External Shocks and the Urban Poor

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First Complete Draft: March 23, 2005
This version: January 11, 2006

Abstract

This paper examines the effect of external shocks on urban poverty in a two-household (rich and poor) intertemporal optimizing model of an open economy with segmented labor markets. Skilled and unskilled labor are used in the formal sector, whereas only unskilled labor is used in the informal economy. Using the minimum wage in the formal sector as the poverty line, various poverty indicators are defined and computed. The analysis shows that the extent to which an increase in the world risk-free interest rate affects the incidence and depth of poverty depends crucially on the wedge between consumption and product wages in the formal economy.

JEL Classification Numbers: I32, J42, F41

*I am indebted to participants at various seminars for coments on a previous draft. I bear sole responsibility, of course, for the views expressed in this paper.

1 Introduction

The potential long-run benefits that trade and financial openness may bring are well recognized by economists and policymakers alike. Financial openness, for instance, may increase opportunities for portfolio risk diversification and consumption smoothing through borrowing and lending; and producers who are able to diversify risks on world capital markets may choose to invest in riskier (and higher-yield) projects, thereby raising the country's rate of economic growth. In addition, openness to foreign direct investment can contribute to growth by stimulating domestic capital formation and improving efficiency and productivity, as a result of greater access to new technologies. Similarly, openness to trade may generate significant gains, both static and dynamic. Static economic gains, as emphasized by conventional trade theory, result from the reallocation of productive resources toward activities where they are used with comparatively greater efficiency and away from less efficient activities such as import-substitution industries. Dynamic gains, as emphasized in the literature on endogenous growth, may result from various mechanisms through which trade openness may affect the economy's rate of growth in the long run—such as the greater ability to acquire new inputs, less expensive or higher-quality intermediate goods, and improved technologies, which enhance the overall productivity of the economy.

At the same time, however, it is well recognized that openness entails significant risks and potentially large economic and social costs in the short or medium run. Openness to global capital markets has brought greater volatility in domestic financial markets, particularly in countries whose financial systems were weak to begin with and economic policies lacked credibility. In some cases, large reversals in short-term capital flows (often induced by contagion effects or abrupt changes in market sentiment on world capital markets) have led to severe financial crises and persistent increases in unemployment and poverty. Similarly, trade liberalization has led in some countries to a sharp reduction in the relative demand for unskilled labor (as

a result of a drop in the price of imported capital goods and a high degree of complementarity between physical capital and skilled labor) and lower real wages in the short run. Combined with a low degree of inter-sectoral labor mobility, job losses and income declines have often translated into increases in poverty rates. As a result, there has growing concern that the poor may not benefit much from greater integration, and may on the contrary be disproportionately affected in the short run by crises, economic downturns, and adverse developments in the labor market.[1]

The purpose of this paper is to contribute to this debate by focusing on one aspect (or, rather, consequence) of financial openness—greater exposure in the short run to external shocks, and the impact of these shocks on urban poverty. As documented for instance by Agénor and Montiel (2006), Agénor, McDermott and Prasad (2000), and Neumeyer and Perri (2005), there is indeed evidence suggesting that external disturbances of the type discussed below (a shock to world interest rates) may have a significant effect on cyclical movements in output in small open economies. Blankenau, Kose and Yi (2001), using a real business cycle methodology, also found that world interest rate shocks play an important role in explaining cyclical fluctuations in output in these economies.

To analyze the impact of external interest rate disturbances on poverty, I develop a model in which a small open economy faces an imperfect world capital market (with a risk premium that depends on the country's external debt) and the labor market plays a central role. In developing countries the poor often generate a sizable share of their income from wage employment, so understanding the role of the labor market in the transmission of shocks (external or domestic) is essential. Recent evidence for Latin America, for instance, has shown that labor markets are indeed the main channel through which macroeconomic shocks affect the urban poor (see Laderchi (2005)).

[1] I have discussed elsewhere in more detail how increased financial and trade integration can affect the poor (see Agénor (2004*a*)).

Accounting for these markets is all the more important given the peculiarities and imperfections that often characterize them in developing countries, as I have discussed elsewhere (see Agénor (1996, 2005*b*)). In particular, segmentation of the urban component of labor markets can be induced by either government-imposed regulations (such as minimum wage laws, firing restrictions, and severance payments); trade unions, which may prevent wages from being equalized across sectors by extracting a premium for their members; or wage-setting firms, which may set labor compensation on the basis of efficiency considerations. Wage determination will depart in all three cases from market-clearing mechanisms, and unemployment (or disguised unemployment) becomes a likely outcome.

Beyond the impact of disturbances to world interest rates, the framework developed in this paper is potentially useful for analyzing a variety of issues. Indeed, the model can readily be used to examine the effects on the poor of changes in, for instance, government spending (under alternative budget financing rules), minimum wages, or the terms of trade. The dynamic nature of the model is clearly important in this context, given that all of these policies may entail trade-offs between impact and longer-run effects. Thus, this paper can also be viewed as a contribution to a broader research agenda, aimed at designing suitable macroeconomic models for studying the transmission of policy and exogenous shocks to poverty, in a context where labor markets are subject to significant distortions.

The remainder of the paper is organized as follows. Section II presents the model, which focuses on a small open economy facing an imperfect world capital market. The model, as noted earlier, accounts explicitly for the segmented nature of the urban labor market, with a large informal sector (characterized by wage and price flexibility, and a lack of enforcement of labor regulations) and a formal sector, where firms comply with prevailing labor market regulations. As is well known, the share of informal sector employment in total urban employment is sizable in many developing countries.

One reason is that unemployment insurance or compensation schemes are not well developed in these countries; as a result, workers cannot afford to remain openly unemployed for long. Underemployment (or disguised unemployment) in the informal sector tends therefore to be far more pervasive than open unemployment—at least for some categories of workers. Both features are captured in the model. Several indicators of the incidence and depth of poverty are defined, under the assumption that the poverty line is the minimum wage prevailing in the formal economy. Section III derives the dynamic form of the model and characterizes its steady-state properties. A graphical illustration of the economy's general equilibrium, together with the determination of the poverty rate, is also presented. Section IV examines the short- and long-run effects of a permanent increase in the world risk-free interest rate, and studies the impact of this shock on the urban poor. The final section offers some concluding remarks.

2 The Model

Consider a small open economy in which there are two segments: a formal sector, which produces an exportable good and whose output is entirely sold abroad, and an informal sector, which produces a nontraded good used only for domestic consumption. The size of each sector (as measured by the number of producers) is taken as given here.[2] There are three categories of agents: producers, households, and the government. There is a single producer in each sector, and two households: a rich household, which consists of all workers employed in the formal economy, and a poor household, consisting of those workers employed in the informal sector. The rich household optimizes consumption, pays taxes, saves and borrows abroad. The poor household pays

[2]In general, the relative size of the informal economy is endogenously related to the level of taxes in the formal sector and the cost of operating in the informal economy, as formally illustrated by Fortin, Marceau, and Savard (1997), and Ihrig and Moe (2004). See also Fugazza and Jacques (2004), who examine the role of search frictions, and Straub (2005), who focuses on the role credit market imperfection.

no taxes and spends all of its income.[3] Both rich and poor households supply labor inelastically and consume, in addition to the nontraded good produced in the informal sector, an imported good which is imperfectly substitutable for the home good and whose price is fixed on world markets.

2.1 Production and Labor Demand

Production of exportables in the formal economy, Y_E, requires both labor categories, in quantities n_S and n_U:

$$Y_E = n_S^{\alpha} n_U^{1-\alpha}, \tag{1}$$

where $\alpha \in (0, 1)$. The world price of exportables is exogenous and normalized to unity for simplicity. The domestic price of exportables is thus equal to the nominal exchange rate, E, which is assumed fixed. The stock of physical capital is assumed fixed within the time frame of the analysis.

Unskilled workers are paid a government-mandated minimum wage, ω_m, which is fixed in terms of the price of exportables. The skilled wage, ω_S, measured also in terms of the price of exportables (and referred to in what follows as the product wage), is defined as

$$\omega_S = \theta(z, \Omega), \tag{2}$$

where Ω is a reservation or target wage, $z = E/P_N$ denotes the relative price of imports in terms of nontradables (referred to in what follows as the real exchange rate), and $\theta_z < 0$, $\theta_\Omega > 0$. To exclude the case where skilled individuals are tempted to seek employment as unskilled workers in the formal sector, I impose the restriction $\omega_S > \omega_m$.

[3] Dynan, Skinner, and Zeldes (2004) provide evidence that the rich tend to save more, or more generally that saving rates tend to increase with the level of income. They identify various reasons for this pattern, including differences in rates of time preference. Ogaki and Atkeson (1997) also provide evidence that the poor save proportionately less than the rich, in a developing-country context.

Equation (2) indicates that the skilled product wage is related negatively to the real exchange rate and positively to the opportunity cost of effort. It can be derived from a variety of models, competitive and non competitive. The key requirement is that while producers' demand for labor is influenced by the *product* wage, the behavior of workers (or those who represent them) is influenced by the *consumption* wage, that is, the nominal wage measured in terms of the cost of living. For instance, it can be derived in a competitive model in which labor supply reacts endogenously to the consumption wage, or in an efficiency wage setting in which the consumption wage affects the level effort (see Agénor (2004*c*)). An appreciation, say, of the real exchange rate, induced by a rise in the price of nontradables, would reduce the consumption wage and lower the level of effort, thereby leading firms to increase the equilibrium (product) wage. A qualitatively similar result could be obtained if instead firms face high turnover costs associated with skilled labor, and if the quit rate is a function of the consumption wage as well (see Agénor (2001)). Alternatively, (2) could be derived under the assumption that the skilled wage is determined by a centralized labor union whose objective is to minimize a quadratic loss function that depends on deviations of employment and the consumption wage from some target levels, subject to the firm's labor demand schedule (see Agénor (2005*a*)). Given that these various alternatives are, to a large extent, observationally equivalent, it is convenient to refer to (2) as a "generic" formulation.

Profit maximization requires equating the marginal product of each category of labor to the relevant product wage:

$$\alpha(\frac{n_U}{n_S})^{1-\alpha} = \omega_S, \quad (1-\alpha)(\frac{n_S}{n_U})^{\alpha} = \omega_m.$$

These equations can be combined to give the skilled-unskilled wage ratio:

$$\frac{\omega_S}{\omega_m} = \frac{\alpha n_U}{(1-\alpha)n_S}. \tag{3}$$

The demand functions for labor can thus be derived as

$$n_S^d = n_S^d(\bar{\omega_S}; \bar{\omega_m}), \quad n_U^d = n_U^d(\bar{\omega_S}; \bar{\omega_m}). \tag{4}$$

Equations (4) indicate that, as a result of gross complementarity, an increase in the product wage for either category of workers reduces the demand for both categories of labor.

Substituting these results in equation (1) and using (2) yields

$$Y_E^s = Y_E^s(\bar{\omega_S}; \bar{\omega_m}) = Y_E^s(\overset{+}{z}; \bar{\omega_m}), \tag{5}$$

which shows that a depreciation raises output of exportables. Note that if $\theta_z = 0$, $Y_E^{s\prime} = 0$. Output of exportables is thus constant as long as the minimum wage does not change. This can be summarized the following proposition:

Proposition 1. *If the skilled wage is independent of the real exchange rate, and if the minimum wage is binding, output and employment of both skilled and unskilled labor in the formal sector are constant.*

The case $\theta_z = 0$ plays therefore a crucial role in the transmission process of external shocks, as discussed below.

In the informal sector, production of the nontraded good, Y_N, requires only unskilled labor, in quantity n_N:

$$Y_N = n_N^{\eta}, \tag{6}$$

where $\eta \in (0, 1)$. Profit maximization yields equality between marginal revenue and marginal cost, $\omega_N = Y_N'/z$, where ω_N denotes the real wage in the informal sector, measured in terms of the price of exportables. I assume that $\omega_N < \omega_m$, that is, that the minimum wage is higher than the informal sector wage. This condition is necessary to prevent a corner solution in which unskilled workers have no incentive to seek employment in the formal economy.[4]

[4] As shown below, the condition $\omega_N < \omega_m$ always holds given the definition of the poverty line. Note that, in an expected sense, this restriction should be $\omega_N < \omega_m n_U^d/N_U$, where the probability of employment is unity in the informal sector (given the absence of barriers to entry) and n_U^d/N_U in the formal sector (assuming complete turnover of jobs in every period). This condition is stricter than $\omega_N < \omega_m$.

Labor demand is thus given by

$$n_N^d = (\frac{\omega_N z}{\eta})^{1/(\eta-1)}, \tag{7}$$

where $\omega_N z$ measures the product wage in the informal sector and $n_N^{d\prime} < 0$. Substituting (7) in (6) yields the supply function of informal sector goods:

$$Y_N^s = (\frac{\omega_N z}{\eta})^{\eta/(\eta-1)}, \quad Y_N^{s\prime} < 0. \tag{8}$$

2.2 Informal Labor Market

The informal labor market absorbs all unskilled workers who do not queue up for employment in the formal sector. This specification follows Agénor (1996, 2001) and corresponds to the "shock absorber" view of the informal sector. It could be extended, as I have done elsewhere (see Agénor (2004*c*, 2005*a*)), to the case where labor mobility between the formal and informal sectors is imperfect.[5]

Suppose that N_U, the total number of unskilled workers in the labor force, is constant. The supply of unskilled workers in the informal sector is thus $N_U - n_U^d$. Using (4) and (7), the equilibrium condition of the informal labor market is thus given by

$$N_U - n_U^d(\omega_S; \omega_m) = n_N^d(\omega_N z).$$

Wages adjust continuously to equilibrate supply and demand. Thus, using (2) to solve this condition for ω_N yields

$$\omega_N = \upsilon(z; \omega_m), \tag{9}$$

[5]Search considerations and informational frictions could also be introduced along the lines of King and Welling (1995), who assume that workers bear a direct cost when they decide to actively search for a job. This is an important consideration for many developing economies where agencies designed to help workers in their search process are either inexistent or inefficient.

where[6]

$$\upsilon_z = -(\tilde{z}n_N^{d\prime})^{-1}\left[(\frac{\partial n_U^d}{\partial \omega_S})\theta_z + n_N^{d\prime}\tilde{\omega}_N\right],$$

$$\upsilon_{\omega_m} = -(\tilde{z}n_N^{d\prime})^{-1}(\frac{\partial n_U^d}{\partial \omega_m}) < 0.$$

The second result indicates that an increase in the minimum wage, by lowering the demand for unskilled labor in the formal sector and increasing the supply of labor in the informal economy, tends to lower the informal sector wage. A real exchange rate depreciation (a rise in z) has, in general, an ambiguous effect on the market-clearing wage. On the one hand, a real depreciation lowers the demand for labor in the informal sector, because the product wage in the informal sector, $\omega_N z$, tends to increase. To eliminate the excess supply of labor, the informal sector wage must fall. If the demand for unskilled labor in the formal sector, n_U^d, were to remain constant (which would be the case if $\theta_z = 0$), the fall in ω_N would exactly offset the increase in z, and the product wage, $\omega_N z$, would also remain constant. But on the other hand, as long as $\theta_z > 0$, the rise in z lowers the skilled wage in the formal sector, which tends to increase the demand for unskilled labor in the formal sector. This reduces labor supply in the informal economy and puts upward pressure on wages there. The net effect on ω_N therefore depends on the relative strength of the direct and indirect effects. I will assume in what follows that the direct effect dominates to ensure that $\upsilon_z < 0$. This condition, in turn, requires that the elasticity of labor demand in the informal economy be sufficiently high.

Note also that, with initial steady-state values of the informal sector wage and the real exchange rate normalized to unity, υ_z can be rewritten as $\upsilon_z = -[1 + \theta_z(n_N^{d\prime})^{-1}(\partial n_U^d/\partial \omega_S)]$. Consequently, as long as $\theta_z < 0$, $|\upsilon_z| < 1$ and the product wage increases as a result of a real depreciation

[6] A "~" over a variable is used to denote a steady-state value. Note that, in calculating υ_{ω_m}, I have assumed that the reservation wage of skilled workers, Ω, is independent of the minimum wage.

$(\partial(\omega_N z)/\partial z = 1 + \upsilon_z > 0)$. Thus, a real depreciation lowers employment and output in the informal sector, even if the informal sector wage (measured in terms of the price of exportables) falls. But if $\theta_z = 0$, then $\upsilon_z = -1$; in that case, $\partial(\omega_N z)/\partial z = 0$, and a change in the real exchange rate has no effect on the product wage. Intuitively, given that with $\theta_z = 0$ unskilled labor cannot shift across sectors, any movement in z must be offset by an opposite movement in the informal sector wage. This can be summarized in the following proposition:

Proposition 2. *If the skilled wage is independent of relative prices, changes in the informal sector wage exactly offset changes in the real exchange rate, thereby keeping the product wage constant. In the opposite case, the real exchange rate and the product wage in the informal sector always evolve in the same direction.*

Again, this result is important to understand the impact of external shocks on poverty, as discussed below.

2.3 Household Consumption

As noted earlier, there are two representative households in the economy: rich and poor. The rich household's consumption decisions follow a two-step process. First, the level of total spending is determined, based on intertemporal optimization and subject to a flow budget constraint. Second, total spending is allocated between consumption of the home good and the imported good, based on relative prices.

The rich household's discounted lifetime utility is given by

$$V = \int_0^\infty \frac{c_R^{1-\mu}}{1-\mu} e^{-\rho t} dt, \quad \mu > 0, \ \mu \neq 1, \tag{10}$$

where c_R is total consumption, measured in terms of the price of exportables, $\rho > 0$ the rate of time preference (assumed constant), and $\sigma = 1/\mu$ the intertemporal elasticity of substitution.

Let D_R denote the rich household's stock of foreign debt, measured in foreign-currency terms. Its flow budget constraint can thus be written as

$$\dot{D}_R = i^* D_R + c_R + T - Y_E^s, \tag{11}$$

where i^* is the cost of borrowing on the world capital market and T lump-sum taxes, also measured in terms of the price of exportables.

The world capital market is imperfect. Specifically, the interest rate facing domestic borrowers is the sum of a risk-free rate, i_f^*, and a country-risk premium, which varies positively with the ratio of the economy's ratio of foreign debt to exports:

$$i^* = i_f^* + \kappa(D/Y_E^s), \tag{12}$$

where $\kappa' > 0$, and $\kappa'' > 0$ and $D = D_R + D_G$ is the economy's total stock of external debt, defined as the sum of the rich household's debt, D_R, and government debt, D_G. This specification is consistent with the evidence provided for instance by Hu, Kiesel, and Perraudin (2002), which suggests a negative relationship between debt-to-GDP ratios and credit ratings (and thus a positive relationship between these ratios and interest rate spreads) for sovereign countries.[7]

The rich household treats Y_E^s, i^*, and T as given, and maximizes (10) subject to (11), by choosing a sequence $\{c_R, D_R\}_{t=0}^{\infty}$. The first-order optimality condition is the familiar Euler equation relating the rate of change in consumption to the difference between the marginal cost of borrowing (given by (12)) and the discount rate:

$$\dot{c}_R/c_R = \sigma[i_f^* + \kappa(D/Y_E^s) - \rho]. \tag{13}$$

[7]See for instance Murphy (1991) for a specification similar to (12). The composition of output could also be added as a determinant of κ, following Agénor and Aizenman (1999) and Agénor and Santaella (1998). This would capture the idea that the world interest rate faced by a small country also depends on its potential capacity to repay, which in turn depends on the economy's relative ability to produce exportables. Following Agénor (1997, 2005*c*), individual default risk could also be introduced.

Ruling out Ponzi games also requires imposing the transversality condition $\lim_{t\to\infty}(D_R e^{-\rho t}) = 0$.

The rich household allocates total consumption spending between purchases of the informal sector (respectively, imported) good, c_R^N (respectively, c_R^M):

$$c_R^N = \delta z c_R, \quad c_R^M = (1-\delta)c_R, \tag{14}$$

where $0 < \delta < 1$.[8]

Income of the poor household (measured in terms of exportables) consists of resources generated in the informal economy, $z^{-1}Y_N^s$. All income is spent on consumption, c_P:

$$c_P = z^{-1}Y_N^s. \tag{15}$$

Assuming for simplicity an allocation rule across consumption goods that is similar to the rich household's yields

$$c_P^N = \delta z c_P, \quad c_P^M = (1-\delta)c_P. \tag{16}$$

2.4 Government

The government derives revenue by levying lump-sum taxes on the rich household. It spends on imported goods, G, and services its foreign debt, D_G, also at the (premium-inclusive) rate i^*. It finances its deficit by borrowing on world capital markets:

$$\dot{D}_G = i^* D_G + G - T. \tag{17}$$

2.5 Market for Informal Sector Goods

The equilibrium condition of the market for informal sector goods can be written as

[8] As is well known, the allocation rule described in (14) is optimal if the sub-utility function in both goods is homogeneous of degree one. The constancy of expenditure shares results from the assumption that the sub-utility function is Cobb-Douglas.

$$Y_N^s = c_R^N + c_P^N. \tag{18}$$

Using equations (8), (14) and (16), this condition becomes

$$Y_N^s(\omega_N z) = \delta z(c_R + c_P),$$

which can be rewritten as, using (15):

$$Y_N^s(\omega_N z) = \frac{\delta}{1-\delta} z c_R. \tag{19}$$

The price of the nontraded good is flexible and adjusts to eliminate excess demand. Condition (19) can therefore be solved for the equilibrium real exchange rate:

$$z = z(c_R, \omega_N), \tag{20}$$

where

$$z_{c_R} = \left[Y_N^{s\prime} \tilde{\omega}_N - \frac{\delta \tilde{c}_R}{1-\delta} \right]^{-1} \frac{\delta \tilde{z}}{1-\delta} < 0,$$

$$z_{\omega_N} = -\left[Y_N^{s\prime} \tilde{\omega}_N - \frac{\delta \tilde{c}_R}{1-\delta} \right]^{-1} Y_N^{s\prime} \tilde{z} < 0.$$

With $\tilde{\omega}_N = \tilde{z} = 1$, $z_{\omega_N} = -\left[Y_N^{s\prime} - \delta \tilde{c}_R/(1-\delta)\right]^{-1} Y_N^{s\prime}$ and $|z_{\omega_N}| < 1$. Equation (20) shows that an increase for instance in ω_N (for c_R given), by raising the product wage and lowering the supply of goods in the informal sector, requires an appreciation of the real exchange rate (a fall in z) to eliminate excess demand. This effect is less than proportional because the appreciation mitigates the initial adverse effect of the rise in ω_N on the product wage. An increase in expenditure by the rich household raises demand for informal sector goods and also leads to a real appreciation.

Substituting (9) for ω_N in (20) yields

$$z = \chi(c_R; \omega_m), \tag{21}$$

where[9]

$$\chi_{c_R} = \frac{z_{c_R}}{1 - z_{\omega_N} \upsilon_z} < 0, \qquad \chi_{\omega_m} = \frac{z_{\omega_N} \upsilon_{\omega_m}}{1 - z_{\omega_N} \upsilon_z} > 0.$$

Equation (21) shows that an increase in the minimum wage, by lowering the market-clearing wage in the informal sector, raises employment and output. To eliminate the excess supply of goods, the real exchange rate must depreciate.

2.6 Poverty Indicators

Suppose that the legal minimum wage, measured at current prices (that is, $E\omega_m$) is used as the official poverty line, and that average income in the informal sector, $P_N Y_N^s / n_N^d$, is less than $E\omega_m$. Given (7) and (8), this implies that $\omega_N / \eta < \omega_m$.[10] Suppose also skilled workers who are unemployed benefit from a non-market source of income (which is not explicitly modeled here) that keeps them above the poverty line.

A first indicator of poverty is the "adjusted" unskilled wage gap, I_W:

$$I_W = \omega_m - \eta^{-1} \omega_N, \tag{22}$$

which measures the relative distance from the poverty line, or the depth of poverty, from the standpoint of an individual worker in the informal economy.[11]

A second indicator is the headcount poverty index, I_H, which can be defined in the present context as the number of workers employed in the

[9] Note that, because $|\upsilon'|$ and $|z_{\omega_N}|$ are both less than unity from from (9) and (20), $1 - z_{\omega_N} \upsilon_z > 0$.

[10] This condition implies that $\omega_N < \omega_m$, given that $\eta \in (0, 1)$. Note that if expected income (rather than the going wage, in the informal sector) is what matters, then the restriction that must be imposed to prevent a corner solution would be $P_N Y_N^s / n_N^d < E\omega_m n_U^d / N_U$, that is, $\omega_N / \eta < \omega_m n_U^d / N_U$. This condition is more restrictive than the one given in the text.

[11] This indicator corresponds to the simple wage gap only if production in the informal sector is subject to constant returns to scale ($\eta = 1$). But then, the condition $\omega_N = Y_N' / z$ implies that $\omega_N z = 1$. Informal sector employment is thus constant, and so is the headcount poverty rate defined in (23).

informal sector, divided by the total size of the urban labor force, N:[12]

$$I_H = \frac{n_N^d}{N} = 1 - (\frac{N_S + n_U^d}{N}). \tag{23}$$

The headcount index measures therefore the incidence of poverty. A third indicator is the composite indicator consisting of the product of I_W and I_H, which measures the income transfer needed to bring all the poor to the poverty line, normalized by the size of the population:[13]

$$I_C = I_W I_H = (\omega_m - \eta^{-1}\omega_N)H. \tag{24}$$

3 Dynamic Form and the Steady State

The dynamics of the model are driven by equations (5), (11), (12), (13), (17), and (21), which are repeated here (in a more compact form) for convenience:

$$\dot{c}_R/c_R = \sigma(i^* - \rho), \tag{25}$$

$$\dot{D}_R = i^* D_R + c_R + T - Y_E^s[\chi(c_R)], \tag{26}$$

$$i^* = i_f^* + \kappa\{D/Y_E^s[\chi(c_R)]\}, \tag{27}$$

$$\dot{D}_G = i^* D_G + G - T, \tag{28}$$

with equation (9) determining the informal sector wage, and equations (22), (23), and (24) the poverty indicators.

Equations (25)-(28) can be further reduced into a dynamic system in c_R, consumption of the rich household, and D, the economy's total stock of debt.

[12] An alternative approach (at this level of abstraction) would be to assume that *all* unskilled workers, in both the formal and informal sectors, are poor. The empirical evidence suggests indeed that the average number of years of schooling of the poor tends to be much lower than that of the total workforce.

[13] Differentials between average income in the formal and informal sectors, $EY_E^s/(n_S^d + n_U^d) - P_N Y_N^s/n_N^d$, can also be calculated from the model. But this would not generally be a relevant poverty indicator, given that one would expect the poverty line to be typically lower than average income in the formal sector.

To derive this system, the first step is to combine the budget constraints of the rich household and government, equations (26) and (28). Together with (27), this yields

$$\dot{D} = [i_f^* + \kappa\{D/Y_E^s[\chi(c_R)]\}]D + G + c_R - Y_E^s[\chi(c_R)], \tag{29}$$

where $D = D_R + D_G$. Note that in (29), c_R corresponds also to total imports (by the rich and the poor), so that $Y_E^s - G - c_R$ is indeed the economy's trade balance.[14]

The model therefore boils down to (25) and (29). These equations form a dynamic system in c_R and D^*, which can be linearized around the steady state to give

$$\begin{bmatrix} \dot{c}_R \\ \dot{D} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} c_R - \tilde{c}_R \\ D - \tilde{D} \end{bmatrix}, \tag{30}$$

where, recalling that $Y_E^{s\prime} > 0$ and $\chi_{c_R} < 0$,

$$a_{11} = -\sigma\tilde{c}_R\tilde{D}\kappa' Y_E^{s\prime}\chi_{c_R}/\tilde{Y}_E^{s2} > 0,$$

$$a_{12} = \sigma\tilde{c}_R\kappa'/\tilde{Y}_E^s > 0,$$

$$a_{21} = -\kappa' Y_E^{s\prime}\chi_{c_R}(\tilde{D}/\tilde{Y}_E^s)^2 + 1 - Y_E^{s\prime}\chi_{c_R} > 0,$$

$$a_{22} = i_f^* + \kappa(\tilde{D}/\tilde{Y}_E^s) + \kappa'\tilde{D}/\tilde{Y}_E^s > 0.$$

Saddlepath stability requires one unstable (positive) root. A necessary and sufficient condition is thus that the determinant of the matrix of coefficients $\mathbf{A}$ in (30) be negative, that is, $\det \mathbf{A} = a_{11}a_{22} - a_{12}a_{21} < 0$. Intuitively, this condition imposes an upper bound on the debt-to-exports ratio. If that ratio is too high to begin with, a small increase in debt will generate a large increase in interest payments (given the endogeneity of the premium), leading to a further increase in debt, and so on. By contrast, a low enough

[14] To see that, note that total imports are given by $c_R^M + c_P^M$. But from (15) and (16), $c_P^M = (1-\delta)z^{-1}Y_N^s$; and from the equilibrium condition (18), $c_R^N = (1-\delta)Y_N^s$. Thus, using (14), $c_P^M = z^{-1}c_R^N = \delta c_R$. Given that $c_R^M = (1-\delta)c_R$, we have indeed $c_R^M + c_P^M = c_R$.

ratio precludes unsustainable debt dynamics. This condition is interpreted graphically below.

From the linearization given above, the saddlepath is given by

$$c_R = \tilde{c}_R + (D_0 - \tilde{D}) \exp(\nu t), \tag{31}$$

or equivalently

$$c_R = \tilde{c}_R + \beta(D - \tilde{D}), \tag{32}$$

where $\beta \equiv (\nu - a_{22})/a_{21} < 0$, with ν denoting the negative root of (30).

In the long-run equilibrium, with $\dot{c}_R = 0$, (25) yields

$$\tilde{D}/Y_E^s[\chi(\tilde{c}_R)] = \kappa^{-1}(\rho - i_f^*), \tag{33}$$

whereas setting $\dot{D} = 0$ in (29) implies that, in the steady state, the current account must be in equilibrium:

$$[i_f^* + \kappa\{\tilde{D}/Y_E^s[\chi(\tilde{c}_R)\}]\tilde{D} + G + \tilde{c}_R - \tilde{Y}_E^s = 0. \tag{34}$$

Figure 1 depicts the equilibrium of the economy, under the assumption that $\theta_z > 0$ and skilled workers who are unable to obtain a job in the formal sector opt to remain unemployed rather than seek employment in the informal economy.[15] The phase diagram corresponding to (30) is shown in the upper northeast quadrant of the figure. The phase curve CC represents the combinations of c_R and D for which consumption of the rich is constant ($\dot{c}_R = 0$), whereas the phase curve DD represents the combinations of c_R and D for which the current account is in equilibrium ($\dot{D} = 0$). Both curves are downward-sloping, with CC being steeper than DD to ensure saddlepath stability ($\det \mathbf{A} < 0$). The saddlepath SS also has a negative slope.[16] The long-run equilibrium is located at point E.

[15] See Agénor (1996, 2005*a*) for a further discussion of this hypothesis and a brief review of the evidence on skilled unemployment in developing countries.

[16] To show, for instance, that SS is steeper than DD, note that with $\nu < 0$, $|\beta|$ is greater than the absolute value of the slope of DD, which is given by $-a_{22}/a_{21}$.

In the upper northwest panel, the curve NN shows the relationship between c_R and z given in (21), whereas curve LL in the lower northwest panel displays the relationship between z and ω_N given in (9). The equilibrium real exchange rate is determined at point B, which is translated to point H, with the equilibrium informal sector wage being determined at F. The demand curve for labor in the informal sector, obtained solely as a function of z by combining equations (7) and (9), is shown as $n_N^d[\upsilon(z;\omega_m)z]$ in the lower northeast panel. Equilibrium employment in the informal sector is determined at point J. Finally, the lower southeast panel shows the determination of the poverty headcount index solely as a function of informal sector employment, as defined in (23). The headcount poverty rate is determined at point M.

Consider now the case $\theta_z = 0$. As noted earlier, output in the formal sector is thus constant and $Y_E^{s\prime} = 0$. Thus, $a_{11} = 0$, $a_{21} = 1$, and the condition for saddlepath stability always holds, because in this case $\det \mathbf{A} = -a_{12} < 0$. The steady-state level of foreign debt is also independent of consumption of the rich, so that in Figure 1 curve CC becomes vertical. In the lower panel on the right, the demand curve for labor in the informal sector, n_N^d, becomes vertical. Employment and output are thus constant in both sectors.

4 Increase in the Risk-Free Rate

I now examine the impact of a permanent increase in the world risk-free interest rate, i_f^*. To do so, consider first the case where $\theta_z = 0$. As shown in the Appendix, the steady-state effect of an increase in i_f^* in this case is always to reduce foreign debt. However, the effect on consumption of the rich is in general ambiguous. The reason is that an increase in i_f^* has three types of effects on the current account. First, at the initial level of the economy's stock of foreign debt, it raises interest payments. Second, at the initial risk-free rate, and because the economy's stock of debt falls, interest payments

tend to fall. Third, because the reduction in foreign borrowing lowers the premium-related component, $\kappa\tilde{D}$, it tends also to lower interest payments. To maintain external balance, any movement in the services account must be offset by a change in consumption of the rich or a reduction in domestic supply of exportables. Thus, whether consumption of the rich rises or falls to maintain current account balance cannot be established a priori. If the initial debt-to-exports ratio is not too large, and if the premium is not overly sensitive to changes in the debt-to-exports ratio (or, more compactly, if the elasticity of the premium, $\tilde{D}\kappa^{-1}\kappa'/\tilde{Y}_E^s$, is not too large), the first effect will dominate. At the initial level of the real exchange rate, consumption of the rich must therefore fall to maintain external balance in the long run. I will assume in what follows that this is indeed the case.

As also shown in the Appendix, if consumption of the rich falls, the real exchange rate must depreciate to maintain equilibrium of the market for nontraded goods. However, as noted earlier, with $\theta_z = 0$ the informal sector wage falls proportionally, so that the product wage remains constant. Informal sector employment and output, consumption of the poor, and the poverty headcount index, therefore remain constant. But given that the informal sector wage falls, the (adjusted) unskilled wage gap, and thus the composite indicator, increase. These long-run results can be summarized in the following proposition:

Proposition 3. *If the skilled wage is independent of relative prices, and if the elasticity of the risk premium with respect to the debt-to-exports ratio is not too large, an increase in the world risk-free interest rate lowers in the long run foreign debt and consumption of the rich, has no effect on output and employment in the formal and informal sectors, and raises the depth of poverty.*

On impact, the stock of foreign debt D cannot change, but the increase in the world risk-free interest rate lowers unambiguously spending by the rich. The reason is that the intertemporal substitution effect and the wealth

effect operate in the same direction. The conventional intertemporal effect is to reduce consumption of the rich. At the same time, the higher interest rate increases the burden of debt, and this generates a negative wealth effect.[17] The fall in consumption leads to a depreciation of the real exchange rate. Although the trade balance and the services account move in opposite directions (the former improves, whereas the latter deteriorates), the net effect is a current account surplus on impact—and thus a reduction in external debt. As is the case with the long-run effect the headcount poverty rate remains constant (because the product wage in the informal sector does not change), whereas the unskilled wage gap widens. The depth of poverty therefore increases on impact as well.

Consider now the case where $\theta_z < 0$. As also shown in the Appendix, the long-run effects of a rise in i_f^* on both foreign debt and consumption of the rich are now ambiguous. If both θ_z and the elasticity of the premium with respect to the debt-to-exports ratio are not too large, consumption of the rich falls. As a result, the real exchange rate must depreciate to eliminate excess supply of nontraded goods. As before, the informal sector wage must fall. But now the product wage increases, given that (as shown earlier) $\partial(\omega_N z)/\partial z > 0$. Informal sector employment falls and so does output in that sector and consumption of the poor. In addition to these effects, the real depreciation that occurs both in the short and the long run lowers the skilled wage (as implied by (2)), thereby stimulating output and employment of both categories of labor in the formal sector. Skilled unemployment falls, whereas the increase in the demand for unskilled labor lowers labor supply in the informal sector, thereby mitigating the downward movement in wages in that sector. Overall, therefore, the depth of poverty (as measured by the adjusted wage gap) increases, whereas its incidence (as measured by the headcount index) falls. As a result, the behavior of the composite indicator,

[17] As discussed by Agénor (1998), if the economy is initially a net creditor with respect to the rest of the world, the impact effect of a reduction in the risk-free rate on consumption is ambiguous, because wealth and intertemporal effects operate in opposite directions.

I_C, is in general ambiguous. These results can be summarized as follows:

Proposition 4. *If the skilled wage depends on relative prices, and if the elasticity of the risk premium with respect to the debt-to-exports ratio is not too large, an increase in the world risk-free interest rate lowers in the long run foreign debt and consumption of the rich, shifts unskilled employment toward the formal sector, but has conflicting effects on the incidence and depth of poverty.*

The dynamic path of consumption of the rich, foreign debt, and the real exchange rate are illustrated in the left-corner of the upper panel of Figure 2 for $\theta_z < 0$. Both CC and DD shift to the left, but the former shifts algebraically by more than the latter, in the case summarized in Proposition 4. Consumption jumps downward from point E to point A, and the real exchange rate depreciates (from B to B', or from H to H'). The reason why consumption of the rich overshoots on impact (by the distance $E'A'$) is because, with D constant on impact, the only effect of the increase in the risk-free rate is a higher burden of debt; there are no "mitigating effects" associated with a reduction in the level of borrowing and the concomitant reduction in the premium (as discussed earlier in relation to the long-run effects). Because of the permanent nature of the shock and the monotonic nature of the adjustment process, the current account remains in surplus (with the economy's external debt decreasing) throughout the transition period; the reduction in debt lowers the premium over time and allows the rich to increase their consumption gradually toward the new, lower steady-state equilibrium. The real exchange rate appreciates continuously, thereby reducing exports. The combined effect of the increase in consumption of the rich and the reduction of exports is a gradual reversal of the initial improvement in the trade balance. The new equilibrium of the economy is at point E'. The informal sector wage falls (from F to F'), informal employment contracts (from J to J'), and the headcount index drops (from M to M'). The unskilled wage gap (the difference between the minimum wage and the in-

formal sector wage, both measured in terms of the price of exports) widens, and so does the depth of poverty.

Thus, in the above setting, whether an adverse external shock raises urban poverty depends crucially on the specification of the labor market and on how poverty is measured. In the present setting, because unskilled employment shifts toward the higher-wage formal sector if the skilled wage is sensitive to relative prices, the incidence of poverty (as measured by the number of workers employed in the informal economy) decreases. At the same time, however, because wages fall in the informal sector, the depth of poverty (for those remaining behind, in a sense) increases.

5 Concluding Remarks

The purpose of this paper has been to analyze the impact of external shocks on the urban poor, in a macroeconomic context that is representative of the conditions typically faced by developing countries. To do so I presented a two-household framework that accounts for some of the key labor market features of these countries. The rich optimize their consumption path through saving and borrowing on an imperfect world capital market, whereas the poor (who are located in the informal economy) spend all of their income. A key feature of the model is the dependence of formal sector wages on the relative price of formal and informal sector goods. This dependence was shown to result from fundamental differences in the behavior of producers, which depends on the product wage, and the behavior of workers and their representatives, which depends on the consumption wage.

After characterizing the dynamic properties of the model, it was used to analyze the impact of a permanent increase in the world risk-free interest rate. The analysis showed that a key aspect of the transmission process is related to the magnitude of the wedge between the consumption and product wages for skilled labor in the formal economy. If the skilled wage is independent of

the real exchange rate, and if the elasticity of the risk premium with respect to the debt-to-exports ratio is not too large, an increase in the world risk-free interest rate lowers foreign debt and consumption of the rich, has no effect on output and employment in either sector, and raises the depth of poverty in the long run . By contrast, if the skilled wage depends on the real exchange rate, and if the elasticity of the risk premium with respect to the debt-to-exports ratio again is not too large, an increase in the world risk-free interest rate lowers again foreign debt and consumption of the rich, but also shifts employment toward the formal sector. Thus, the effects on urban poverty are ambiguous: whereas the incidence of poverty falls, the depth of poverty increases.

The foregoing analysis helps to illustrate that the poverty effects of macroeconomic policies in a typical developing-country context operate through complex channels involving changes in aggregate demand and supply in the formal and informal sectors, as well as changes in relative prices and wages. The labor market plays a particularly important role in this context, including in particular the impact of wage formation for the skilled in the formal sector and its impact on the demand for unskilled labor in that sector. To the extent that the demand for unskilled labor rises in the formal economy, the product wage in the informal sector must increase to reduce labor demand there. Accounting for these general equilibrium effects is crucial to determine whether external shocks hurt the urban poor.[18]

The model could be extended in various directions. The informal sector could be disaggregated to account for the production of both traded and nontraded goods, as for instance in Marjit (2003), although in a two-tier labor market of this type, the effects highlighted above would become less clear. Adding a rural sector would be important to account for rural poverty and

[18]Note that it was assumed that the poverty line is fixed at the level of the minimum wage. In general, of course, the poverty effects of government spending shocks will depend not only on changes in employment levels but also on where the different after-tax wages (formal and informal) lie relative to the poverty line.

rural-urban migration. However, these extensions may increase significantly the degree of complexity of the model and preclude analytical solutions, requiring therefore recourse to numerical methods for policy analysis.

Appendix

The long-run effect of an increase in i_f^* on $\tilde{c}_R$ and $\tilde{D}$ is determined by setting $\dot{c}_R = \dot{D} = 0$ and calculating $d\tilde{D}/di_f^*$ and $d\tilde{c}_R/di_f^*$. From (33), $d\tilde{D}/di_f^*$ is given by

$$\frac{d\tilde{D}}{di_f^*} = -Y_E^s[\chi(\tilde{c}_R)]\kappa^{-1\prime} + \frac{\tilde{D}}{Y_E^s[\chi(\tilde{c}_R)]} Y_E^{s\prime} \chi_{c_R} \frac{d\tilde{c}_R}{di_f^*}, \tag{A1}$$

whereas (34) implies that

$$a_{21}\frac{d\tilde{c}_R}{di_f^*} + a_{22}\frac{d\tilde{D}}{di_f^*} = -\tilde{D}, \tag{A2}$$

where a_{21}, $a_{22} > 0$, as noted in the text.

Combining these two expressions yields

$$\frac{d\tilde{c}_R}{di_f^*} = \frac{-\tilde{D} + a_{22}\tilde{Y}_E^s\kappa^{-1\prime}}{a_{21} + a_{22}(\tilde{D}/\tilde{Y}_E^s)Y_E^{s\prime}\chi_{c_R}}. \tag{A3}$$

Consider first the case where $\theta_z = 0$. Then $Y_E^{s\prime} = 0$ and $a_{21} = 1$. From (A1) and (A2),

$$\frac{d\tilde{D}}{di_f^*} = -\tilde{Y}_E^s\kappa^{-1\prime} < 0, \quad \frac{d\tilde{c}_R}{di_f^*} = -\tilde{D} + a_{22}\tilde{Y}_E^s\kappa^{-1\prime}.$$

These expressions show that $d\tilde{D}/di_f^*$ is unambiguously negative, whereas $d\tilde{c}_R/di_f^*$ is in general ambiguous. Consumption will decrease if the elasticity of the premium with respect to the debt ratio is not too high, that is, $a_{22}\tilde{Y}_E^s\kappa^{-1\prime} > \tilde{D}$, or $\varepsilon(\kappa, \tilde{D}/\tilde{Y}_E^s) < a_{22}$.

If consumption of the rich falls, (21) implies that the real exchange rate depreciates, $d\tilde{z}/di_f^* > 0$. From (9), the informal sector wage falls, $d\tilde{\omega}_N/di_f^*$, by the exact same amount as $\tilde{z}$, so that the product wage remains constant, $d(\tilde{\omega}_N\tilde{z})/di_f^* = 0$. Informal sector employment and output remain constant ($d\tilde{n}_N^d/di_f^* = d\tilde{Y}_N^s/di_f^* = 0$), and so does the headcount poverty index. However, given that $\tilde{\omega}_N$ falls, the (adjusted) unskilled wage gap, and thus the composite indicator, increase.

From (32), the impact effect of a rise in i_f^* on consumption of the rich, given that D cannot change instantaneously (so that $dD_0/di_f^* = 0$), is

$$\frac{dc_R(0)}{di_f^*} = \frac{d\tilde{c}_R}{di_f^*} - \beta(\frac{d\tilde{D}}{di_f^*}). \tag{A4}$$

In the case where consumption of the rich falls in the long run, and given that $\beta < 0$ and $d\tilde{D}/di_f^* < 0$, consumption also falls on impact. Thus, the short-run effects on $\tilde{z}$, $\tilde{\omega}_N$, $\tilde{\omega}_N\tilde{z}$, $\tilde{n}_N^d$, $\tilde{Y}_N^s$, and the poverty indicators operate in the same direction as the long-run effects.

Consider now the case where $\theta_z < 0$. The long-run effect of an increase in i_f^* on $\tilde{D}$ is now ambiguous, as can be inferred from (A1); the effect on $\tilde{c}_R$ remains also ambiguous. If consumption of the rich falls, the real exchange rate depreciates, $d\tilde{z}/di_f^* > 0$. From (9), the informal sector wage falls, $d\tilde{\omega}_N/di_f^* < 0$, but this time the product wage increases $d(\tilde{\omega}_N\tilde{z})/di_f^* > 0$, given that $\partial(\omega_N z)/\partial z = 1 + \upsilon_z > 0$. Informal sector employment therefore falls, $d\tilde{n}_N^d/di_f^* < 0$, and so does output $d\tilde{Y}_N^s/di_f^* < 0$. Consequently, the headcount index falls, $d\tilde{I}_H/di_f^* < 0$, but given that the (adjusted) wage gap increases, the change in the composite indicator (24),

$$\frac{d\tilde{I}_C}{di_f^*} = -\tilde{I}_H\eta^{-1}(\frac{d\tilde{\omega}_N}{di_f^*}) + \frac{(\omega_m - \eta^{-1}\tilde{\omega}_N)}{N}(\frac{d\tilde{n}_N^d}{di_f^*}),$$

is in general ambiguous. If the initial headcount rate $\tilde{I}_H$ is sufficiently high, then $d\tilde{I}_C/di^* < 0$.

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Figure 1
General Equilibrium
and Determination of the Poverty Rate

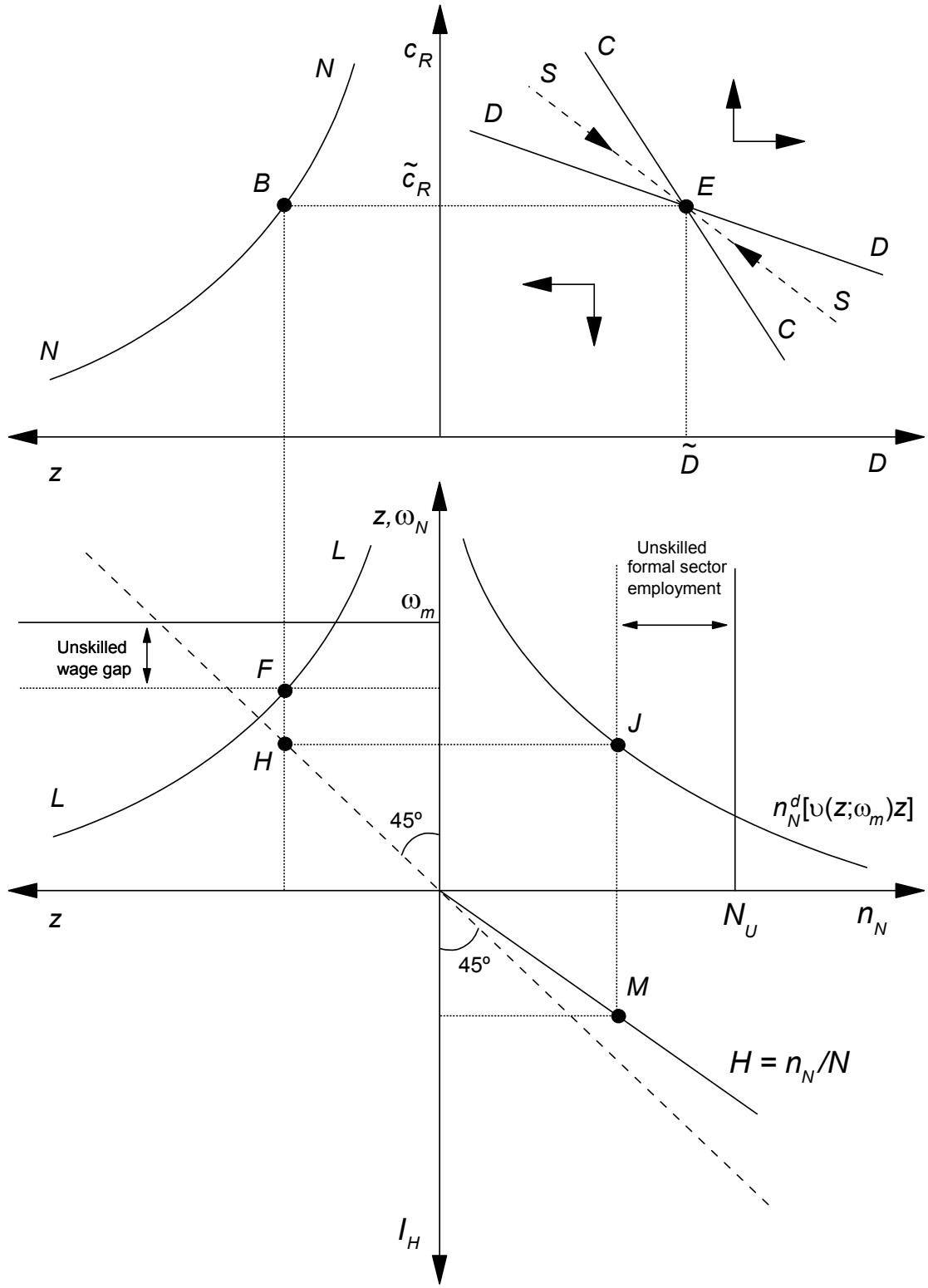

Figure 2

Permanent Increase
in the World Risk-free Interest Rate