gains from trade reform? Some remaining puzzles. Journal of Development Economics 59, 125–154.

Hausmann, R., Rojas-Suares, L., 1996. Volatile Capital Flows: Taming Their Impact on Latin America. Johns Hopkins University Press for the Inter-American Development Bank, Baltimore.

Horton, S., Kanbur, R., Mazumdar, D., 1994. Overview. In: Horton, S., Kanbur, R., Mazumdar, D. (Eds.), Labor Markets in an Era of Adjustment. The World Bank, Washington, DC, pp. 1–60.

International Monetary Fund (IMF), 2003. "South Africa: Selected Issues" IMF Country Report No. 3/18.

Jacoby, H.G., Skoufias, E., 1997. Risk, financial markets, and human capital in a developing country. Review of Economic Studies 64 (3), 311–335.

Janeba, E., 2000. Trade, income inequality and government policies: redistribution of income or education subsidies. NBER Working Paper 7485.

Kraay, A., 1999. Exports and economic performance: evidence from a panel of Chinese enterprises. Revue d' Économie du Développement 1–2, 183–207.

Lluch, C., Powell, A., Williams, R., 1977. Patterns in Household Demand and Savings. Oxford University Press, London.

Lucas, R., 1988. On the mechanics of economic development. Journal of Monetary Economics 22 (1), 3–42.

Maechler, A., Roland-Holst, D., 1995. Empirical Specifications for a General Equilibrium Analysis of Labor Market Policies and Adjustments, Paris: OECD, Technical Paper No.106.

Morley, S., Vos, R., 1998. Pobreza y Crecimiento Dual en Paraguay. In: Ganuza, E., Taylor, L., Morely, S. (Eds.), Política Macroeconómica y Pobreza en América Latina y el Caribe. Mundi-Prensa Libros, s.a., Madrid, pp. 669–712.

Mussa, M., Masson, P., Swoboda, A., Jadresic, E., Mauro, P., Berg, A., 2000. Exchange Rate Regimes in an Increasingly Integrated World Economy. International Monetary Fund, Washington, DC.

Nattrass, N., 2004. The Moral Economy of AIDS in South Africa. Cambridge University Press, Cambridge.

Rakowski, C., 1994. Contrapunto: The Informal Sector Debate in Latin America. SUNY Press, Albany.

Riveros, L., 1990. Recession, adjustment and the performance of urban labor markets in Latin America. Canadian Journal of Development Studies 11, 34–59.

Rodrik, D., 1997. Has Globalization Gone Too Far? Institute for International Economics, Washington, DC.

Rodrik, D., 1999. The New Global Economy and Developing Countries: Making Openness Work. Overseas Development Council, Washington.

Roland-Holst, D., 2003. East Asian Patterns of Comparative Advantage, Asian Development Bank Institute Research Paper No. 20.

Rotemberg, J., Woodford, M., 1999. The cyclical behavior of prices and costs. In: Taylor, J., Woodford, M. (Eds.), Handbook of Macroeconomics, vol. 1B, pp. 1051–1135.

Rucci, G., 2003. Macro Shocks and Schooling Decisions: The Case of Argentina. UCLA.

Schaefer, K., 2002. "Capacity utilization, income distribution and the urban informal sector: an open-economy model" PERI Working Paper Series No. 35.

Skott, P., Auerbach, P., 2002. Wage Inequalities and Skill Asymmetries. University of Massachusetts, Department of Economics.

Spilimbergo, A., Londono, J., Szekely, M., 1999. Income distribution, factor endowments, and trade openness. Journal of Development Economics 59, 77–101.

Taylor, L., 1983. Structuralist Macroeconomics. Beacon Press, Boston.

Taylor, L. (Ed.), 1990. Socially Relevant Policy Analysis: Structuralist Computable General Equilibrium Models for the Developing World. MIT Press, Cambridge.

Taylor, L., Vos, R., 2000. Balance of Payments Liberalization in Latin America: Effects on Growth, Distribution and Employment. United Nations Development Programme, Washington, DC.

Thomas, D., Beegle, K., Frankenberg, E., Sikoki, B., Strauss, J., Teruel, G., 2003. Education in a crisis. Journal of Development Economics 74 (1), 53–85.

World Bank, 2002. Globalization, Growth and Poverty: Building an Inclusive World Economy. Oxford University Press, New York.