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Editor's Introduction

Ekonomi-tek is a publication of the Turkish Economic Association Foundation. The establishment of the Turkish Economic Association goes back to the late 1920s. The National Economy and Savings Society was established on December 12, 1929 when it was understood that the 1929 Great Depression was reaching the shores of Turkey. Indeed, according to its constitution, the purpose of the Society was to explain and help minimize the devastating impacts of the 1929 Great Depression, encourage savings in the struggle against extravagance, and promote the use of domestically produced goods given the large trade and current-account deficits.

The name of the Society was changed to the National Association of Economy and Savings in June 1939 and to the Turkish Economic Association (TEA) in January 1955. In 1973, the TEA Foundation was established to manage the assets of the association. In 1977, the TEA became a member of the International Economic Association, reflecting the will of the Turkish economists to become an active part of the international community of economists.

When we celebrated the 80th anniversary of the TEA in 2009, in the midst of the Great Recession, we decided that it was time to publish a refereed scholarly economics journal and aimed for a late 2011 launch date. We are now pleased in early 2012 to present this first issue of our journal, Ekonomi-tek. We plan on having three issues a year, both on paper and electronically, and on being relevant to economists all over the world. We see our mission as sharing research findings on theoretical, policy-related, and empirical questions in economics. Articles submitted to the journal will be peer-reviewed and published in a timely manner.

The editorial board of Ekonomi-tek does not have an explicitly stated focus or niche. However, considering the TEA and Ekonomi-tek are located in a developing country/an emerging market, we would especially welcome research on issues affecting the developing world/emerging markets, obviously including Turkey. At the same time, given the TEA's founding at a time of crisis and the poignant reminders of that period nowadays, we will encourage contributors to submit research on global and regional crises, especially those

regarding imbalances and monetary and fiscal policies at the global and national levels.

In this first issue, the journal features four articles, two of them covering these very areas. We would like to thank advisory board members Stephen Turnovsky, Dani Rodrik, and Yılmaz Akyüz for helping us get our journal off the ground with their stimulating contributions. In subsequent issues, we eagerly await articles from fellow economists around the world. At the same time, we hope our readers join us in wishing this new venture of ours a long productive life to answer the needs of economists.

Ercan Uygur

Editor

Ekonomi-tek

Editörün Sunuşu

Ekonomi-tek, Türkiye Ekonomi Kurumu Vakfı'nın yayınıdır. Türkiye Ekonomi Kurumu'nun kuruluşu, 1920'li yıllara gider. Milli İktisat ve Tasarruf Cemiyeti 12 Aralık 1929 yılında 1929 Büyük Buhranının Türkiye'ye yaklaşmakta olduğu görülünce kurulmuştur. Tüzüğe göre Cemiyetin kuruluş amacı, 1929 Büyük Buhranı'nın yıkıcı etkilerini açıklamak ve azaltmaya yardımcı olmak üzere, büyük ticaret ve cari denge açıklarını da dikkate alarak, bir yandan israfla mücadele ederek tasarrufu teşvik etmek, diğer yandan yerli malların tanıtımını ve kullanımını özendirmek idi.

Cemiyetin adı Haziran 1939'da Ulusal Ekonomi ve Artırma Kurumu ve Ocak 1955 tarihinde Türkiye Ekonomi Kurumu (TEK) olarak değiştirildi. 1973 yılında kurumun mal varlığını yönetmek üzere TEK Vakfı kuruldu. TEK, 1977'de Uluslararası Ekonomi Birliği'ne (International Economic Association) üye oldu; bu üyelik, Türkiye'deki iktisatçıların uluslararası ekonomi toplununun faal bir parçası olma isteğini yansıtıyordu.

2009 yılında Büyük Durgunluğun ortasında TEK'in 80. Kuruluş yıldönümünü kutladığımızda, hakemli akademik bir ekonomi dergisinin yayınlanması zamanının geldiğine karar verdik ve yayının başlaması için 2011 yılı sonlarını hedefledik. Şimdi 2012 başlarında dergimiz Ekonomi-tek'in bu ilk sayısını sunmanın mutluluğu içindeyiz. Derginin, hem basılı hem elektronik olarak yılda üç sayısının yayınlanmasını ve dünyadaki tüm iktisatçılara hitap etmesini tasarlıyoruz. Amacımız, iktisat alanındaki kuramsal, politikaya yönelik ve uygulamalı sorulara cevap arayan araştırmaların ulusal ve uluslararası düzeyde paylaşılmasını sağlamaktır. Dergiye gönderilen makaleler dikkatle değerlendirilecek, uygun bulduklarında gecikmeden yayınlanacaklardır.

Ekonomi-tek'in editör kurulunun odaklandığı veya özellikle yer vermek istediği bir iktisat konusu yoktur. Ancak, Ekonomi-tek'in gelişmekte olan / yükselen bir piyasa ekonomisinde yer aldığı dikkate alınırsa, elbette Türkiye dahil gelişmekte olan/yükselen piyasa ekonomileriyle ilgili konulardaki araştırmaları dergide özellikle görmek isteriz. Aynı zamanda, TEK'in bir buhran döneminde kurulduğunu ve bugünlerde bu acı dönemi anımsatan gelişmeler olduğunu düşünürsek, küresel ve bölgesel bunalımlar konusundaki araştırmaların, özellikle küresel ve ulusal düzeydeki dengesizliklerle, para ve maliye politikalarıyla ilgili olanların dergiye sunulmasını özendirmek isteriz.

Bu ilk sayımızda yer alan dört makaleden ikisi tam da bu konulardadır. Danışma kurulu üyelerimiz Stephen Turnovsky, Dani Rodrik ve Yılmaz Akyüz'e, dergimizin iyi bir başlangıç yapması için verdikleri teşvik edici katkı ve desteğe çok teşekkür etmek isteriz. Bundan sonraki sayılar için dünyanın her yanındaki meslektaş iktisacılarından sabırsızlıkla makale bekliyoruz. İktisatçıların araştırma/tartışma gereksinimlerini karşılayacağını düşündüğümüz bu yeni girişimimize uzun ve üretken bir yaşam diliyoruz; okuyucularımızın bu dileğimize katılacağını umuyoruz.

Ercan Uygur

Editör

Ekonomi-tek

The Effects of Foreign Transfers with a Flexible Labor Supply*

*Serpil Bouza** and Stephen J. Turnovsky****

Abstract

We show that the importance of flexible labor supply in determining the impact of foreign transfers depends upon whether the transfers are untied or tied to productivity enhancement. This is because the transfer has both a wealth effect and a relative price effect, the relative importance of which depends upon its allocation. For an untied transfer, the relative price effect is weak, the wealth effect on leisure dominates, and the endogeneity of the labor supply is important. For a tied transfer, the increase in productivity raises the wage rate, thereby inducing an increase in aggregate labor supply and offsetting the increase in leisure due to the wealth effect. The overall response in leisure is small and is dominated by the relative price effect. In this case, given this small response, whether the aggregate labor is supplied elastically or is constrained to be fixed turns out to make little difference.

JEL codes: D31, F34, F41, F43

Keywords: Foreign transfers, flexible labor supply.

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1. Introduction

The consequences of the international transfer of resources for relative price movements and internal resource allocation are a longstanding and recurring theme in international economics. The issue first gained attention in the context of the war reparations imposed on Germany at the conclusion of World War I, leading to the debate between Keynes (1929) and Ohlin (1929) concerning the so-called “transfer problem.” Then, in the 1970s and 1980s, the role of relative prices was central in analyzing the consequences of the discovery of natural resources in both Australia (raw materials) and Northern Europe (oil and natural gas). It was argued that by increasing the supply of tradable goods and lowering their relative price, productive factors are shifted to the nontraded sector, thereby reducing the size of the country’s traditional export sector and thus adversely affecting its growth rate. This problem became known as “Dutch disease,” a reference to the decline of the manufacturing sector in the Netherlands after the discovery of a large natural gas field some years earlier, and was first analyzed in some detail by Corden and Neary (1982) and Corden (1984). More recently, the issue of Dutch disease has again been addressed in assessing the benefits of foreign aid. Much of this research has been empirical, yielding a generally mixed relationship between Dutch disease symptoms and aid.¹

As the literature analyzing foreign transfers has progressed, the formal analytical models employed have increased in sophistication. First, much of the earlier literature analyzing transfers was static. This was certainly true of Samuelson’s (1952, 1954) seminal analysis, which assumed that a transfer would have dynamic consequences but would be offset by changes in an economy’s trade balance that left the current account unchanged. Similarly, the Corden and Neary (1982) and Corden (1984) analyses of Dutch disease are based on a static version of the dependent-economy model of Salter (1959). More recently, this question has increasingly been addressed within an intertemporal framework. Thus, Brock and Turnovsky (1994) and Brock (1996) employ a dynamic dependent-economy model and show that a small

¹ For example, Kang, Prati, and Rebucci (2010) find evidence of Dutch disease effects holding in half of their sample of 38 countries. Nkusu (2004) argues that Dutch disease need not occur in low-income countries that can draw upon their idle productive capacity to satisfy the aid-induced increased demand. In contrast, Rajan and Subramanian (2005) do find evidence of Dutch disease leading to adverse effects on growth, even for economies adopting “good policies” in the Burnside-Dollar (2000) sense.

economy's macroeconomic adjustment to a foreign transfer depends upon the relative capital intensities of the traded and nontraded sectors.²

Second, virtually all of the literature assumes that the foreign transfer takes the form of a pure income flow, the direct effect of which is to enhance the country's overall resources (i.e., its wealth) and to raise its levels of consumption and savings. Any effects on output or production are indirect and result from the higher demand and the inter-sectoral factor movements induced by the relative price changes. But in practice, the revenue received by a country from abroad may be directly applied to productivity enhancement. Indeed, in the case of the transfers granted by the European Union to potential candidates, this was required as a condition for membership.³ To the extent that the transfer is invested in enhancing productive capacity, thereby altering the relative sectoral productivities, it will further directly influence relative prices and, therefore, resource allocation.⁴

This paper builds upon a recent contribution by Cerra, Tekin, and Turnovsky (2009), who present a dynamic model of a two-sector-dependent economy that produces both traded and nontraded output. The country they consider receives transfers from abroad, which can be allocated to three potential uses. First, as in the traditional literature, it may be a pure income flow, whose direct effect is to reduce debt and lift consumption and savings. Second, it may be channeled into productivity enhancement in the traded sector; and third, it may similarly end up in the nontraded sector. Their analysis demonstrates how each of these scenarios has substantially different consequences for relative price movements; each case causes the economy to follow a markedly different time path and yields a correspondingly different welfare profile.

But like the previous literature, Cerra et al. (2009) impose one strong assumption, namely, that while labor can move freely between the two sectors, its aggregate supply is fixed inelastically. The present paper relaxes this assumption and instead stipulates that total labor is supplied endogenously, by allowing the representative agent to have a work-leisure choice. As a general

² The dependent-economy model, as it originated with Salter (1959), Swan (1960), and Pearce (1961), was purely static. Dynamic extensions have been developed by a number of authors, including Bruno and Sachs (1982), van Wijnbergen (1985), Brock and Turnovsky (1994), Turnovsky and Sen (1995), and Brock (1996). Recently, Kuralbayeva and Vines (2008) employ a dynamic version of this model to analyze Dutch disease effects stemming from a terms-of-trade shock originating from an oil price increase.

³ See e.g., Chatterjee, Sakoulis, and Turnovsky (2003), where this is discussed and documented in more detail.

⁴ This includes the Balassa-Samuelson effect, which refers to the enhanced productivity of the traded sector, causing an appreciation of the real exchange rate; see Balassa (1964) and Samuelson (1964).

proposition, endogenizing the total labor supply has potentially profound implications. By equating the marginal utility of leisure to the marginal utility of consumption foregone, priced at the real wage (the opportunity cost of leisure), it links the production side of the economy to the demand side. One important effect of this is to strengthen the role of demand shocks as an influence on the dynamic adjustment. This is the case in both the standard one-sector Ramsey representative agent model, as well as in the foreign-aid endogenous-growth model of Chatterjee and Turnovsky (2007).⁵

In the present two-sector production framework, it turns out that endogenizing the labor supply has no effect on those aspects of the long-run equilibrium that are determined solely by supply conditions. Thus, it has no effect on the long-run relative price of nontraded goods, sectoral capital-labor ratios, or the rates of return on capital or labor (the real wage rate). That being the case, the long-run depressive effects on exports produced by a pure transfer should not be viewed as a Dutch disease symptom. Being a pure demand shock, such transfers have no long-term effect on relative prices. Rather, the weakening of exports is a “current-account balance effect,” meaning that untied transfers substitute for the production of export goods in financing the purchase of traded consumption goods.⁶

In other respects, the role of the labor supply in determining the impact of foreign transfers depends upon how these resources are allocated. If they are in the form of a pure transfer, introducing the element of an elastic labor supply has significant outcomes. When the total labor supply is fixed, the decoupling of the consumption and production decisions that occurs permits many variables to respond almost instantaneously, insulating much of the system from the transitional dynamics. However, when labor is supplied elastically, pure transfers modify the marginal rate of substitution between consumption and leisure, thereby exposing more of the economy’s dynamic adjustment to the more sluggish accumulation of the capital stock and debt.

⁵ In either case, with an inelastic labor supply, the economy responds fully on impact to demand shocks.

⁶ The independence of the long-run relative price from untied transfers (a pure demand shock) is an immediate consequence of a basic property of the two-factor two-sector production model, namely that with perfect sectoral factor mobility, the long-run relative price depends solely upon supply conditions. A similar result is obtained by Devarajan, Go, Page, Robinson, and Thierfelder (2008). Arellano et al. (2009) generate long-run Dutch disease effects by introducing the imperfect substitutability of capital *stocks* across sectors. In contrast, untied transfers would continue to have no long-run relative price effects for the form of costly intrasectoral capital *flows* introduced by Morshed and Turnovsky (2004).

The possibility that the wealth effects stemming from the pure transfer may be absorbed by leisure leads to other situations as well. First, whereas with an inelastic labor supply, the response of the long-run capital stock and debt depends solely upon the sectoral capital-labor ratios, the rise in leisure now becomes relevant, and in some cases may dominate this more traditional effect. Second, as leisure goes up, both traded and nontraded production goes down, leading to an overall shrinkage in aggregate output. In this respect, the now smaller size of the export sector now resembles a Dutch disease component, but one due to an increase in wealth, rather than to a change in the relative price.

In contrast to the pure transfer, tied productivity-enhancing transfers have relatively little to do with changes in the labor supply, whether fixed or flexible. While it is true that the labor supply will be slimmed by the wealth effects brought about by the transfer, this is largely offset by the positive supply effect of the higher wages coming from the productivity enhancement. In addition, there are large sustained movements in the relative price, which determines these modest adjustments in the labor supply. Thus, overall, the dynamic adjustments in response to tied transfers entering a country with an assumed inelastic labor supply remain more or less intact.

While the structural consequences of foreign transfers are important, the overriding issue is their welfare implications. In this regard, Cerra et al. (2009) highlight the tradeoffs that exist between (i) the relative price (real exchange rate), (ii) the accumulation of capital (growth), and (iii) the welfare gains associated with the transfer. Overall, the tradeoffs relevant for an inelastic labor supply continue to apply when the labor supply is endogenized.

The two-sector production structure, together with the specification of the financial sector, which we take to involve increasing debt costs, leads to a state of macroeconomic equilibrium that is specified by a fourth-order dynamic system. The key equilibrium dynamic variables consist of: (i) the capital stock, (ii) the stock of debt, (iii) the relative price of nontraded to traded output, and (iv) the shadow value of wealth, expressed in terms of traded output as numeraire. Both the macrodynamic equilibrium, and, in particular, the role of the endogenous labor supply, are characterized as far as possible. But being a high order system, it must inevitably be analyzed numerically, and, thus, much of our analysis is based on a plausible calibration of the model.

As has been shown previously, the dynamics of two-sector models of this type depend upon the relative sectoral capital intensities, which, in turn, have

an important bearing on the dynamics of the relative price.⁷ However, there is little evidence—and no consensus—as to what the appropriate specification of this aspect should be. For example, Arellano et al. (2009) parameterize their model to make the nontraded sector relatively capital intensive, whereas Kuralbayeva and Vines (2008) adopt precisely the opposite assumption. We therefore contrast two benchmark cases: (i) where the traded sector is relatively capital intensive; and (ii) where the relative sectoral capital intensities are reversed.

The economy we consider is one having well-functioning internal markets and with a high degree of access to world financial markets. Thus, our analysis is most applicable to countries such as Greece and Portugal and emerging-market economies, such as Turkey, seeking admission to the European Union. It also may plausibly describe more developed countries like Australia and Norway, following their discovery of natural resources.⁸

Following this introduction, Section 2 outlines the theoretical framework. Sections 3 and 4 discuss some of the long-run and short-run implications of the model, stressing in particular the role played by the endogeneity of the labor supply. In Sections 5 and 6, we perform a numerical simulation of the model and calibrate it for a small open economy. Sections 7 and 8 analyze the dynamics of foreign transfers, given three allocation scenarios: (i) pure transfer, (ii) transfer devoted to increasing the productivity of the traded sector, and (iii) transfer devoted to increasing the productivity of the nontraded sector. Section 9 examines some of the welfare consequences and the tradeoffs involved between different measures of economic performance, while Section 10 concludes the paper.

2. Two-sector Model of Foreign Transfers

The framework we will employ is an extension of Cerra, Tekin, and Turnovsky (2009) to cover an endogenous labor supply. Hence, our explanation of the model is brief.

⁷ See e.g., Turnovsky and Sen (1995).

⁸ But with labor and capital being perfectly mobile across sectors, we are assuming more internal flexibility than would characterize a truly developing economy, although it would be straightforward to adapt the framework to deal with that case. Moreover, as long as the impediments to sectoral factor movements involve only the flows, as in Morshed and Turnovsky (2004), our long-run results, when all sectoral movements cease, should provide some guidance to even developing economies. Arellano et al. (2009) formulate the impediments to sector factor mobility, characterizing a developing economy in terms of a convex transformation function involving the capital stocks. This does have long-run consequences.

2.1 The economic structure

We consider a small open economy model with an infinitely-lived representative agent who is endowed with one unit of time, a fraction L_T of which is devoted to employment in the traded sector, L_N to employment in the non-traded sector, and the remaining l to leisure. Labor is supplied at a competitive wage rate. The agent also accumulates capital, K , which he rents out at a competitively determined rental rate.

The economy produces a traded good (the numeraire) using capital, K_T , and labor, L_T , by means of the neoclassical production function, $F(K_T, L_T, G_T)$, where both capital and labor have positive, but diminishing, marginal physical products and are subject to constant returns to scale. In addition, government spending on infrastructure (a nontraded good) allocated to the traded sector, G_T , serves to increase the productivity of that sector, so that $F_G > 0$.

The economy also employs capital, K_N , and labor, L_N , to produce a non-traded good, using the production function, $H(K_N, L_N, G_N)$, having similar neoclassical properties, where G_N represents the government spending on the nontraded good allocated to enhance the productivity of the nontraded output sector, $H_G > 0$.⁹ The relative price of nontraded output in terms of the traded output is p . It thus serves as a proxy for the real exchange rate, with an increase in p representing a real exchange-rate appreciation. All individuals take p as parametrically given, although it is determined by the aggregate market-clearing conditions in the economy.

The two private factors, capital and labor, are freely mobile between the two sectors, with the sectoral allocations being constrained by:

$$K_T + K_N = K \tag{1a}$$

$$L_T + L_N + l = 1. \tag{1b}$$

⁹ To preserve tractability, these expenditures are introduced as *flows*, as in Barro (1990), although a natural extension would be to specify them as public capital *stocks*, as in the one-sector analysis of Chatterjee, et al. (2003).

Physical capital is produced in the nontraded sector and depreciates at the rate δ_K , thus implying the following capital accumulation constraint:

$$\dot{K} = I - \delta_K K \quad (2)$$

As discussed by Turnovsky (1997) in detail, the treatment of physical capital as being traded or nontraded has generated substantial debate over the years, although as Brock and Turnovsky (1994) show, restricting capital to be nontraded does not involve a serious loss of generality.¹⁰

The economy can borrow in the international capital market, although it faces increasing borrowing costs in doing so. We express this by postulating that the rate of interest at which it may borrow is an increasing function of the ratio of its debt to the value of its capital, which serves as a proxy measure of its ability to service its debt. Thus we have:

$$r\left(\frac{N}{pK}\right) = r^* + \omega\left(\frac{N}{pK}\right); \quad \omega' > 0, \quad \omega'' > 0 \quad (3)$$

where N is the country's stock of debt, r^* is the exogenous world interest rate, and $\omega(N/(pK))$ is the borrowing premium. In making his individual decisions, the representative agent takes the interest rate as given. This is because the interest rate facing the debtor nation is an increasing function of the economy's *aggregate* debt, which the individual assumes he is unable to influence.¹¹

Given this access to the world's goods and financial markets, the domestic agent's instantaneous budget constraint is specified by:

$$\dot{N} = C_T + pC_N + p(\dot{K} + \delta_K K) + pT - F(K_T, L_T, G_T) - pH(K_N, L_N, G_N) + r\left(\frac{N}{pK}\right)N \quad (4)$$

where C_T and C_N are the agent's consumption of the traded and nontraded goods, and T denotes domestic taxes, which we take to be lump-sum and denominated in terms of nontraded output.

The representative agent chooses his consumption levels, C_T and C_N ; sectoral labor allocations, L_T , L_N ; leisure, l ; sectoral capital allocations, K_T

¹⁰ Brock and Turnovsky (1994) extend this model to include both traded and nontraded capital.

¹¹ Many variants of (3) can be found in the literature, some of which are discussed by Chatterjee, Sakoulis, and Turnovsky (2003).

and K_N , and the rates of accumulation of capital and debt, \dot{K} and \dot{N} ; to maximize the intertemporal utility function:

$$\Omega \equiv \int_0^{\infty} U(C_T, C_N, l) e^{-\rho t} dt \quad (5)$$

subject to the constraints (1)-(4) and given initial stocks of assets $K(0) = K_0$ and $N(0) = N_0$. The instantaneous utility function is assumed to be concave in the two consumption goods, as well as leisure, all of which are assumed to be normal goods. The agent's rate of time preference, ρ , is constant.

Performing the optimization yields the following optimality conditions:

$$U_T(C_T, C_N, l) = \mu \quad (6a)$$

$$U_N(C_T, C_N, l) = \mu p \quad (6b)$$

$$U_l(C_T, C_N, l) = \mu F_L(K_T, L_T, G_T) \quad (6c)$$

$$\frac{1}{p} F_K(K_T, L_T, G_T) = H_K(K_N, L_N, G_N) \quad (6d)$$

$$\frac{1}{p} F_L(K_T, L_T, G_T) = H_L(K_N, L_N, G_N) \equiv w \quad (6e)$$

$$\rho - \frac{\dot{\mu}}{\mu} = r \left(\frac{N}{pK} \right) \quad (6f)$$

$$\frac{F_K(K_T, L_T, G_T)}{p} + \frac{\dot{p}}{p} - \delta_K = r \left(\frac{N}{pK} \right) \quad (6g)$$

together with the transversality conditions that must hold to ensure that the agent's intertemporal budget constraint is met:

$$\lim_{t \rightarrow \infty} \mu N e^{-\rho t} = 0; \quad \lim_{t \rightarrow \infty} \mu p K e^{-\rho t} = 0. \quad (6h)$$

where μ , the Lagrange multiplier associated with (4), is the shadow value of wealth.

Equations (6a) and (6b) equate the marginal utility of consumption to the shadow value of wealth, appropriately measured in terms of the numeraire. Equation (6c) equates the marginal utility of leisure to the shadow value of wage income foregone. This means that changes in wage income will affect the amount of leisure, as well as traded and nontraded goods consumption. This equation represents the critical departure from Cerra, Tekin, and Turnovsky (2009), where with labor supply taken to be exogenous, it is no longer applicable.¹² Equations (6d) and (6e) determine the sectoral allocation decisions by equating the marginal physical products of the two factors across the two sectors. Equations (6f) and (6g) are arbitrage conditions equating the rate of return on consumption and the rate of return on nontraded capital to the borrowing cost.

The government receives foreign transfers, TR , that are denominated in units of traded output, thereby providing it, together with the lump-sum taxes collected from domestic residents, with two sources of revenue. We assume that the government maintains a balanced budget and that these resources may be allocated in three ways: (i) to enhance the productivity of the traded sector, G_T , (ii) to enhance the productivity of the nontraded sector, G_N , and (iii) to reduce the tax burden of the domestic residents.¹³

$$G_T + G_N = T + \frac{TR}{p} \quad (7)$$

The economy starts from equilibrium with zero transfers, so that initially all expenditures are financed using lump-sum taxation:

$$G_{T,0} + G_{N,0} = T_0 \quad (8)$$

At time 0, the government receives a permanent foreign transfer, TR , that is allocated toward G_T, G_N, T in accordance with:

$$G_T(t) = G_{T,0} + \lambda(1-\phi) \frac{TR}{p(t)} \quad (9a)$$

¹² In that case, equation (6c) is replaced with the constraint $l = \bar{l}$, which for convenience they set to be unity.

¹³ We assume that the transfer denominated in units of traded output can be costlessly converted to nontraded output (i.e., there are no adjustment costs).

$$G_N(t) = G_{N,0} + \lambda\phi \frac{TR}{p(t)} \quad (9b)$$

$$T(t) = T_0 - (1 - \lambda) \frac{TR}{p(t)} \quad (9c)$$

Thus, λ parameterizes the allocation of the transfer between tax reduction and an increase in productive expenditures, while ϕ specifies the allocation of the expenditures between the two sectors. With the transfer specified in terms of the traded good, the resources available to spend on productivity-enhancing infrastructure (nontraded good) vary inversely with the evolving relative price, $p(t)$.

The final two equations are the economy's accumulation equations. Non-traded goods' market equilibrium requires:

$$\dot{K} = H(K_N, L_N, G_N) - C_N - (G_T + G_N) - \delta_K K \quad (10)$$

That is, any nontraded output that is in excess of domestic private consumption, government purchases, and the stock of capital that has depreciated, is accumulated as nontraded capital. This equation, together with the private-sector budget constraint, (4), and the government budget constraint, (8), yields the current-account equation for the economy:

$$\dot{N} = C_T - F(K_T, L_T, G_T) + r \left(\frac{N}{pK} \right) N - TR \quad (11)$$

The rate of debt accumulation equals the excess of domestic private consumption of the traded good over its supply, plus the interest owed on the existing stock of debt, less the transfers received.

2.2 Macroeconomic equilibrium

The linear homogeneity of the production functions in the private factors allows us to express relations in terms of sectoral capital-labor ratios. Thus, defining $k_i \equiv K_i/L_i$ to be the capital-labor ratio in sector i , where $i = T, N$, the corresponding production functions can be expressed as

$$f(k_T) \equiv F(K_T, L_T, G_T)/L_T, \quad h(k_N) \equiv H(K_N, L_N, G_N)/L_N.$$

This enables us to summarize the macroeconomic equilibrium with the following set of relationships:

$$U_T(C_T, C_N, l) = \mu \quad (12a)$$

$$U_N(C_T, C_N, l) = \mu p \quad (12b)$$

$$U_l(C_T, C_N, l) = \mu [f(k_T, G_T) - k_T f_k(k_T, G_T)] \quad (12c)$$

$$f_k(k_T, G_T) = p h_k(k_N, G_N) \quad (12d)$$

$$f(k_T, G_T) - k_T f_k(k_T, G_T) = p [h(k_N, G_N) - k_N h_k(k_N, G_N)] \quad (12e)$$

$$L_T k_T + (1 - L_T - l) k_N = K \quad (12f)$$

$$\dot{K} = (1 - L_T - l) h(k_N, G_N) - C_N - (G_N + G_T) - \delta_K K \quad (13a)$$

$$\dot{N} = C_T - L_T f(k_T, G_T) + r(.)N - TR \quad (13b)$$

$$\dot{p} = p[r(.) + \delta_K - h_k(k_N, G_N)] \quad (13c)$$

$$\frac{\dot{\mu}}{\mu} = \rho - r \left(\frac{N}{pK} \right) \quad (13d)$$

together with the allocation of the transfers being specified by (9).

Equations (12a)-(12f) define the short-run equilibrium. With an endogenous labor supply, the decoupling of production decisions and consumption decisions of the short-run equilibrium, as laid out, for example, in Turnovsky and Sen (1995), partly breaks down. Now the solution is of the following form, and is more recursive in structure. First, as in the inelastic labor case, (12d) and (12e) can be solved for the sectoral capital-labor ratios

$$k_T = k_T(p, G_T, G_N) \quad (14a)$$

$$k_N = k_N(p, G_T, G_N) \quad (14b)$$

Given these sectoral capital-labor ratios, (12a)-(12c) can be solved for the two consumption levels, C_T and C_N , together with leisure, l , in the form

$$C_T = C_T(\mu, k_T(p, G_T, G_N), p, G_T) \quad (15a)$$

$$C_N = C_N(\mu, k_T(p, G_T, G_N), p, G_T) \quad (15b)$$

$$l = l(\mu, k_T(p, G_T, G_N), p, G_T) \quad (15c)$$

Then (12f) implies the labor allocation to the traded sector

$$L_T = \frac{K - k_N(p, G_T, G_N)[1 - l(\mu, k_T(p, G_T, G_N), p, G_T)]}{k_T(p, G_T, G_N) - k_N(p, G_T, G_N)} \quad (15d)$$

The solutions (15a)-(15d) indicate two key differences introduced by the endogeneity of the labor supply. First, in addition to their direct dependence on relative price, p , and the shadow value, μ , consumptions of both goods now depend upon the sectoral capital-ratio, k_T , and G_T . This occurs through their interactions with leisure and its dependence on the wage rate, providing a second channel for productive government spending and the relative price to influence consumption. Second, because of the time constraint linking leisure and labor, the time allocated to traded labor, L_T (and therefore also nontraded labor, L_N), is now a function of leisure, l , and hence depends upon the shadow value of wealth, μ .¹⁴

Substituting (15a)-(15c) for the production functions, we may express traded and nontraded outputs in the form

$$X = L_T f(k_T, G_T) = X(\mu, K, p, G_T, G_N) \quad (16a)$$

$$Y = (1 - L_T - l)h(k_N, G_T) = Y(\mu, K, p, G_T, G_N) \quad (16b)$$

Again, the endogeneity of the labor supply implies that output depends upon the shadow value of wealth.

3. Steady-state Equilibrium

Substituting (14) and (15) for (13) yields an autonomous dynamic equilibrium determining the evolution of K, N, p, μ , which forms the basis for our numerical simulations. Before discussing this, we shall briefly consider the

¹⁴ In the case where the utility function is additively separable in leisure, then much (although not all) of the decoupling associated with an inelastic labor supply is restored.

steady state, attained when $\dot{K} = \dot{N} = \dot{p} = \dot{\mu} = 0$. In general, this can be summarized with the following sets of relationships:

A. Sectoral allocation relationships

$$h_k(\tilde{k}_N, G_N) - \delta_K = \rho \quad (17a)$$

$$f_k(\tilde{k}_T, G_T) = \tilde{p} h_k(\tilde{k}_N, G_N) \quad (17b)$$

$$f(\tilde{k}_T, G_T) - \tilde{k}_T f_k(\tilde{k}_T, G_T) = \tilde{p} [h(\tilde{k}_N, G_N) - \tilde{k}_N h_k(\tilde{k}_N, G_N)] \quad (17c)$$

B. Aggregate market-clearing relationships

$$\tilde{p} U_T(\tilde{C}_T, \tilde{C}_N, \tilde{l}) = U_N(\tilde{C}_T, \tilde{C}_N, \tilde{l}) \quad (18a)$$

$$U_l(\tilde{C}_T, \tilde{C}_N, \tilde{l}) = U_T(\tilde{C}_T, \tilde{C}_N, \tilde{l}) [f(\tilde{k}_T, G_T) - \tilde{k}_T f_k(\tilde{k}_T, G_T)] \quad (18b)$$

$$\tilde{L}_T \tilde{k}_T + (1 - \tilde{L}_T - \tilde{l}) \tilde{k}_N = \tilde{K} \quad (18c)$$

$$(1 - \tilde{L}_T - \tilde{l}) h(\tilde{k}_N, G_N) - \tilde{C}_N - (G_N + G_T) - \delta_K \tilde{K} = 0 \quad (18d)$$

$$\tilde{C}_T + \rho \tilde{N} = \tilde{L}_T f(\tilde{k}_T, G_T) + TR \quad (18e)$$

$$r\left(\frac{\tilde{N}}{\tilde{p}\tilde{K}}\right) = \rho \quad (18f)$$

Equations (17a)-(17c) and (18a)-(18f) determine the steady-state values (denoted by tildes); $\tilde{k}_N, \tilde{k}_T, \tilde{p}, \tilde{C}_T, \tilde{C}_N, \tilde{L}_T, \tilde{l}, \tilde{K}, \tilde{N}$ in terms of given allocations for G_T, G_N , and TR as determined by (9a)-(9c). When they are written this way, we see that the steady-state solution retains the recursive structure of the steady-state equilibrium obtained with a fixed labor supply.

Analogously to Cerra, Tekin, and Turnovsky (2009), we see that the steady-state equilibrium has the following solution. From (17a)-(17c), we obtain

$$\tilde{k}_N = \tilde{k}_N(G_N) \quad (19a)$$

$$\tilde{k}_T = \tilde{k}_T(G_T, G_N) \quad (19b)$$

$$\tilde{p} = \tilde{p}(G_T, G_N) \quad (19c)$$

Given $(\tilde{k}_N, \tilde{k}_T, \text{and } \tilde{p})$, we can express the solutions for $\tilde{C}_T, \tilde{C}_N, \tilde{L}_T, l, \tilde{K}, \tilde{N}$, as well as output levels, \tilde{X}, \tilde{Y} , and GNP, $\tilde{Z} \equiv \tilde{X} + \tilde{p}\tilde{Y}$, in the form:

$$\begin{aligned} \tilde{\Omega} &\equiv \Omega\left(TR, G_T, G_N, \tilde{k}_N(G_N), \tilde{k}_T(G_N, G_T), \tilde{p}(G_N, G_T)\right) \\ \tilde{\Omega} &\equiv (\tilde{C}_T, \tilde{C}_N, \tilde{L}_T, l, \tilde{K}, \tilde{N}, \tilde{X}, \tilde{Y}, \tilde{Z}) \end{aligned} \quad (20)$$

This mode of expression emphasizes the different channels whereby foreign transfers impact the long-run equilibrium. First, the effect of a pure transfer is simply $\partial\tilde{\Omega}/\partial(TR)$. But to the extent that the transfer is allocated to productivity enhancement, it has several other effects, both indirect and direct. The former operate through the impact on the sectoral capital intensities and relative prices, as in (19). The direct effects operate through their impact on excess demand through the market-clearing conditions (18d) and (18e). From (9a)-(9c), the long-run changes in government allocations due to the transfers can be expressed in the form

$$d\tilde{G}_T = \lambda(1-\phi)\frac{dTR}{\tilde{p}} \quad (9a')$$

$$d\tilde{G}_N = \lambda\phi\frac{dTR}{\tilde{p}} \quad (9b')$$

$$d\tilde{T} = -(1-\lambda)\frac{dTR}{\tilde{p}} \quad (9c')$$

3.1 Long-run effects of transfers on the labor-leisure choice

Our main objective is to determine the effects of the endogeneity of the labor supply on the effects of the transfers. To highlight how the labor-leisure choice influences the equilibrium, it is useful to introduce the specific functional forms for the sectoral production functions and utility function that we

shall employ in our subsequent numerical analysis. They are the Cobb-Douglas and constant elasticity forms, respectively:

$$X = A K_T^\alpha L_T^{1-\alpha} G_T^{\nu_1}; \quad 0 < \alpha < 1 \quad (21a)$$

$$Y = B K_N^\beta L_N^{1-\beta} G_N^{\nu_2}; \quad 0 < \beta < 1 \quad (21b)$$

$$U = (1/\gamma) C_T^{\gamma\theta} C_N^{\gamma(1-\theta)}; \quad 0 < \theta < 1, \quad -\infty < \gamma < 1 \quad (21c)$$

where α, β characterize the degrees of capital intensity in the two sectors, $1/(1-\gamma)$ is the intertemporal elasticity of substitution, and θ reflects the relative importance of traded versus nontraded goods in overall consumption.

Calculating the appropriate marginal products for the two production functions, substituting for the sectoral allocation (17), and taking proportionate derivatives, we can immediately show:

$$\hat{dk}_T = \hat{dk}_N = \frac{\nu_2}{1-\beta} d\hat{G}_N = \frac{\nu_2}{1-\beta} \frac{\lambda\phi}{\tilde{G}_N} \frac{dTR}{\tilde{p}} \quad (22a)$$

$$\hat{dp} = \nu_1 d\hat{G}_T - \nu_2 \frac{(1-\alpha)}{(1-\beta)} d\hat{G}_N = \lambda \left[\nu_1 \frac{(1-\phi)}{\tilde{G}_T} - \nu_2 \frac{(1-\alpha)\phi}{(1-\beta)\tilde{G}_N} \right] \frac{dTR}{\tilde{p}} \quad (22b)$$

where $\hat{}$ denotes percentage change. These expressions are identical to those obtained for an inelastic labor supply, and so the comments made in Cerra et al. (2009) continue to apply. Equation (22b) indicates the factors that determine whether or not a foreign transfer is associated with a long-run appreciation of the real exchange rate. This depends upon the allocation parameters, λ, ϕ , as well as the impact of the transfer on the productivities of the two sectors, ν_1, ν_2 .

Taking the partial derivatives of the utility function, (21c), and substituting them for the consumer optimality conditions, (18a) and (18b), yields the equilibrium consumption allocation conditions

$$\theta \tilde{p} \tilde{C}_N = (1-\theta) \tilde{C}_T \quad (23a)$$

$$\eta \tilde{C}_T = \theta \tilde{l} A (1-\alpha) (\tilde{k}_T)^\alpha (\tilde{G}_T)^{\nu_1} \quad (23b)$$

from which we derive the following proportionate changes:

$$d\hat{C}_N = d\hat{C}_T - v_1 d\hat{G}_T + v_2 \frac{(1-\alpha)}{1-\beta} d\hat{G}_N = d\hat{C}_T - \lambda \left[v_1 \frac{(1-\varphi)}{\tilde{G}_T} - v_2 \frac{(1-\alpha)\varphi}{(1-\beta)\tilde{G}_N} \right] \frac{dTR}{\tilde{p}} \quad (24a)$$

$$d\hat{l} = d\hat{C}_T - v_1 d\hat{G}_T - v_2 \frac{\alpha}{1-\beta} d\hat{G}_N = d\hat{C}_T - \lambda \left[v_1 \frac{(1-\varphi)}{\tilde{G}_T} + v_2 \frac{\alpha\varphi}{(1-\beta)\tilde{G}_N} \right] \frac{dTR}{\tilde{p}} \quad (24b)$$

These two equations make clear how the responses of the two consumption goods to the transfers depend upon the introduction of the labor-leisure choice. To see how this operates, we focus initially on the case of the pure transfer, $\lambda = 0$. With an inelastic labor supply, (23b) and therefore (24b) do not apply, and (24a) reduces to

$$d\hat{C}_N = d\hat{C}_T \quad (25)$$

so that, given the constant elasticity utility function, the two consumption goods will increase proportionately. With the introduction of an elastic labor supply, (24b) now becomes relevant, and (25) is modified to

$$d\hat{l} = d\hat{C}_T = d\hat{C}_N \quad (25')$$

The pure transfer is associated with a pure wealth effect. As long as agents derive utility from leisure, and with all three commodities—traded consumption, nontraded consumption, and leisure—being normal goods, the escalation in wealth from the transfer will generate equally proportionate increases in all three goods. As a result, consumption of the two goods will grow less when the labor supply is elastic than when it is inelastic and the option to take additional leisure does not exist.

In contrast, if the transfer is tied to some productive use, this raises the wage and reduces the incentive for the agent to raise his leisure by the same proportionate amount. In the case where the transfer is allocated to the traded sector, the wage rate (expressed in terms of the traded output) increases by the amount $d\hat{w} = v_1 d\hat{G}_T$. Alternatively, if it is allocated to the nontraded sector, $d\hat{w} = \alpha dk_T = [\alpha/(1-\beta)] v_2 d\hat{G}_N$. In both cases, (24b) indicates that the higher wage rate cancels out the incentive to increase leisure stemming from the wealth effect, and the net impact on the overall labor supply is much reduced.

Indeed, one of the interesting insights of the simulations that we report in Table 3 is that the endogeneity of the labor supply has a large impact on the

effects of pure transfers with its pure wealth effect. But it has very little effect in the case of tied transfers, when the wage effect largely offsets the wealth effect, making the overall change in the labor supply almost negligible. In that case, whether the labor supply is elastic or is fixed inelastically turns out to be of little consequence.

Irrespective of how it is allocated, a rise in foreign transfers eventually causes productive resources, and specifically labor, to migrate from the traded sector. This is a reflection of both an increase in wealth (which pushes up the demand for the nontraded good, necessitating an expansion in its domestically produced output) and shifts in demand due to relative price movements. When labor is supplied inelastically, the only option is for it to move to the nontraded sector. But with an elastic labor supply, agents may choose to devote more time to leisure. This is, in fact, what happens when the transfer is untied, in which case there is little movement to the nontraded sector. With tied transfers, on the other hand, the fact that the overall labor supply (leisure) remains essentially unchanged implies that the labor moves to the nontraded sector, in much the same way as it does when the labor supply is fixed.

3.2 Transfers, economic activity, and Dutch disease

The response of the overall labor supply (and leisure) to a pure transfer has implications for other aspects of the aggregate economy. With the long-run relative price remaining unchanged after such a transfer, capital and debt must eventually change in the same proportions for the long-run borrowing rate to remain equal to the given rate of time preference [see (18f)]. When the labor supply is fixed, these quantities must both increase if the migration of labor from the traded sector implies a move to the more capital-intensive sector ($k_N > k_T$), while they will decrease if these sectoral capital intensities are reversed. But with an elastic labor supply, the fact that the agent chooses to allocate a larger fraction of his time to leisure exerts a negative effect on the capital stock and debt that may be overwhelming to the point of forcing an overall decline in these quantities, even if the nontraded sector is the more capital intensive. Our simulations discussed in Section 7.2 provide an example of this.

An extensively discussed issue concerns whether or not a pure transfer is associated with so-called Dutch disease; see e.g., Arellano et al. (2009). That is, does the transfer lead to an appreciation of the real exchange rate, resulting in a decline in the traded output $X = L_T f(k_T, G_T)$? Cerra et al. (2009) address this for the inelastic labor supply and show that, while a pure transfer is associated with a long-run decline in traded output, this is not due to any

movement in the real exchange rate, which remains unchanged in the long run. They therefore do not identify this as Dutch disease. Basically, the decline in the traded sector is a result of the long-run current-account balance, (18d). On the left-hand side of this equation, we have the country's international obligations, namely, its purchase of traded consumption plus debt-servicing costs, while on the right-hand side we have its sources of finance. Given demand, the larger the transfers, the less the need to produce traded output, and the more resources can be allocated to the nontraded sector.

In contrast, the elastic labor supply does generate elements of Dutch disease, but one associated with the wealth effect via leisure, rather than the conventional relative price effect. In this case, a rise in wealth resulting from the transfer lowers its marginal utility, increasing leisure and reducing the time allocated to labor and production of the traded good. Thus, the overall production of the traded good declines.

4. Role of the Labor Supply in Short-run Adjustments

One of the consequences of the endogeneity of the labor supply is that it provides a second channel, in addition to the relative price, through which the economy can carry out any required short-run equilibrating adjustments to the transfers. This is especially true in the case of pure transfers, where the labor-supply responses are more robust. To see the issues involved, we shall focus on the short-run factor allocations (1b), together with (12d)-(12f), using the specific production functions (21a) and (21b). In this case, we shall focus on a pure transfer, the immediate effects of which are to (i) change the relative price, dp , and to reduce the marginal utility of wealth, $d\mu$, both of which will have immediate consequences for leisure and factor allocations across the sectors. More specifically, from these equations we may determine the following short-run responses:

$$d\hat{k}_T = d\hat{k}_N = \frac{d\hat{p}}{\alpha - \beta} \quad (26a)$$

$$dL_T = \frac{1}{(k_N - k_T)} \left[K \frac{d\hat{p}}{\alpha - \beta} - k_N dl \right] \quad (26b)$$

$$dL_N = \frac{1}{(k_N - k_T)} \left[K \frac{d\hat{p}}{\beta - \alpha} + k_T dl \right] \quad (26c)$$

implying the following output effects

$$\frac{dX}{X} = \frac{1}{L_T(k_N - k_T)} \left[K \frac{d\hat{p}}{\alpha - \beta} - k_N dl \right] + \frac{\alpha}{\alpha - \beta} d\hat{p} \quad (27a)$$

$$\frac{dY}{Y} = \frac{1}{L_N(k_N - k_T)} \left[K \frac{d\hat{p}}{\beta - \alpha} + k_T dl \right] + \frac{\beta}{\alpha - \beta} d\hat{p} \quad (27b)$$

When labor is supplied inelastically, only the relative price effect is operative. In that case, Cerra et al. (2009) found that a pure transfer causes an immediate migration of labor from the traded to the nontraded sector, leading to an immediate increase in nontraded output and decline in traded output.

The ability to adjust the labor supply changes the short-run responses significantly. Countering the impetus of the price effect on labor's migration to the nontraded sector is the wealth effect, which boosts leisure more than enough to overtake the price effect. Whether this comes out of labor allocated to the traded sector or to the nontraded sector depends upon the sectoral capital intensities. If the traded sector is more capital intensive ($\alpha > \beta$), $k_T > k_N$ and the only viable way to reallocate productive resources and maintain full employment is for labor to move from the nontraded sector to the traded sector and leisure, then traded output immediately rises, while nontraded output falls. This is precisely the opposite short-run response to that obtained with fixed labor.

5. Numerical analysis

To study the local dynamics of the economy, we linearize the dynamic equilibrium system in K, N, p, μ about its steady state as defined in (17) and (18). For there to be a unique stable adjustment path, it must have two positive and two negative eigen values. With the capital stock, K , and the national debt, N , evolving gradually, convergence is achieved by instantaneous jumps in the shadow value of wealth, μ , and the real exchange rate, p .

As previously noted, because of the complexity of the model, we will solve it numerically rather than analytically. The functional forms we employ for the sectoral production functions and utility function are (21a)-(21c), and, in addition, we assume that the borrowing function is of the form

$$r = r^* + \xi \left[e^{a(N/pK)} - 1 \right] \quad (21d)$$

which is a positive convex function of the ratio of debt to the value of capital.

The parameters used to calibrate the benchmark economy are summarized in Table 1, which represents a typical small emerging open economy. We consider two different scenarios: Case I, where the traded sector is *more* capital intensive than the nontraded sector ($\alpha > \beta$); and Case II, where it is *less* capital intensive ($\alpha < \beta$). This is important, since the dynamics of a two-sector-dependent economy model are known to be dependent on the relative sectoral capital intensities.¹⁵ The preference parameters γ , θ , ρ are standard, while the other preference parameter, η , is chosen to ensure a plausible equilibrium allocation of time to leisure of around 0.72, consistent with the empirical evidence. The production parameters α , β and the productivity parameters A , B , on the other hand, are chosen to attain a plausible equilibrium labor share in the traded sector.¹⁶ The borrowing premium $a = 0.15$ and the weight of the borrowing premium ξ are chosen in order to attain a plausible debt-to-output ratio.¹⁷

Since one of the issues of concern pertains to the allocation of the transfer to sectoral infrastructure, the base values of G_T and G_N are key. As is typical of most emerging economies, we assume that the economy begins with a shortage of infrastructure, so that G_T and G_N are initially below their respective optimal levels. But how far below is important. The choice of these base spending values is crucial and was discussed in some detail in Cerra et al. (2009). Here we choose them so as to preserve comparability with the earlier paper, in which there is no labor-leisure choice.

¹⁵ In both cases, we find that the equilibrium is a saddlepoint, implying that there is a unique stable adjustment path.

¹⁶ The choice of parameters, particularly those relating to the sectoral aspects, are discussed in greater detail by Morshed and Turnovsky (2004). Our choice of elasticities on government expenditures in production, $v_1=0.15$, $v_2=0.15$, imply that government expenditure is equally productive in producing both nontraded and traded output, which seems like a natural benchmark and implies that both production functions are subject to 15% increasing returns to scale.

¹⁷ Our benchmark debt-GDP ratios of around 0.40 represent a plausible average for small emerging economies. It is also close to that of Cerra et. al. (2009), thus facilitating the comparison between a model with exogenous labor and the present model, where labor is supplied endogenously. In order to examine the importance of access to world financial markets, Cerra et al. perform a sensitivity analysis with respect to different values of a , allowing it to vary between $a=0.015$ (easy access), $a=0.15$ (medium access), and $a=15$ (highly restricted access). We have conducted a similar sensitivity analysis and find that the introduction of endogenous labor has little influence on the importance of access to world commodity markets.

For Base Case I and Base Case II, the optimal levels of traded and non-traded government spending are $\hat{G}_T = 0.025$, $\hat{G}_N = 0.043$ and $\hat{G}_T = 0.034$, $\hat{G}_N = 0.062$, respectively. We assume that the initial total government spending is $G = 0.05$, which is financed fully with lump-sum taxation, $T = 0.05$. In Base Case I, total government spending is therefore 29% below its optimum. Assuming that this shortfall applies proportionately to both components, we set $G_T = 0.018$, $G_N = 0.032$. In Base Case II, total government spending is 52% below its optimum, and the corresponding base components are $G_T = 0.018$, $G_N = 0.032$.¹⁸

Inserting the benchmark parameters into the steady-state equations (17a)-(17f) and (18a)-(18d) and into the functional forms in (21) yields the benchmark equilibrium values summarized in Table 2. Panel A reports the key steady-state equilibrium ratios for Case I, when the traded sector is more capital intensive. The sectoral capital-output ratios in the traded and nontraded sectors are 3.5 and 2.5, respectively, yielding an overall capital-output ratio of 2.88. The traded sector produces 38% of total output, similar to a model with exogenous labor. However, only 10% of a unit time is allocated towards the traded sector, while 72% of the time is allocated to leisure activities. The long-run relative price of the nontraded good is 1.26, and the debt-GDP ratio is around 0.38. Table 2(B) reports the key steady-state equilibrium ratios in Case II, where the nontraded sector is more capital intensive. The sectoral capital-output ratios in the traded and nontraded sectors are 2.5 and 3.5, respectively, yielding an overall capital-output ratio of 3.1. The traded sector produces slightly more of total output and employs slightly more labor than in the case where the traded sector is capital intensive. The fraction of time devoted to leisure is also slightly higher. The long-run relative price of the non-traded good is 0.91, and the debt-GDP ratio is about 0.41.¹⁹

6. Foreign transfers: General characteristics of real exchange rates

Starting from these initial equilibria, we analyze the economic impact and welfare consequences of the three allocations of the transfers, namely debt

¹⁸ In Cerra et. al. (2009), the initial lump-sum tax chosen was 30% (Case I) and 54% (Case II) below its optimal level, very close to what we have here.

¹⁹ These calibrations are similar to those reported in Cerra et al. (2009), which in turn were shown to be consistent with the economic structures of a range of developing countries summarized by Morshed and Turnovsky (2004).

reduction vs. greater productive government spending in either sector. We set the size of the permanent transfer to 0.04 units of traded output, which equals about 8% of baseline GDP in Case I and 8.5% in Case II.²⁰ We analyze the long-run effects and transitional dynamics generated by these shocks, as summarized in Table 3 and Figs. 1-4.

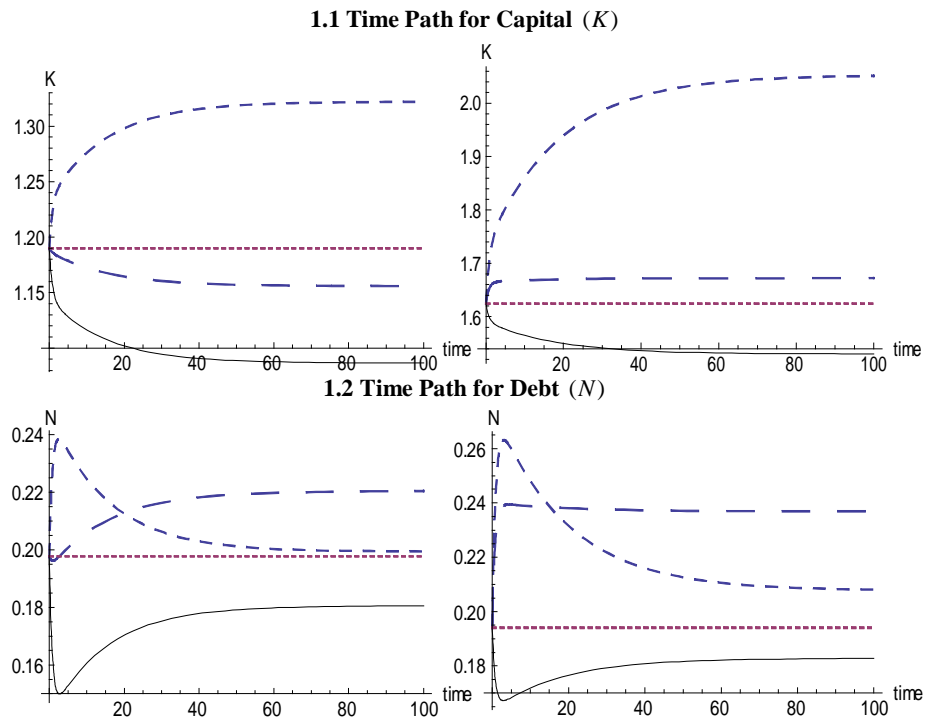
(A) Traded sector more capital intensive:

$$(\alpha = 0.35, \beta = 0.25)$$

(B) Nontraded sector more capital intensive:

$$(\alpha = 0.25, \beta = 0.35)$$

Figure 1. Capital and Debt



²⁰ The size of the transfer is chosen such that its magnitude relative to initial GNP is comparable to that in Cerra et al. (2009), thereby allowing for more accurate comparison between the two cases of fixed versus flexible labor supply.

Figure 2. Financial Variables

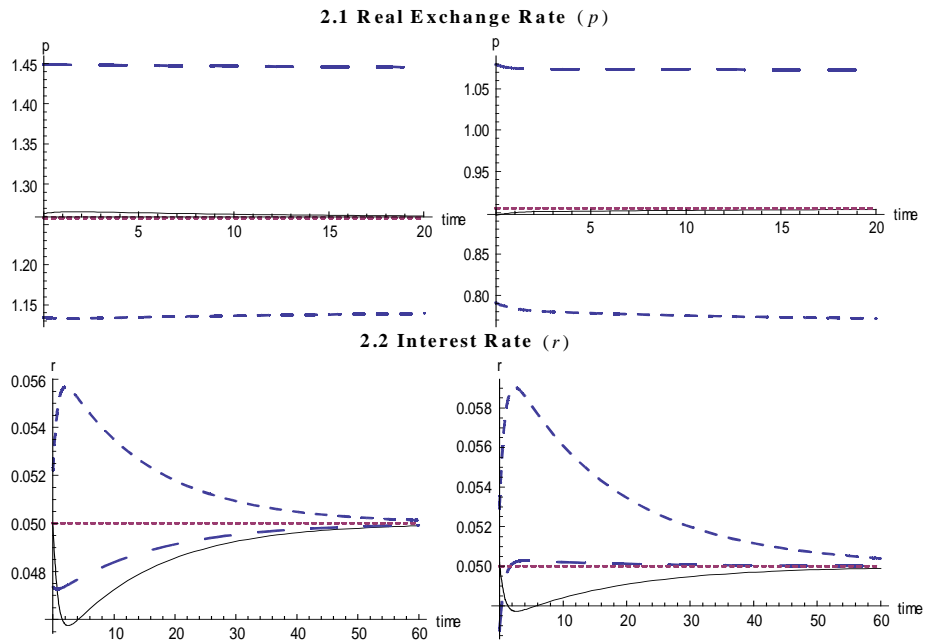
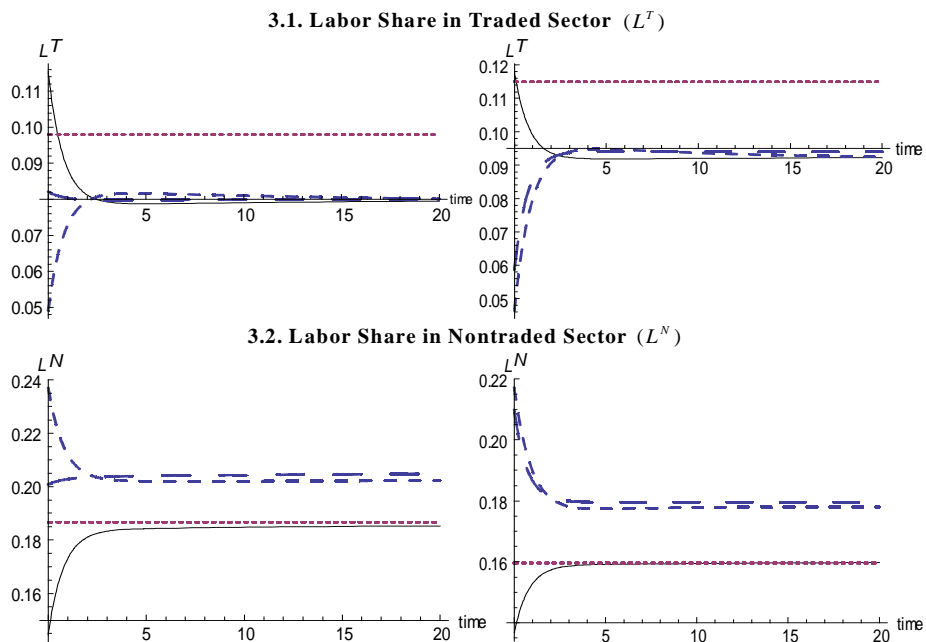
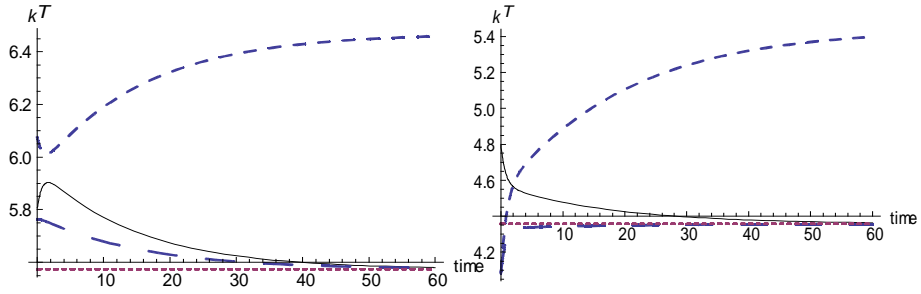


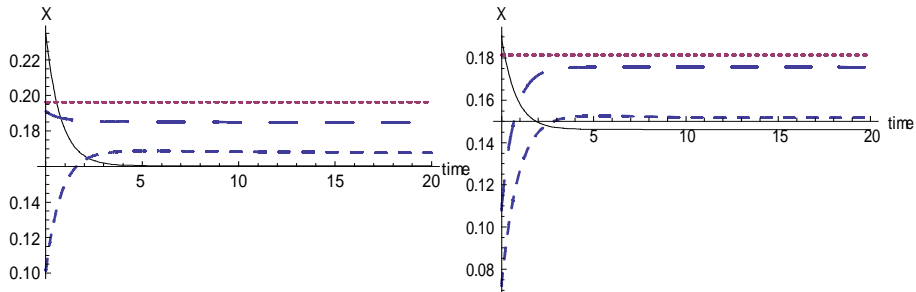
Figure 3. Sectoral Activity and Output



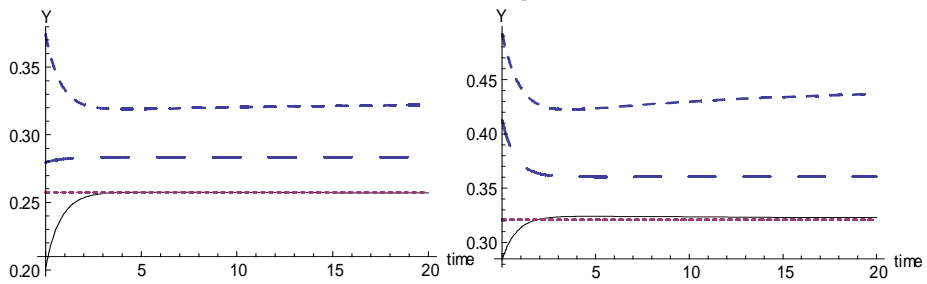
3.3 Capital Intensity in Traded Sector (k^T)



3.4 Traded Output (X)



3.5 Nontraded Output (Y)



3.6 Total Output (Z)

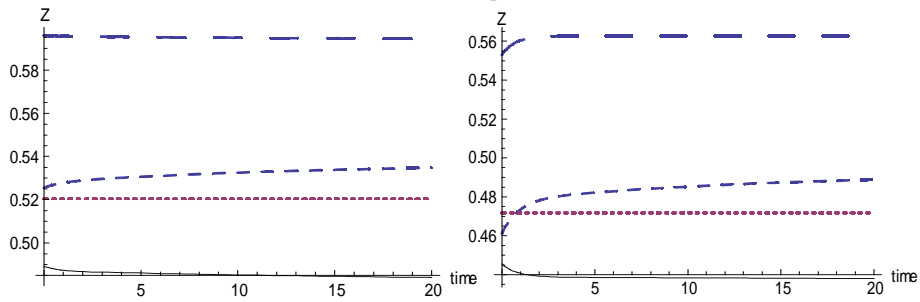
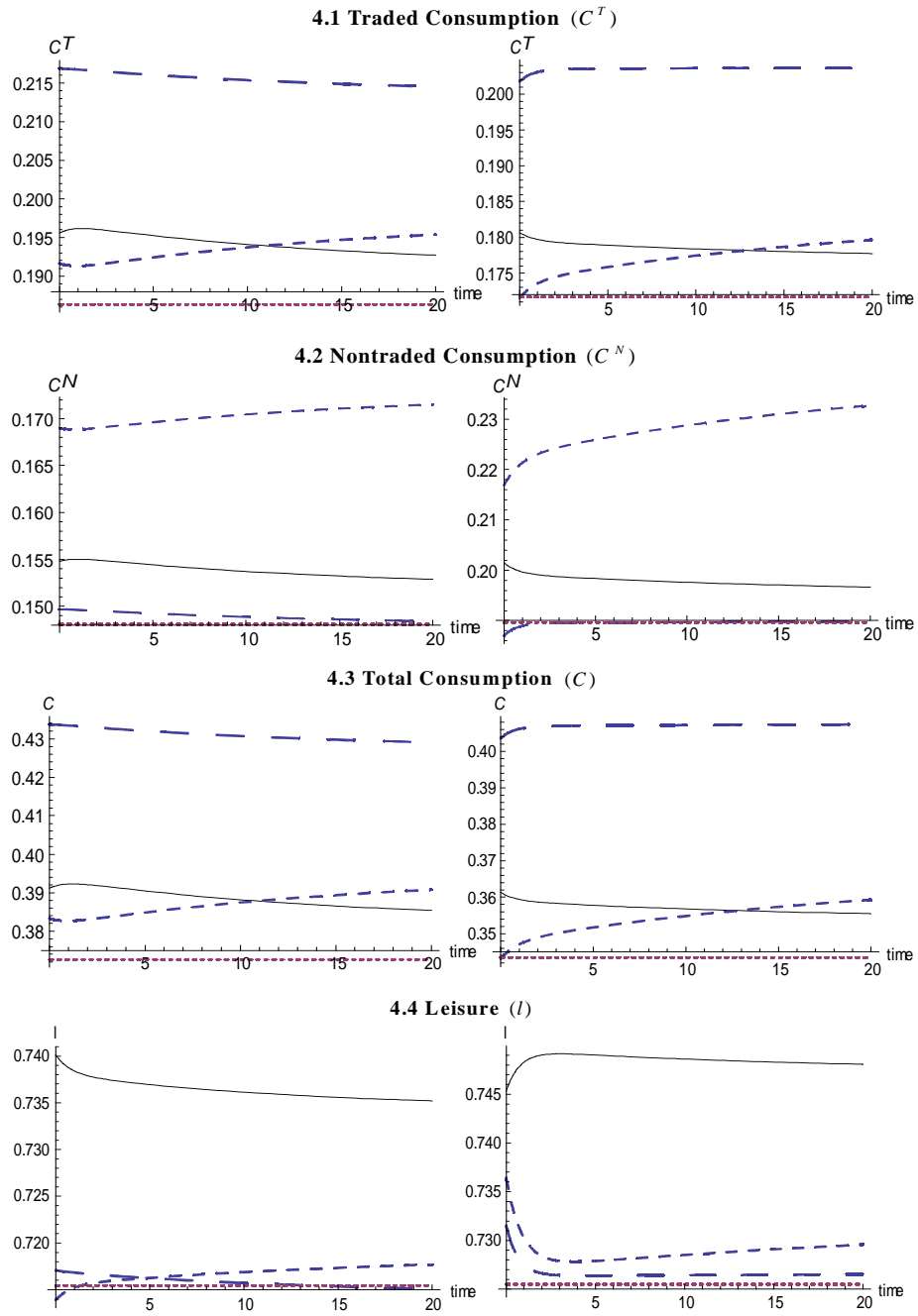
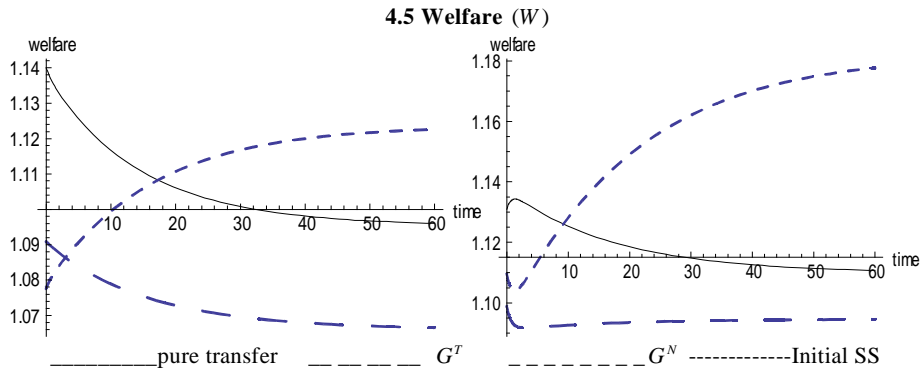


Figure 4. Consumption, Leisure and Welfare





From Fig. 2, we see that in all cases the real exchange rate responds virtually instantaneously to the transfer. This is characteristic of these models, and the underlying intuition is explained by Cerra et al. (2009). It is unsatisfactory in terms of capturing the empirical phenomenon of “real exchange-rate persistence.” This requires more sluggishness, and as Morshed and Turnovsky (2004) discuss, one natural way to obtain more plausible exchange-rate dynamics is to introduce adjustment costs on inter-sectoral capital movements. The fact that there is slightly more transition in the exchange rate with endogenous labor, as compared to inelastic labor (discussed by Cerra et al.), is consistent with more recent work by Morshed and Turnovsky (2011), who show how the endogeneity of the labor supply can also be a central determinant of short-run real exchange-rate dynamics.

7. Pure Transfer

The pure transfer is equivalent to a reduction in taxes, which decreases the economy’s rate of debt accumulation and enables it to increase its consumption of both the traded good and the nontraded good, as well as to enjoy more leisure. It is a pure demand shock that does not influence the relative productivities of either sector and therefore represents a pure wealth effect. Some of the long-run constraints in the responses have been discussed in Section 3.1. The second rows in Table 3 (A) and (B) present the more detailed numerical responses, corresponding to two cases where the traded sector is relatively more capital intensive and vice versa.

These numerical results confirm the qualitative responses discussed previously, and the following aspects merit highlighting.

- (i) The sectoral capital-labor ratios and relative price remain unchanged.

(ii) The consumption of the traded good, the nontraded good, and leisure all increase proportionately as a result of the enhanced wealth, with the increase being 2.6% if $\alpha > \beta$ and 3.1% if $\beta > \alpha$.

(iii) If $\alpha > \beta$, the migration of labor from the traded sector leads to an 8.7% slide in both capital and debt. This is far greater than that obtained by Cerra et al. (2009) (around 1.9%) with an inelastic labor supply. This arises from the jump in leisure that occurs. Indeed, this effect is sufficiently dominant that capital and debt decline even when $\beta > \alpha$. However, the fact that the drop in capital is now 5.8% rather than 8.7% accounts for the larger increase in consumption when $\beta > \alpha$.

(iv) A further consequence of the sectoral capital-labor ratios remaining constant is that the changes in output of the two goods are proportional to the changes in sectoral employment. Therefore, output of the traded sector and employment in that sector both decline by 18.3% or 19.5%, depending upon sectoral capital intensities. These are much larger than the corresponding reductions with an inelastic labor supply (around 10%) in reaction to the negative impact of the wealth effect on the labor supply [see (15c), (15d)]. Thus, the opportunity to enjoy more leisure, following the transfer, contributes significantly to the decline in the traded sector and can be viewed as a kind of Dutch disease.

(v) In both cases, labor moves from the traded sector to leisure. Employment in the nontraded sector remains virtually unchanged, with nontraded output remaining essentially unchanged as well. This contrasts with corresponding increases of around 5.7%-7.7% with an inelastic labor supply, obtained by Cerra et al. (2009).

We now turn to a brief discussion of the dynamics.

7.1 Traded sector is capital intensive: ($\alpha > \beta$)

The increase in wealth due to the transfer immediately raises the demand for both traded and nontraded consumption, as well as leisure [see Figs. 4.1, 4.2, 4.4]. As discussed in Section 4, the introduction of leisure changes the short-run responses from those that appear if labor is supplied inelastically. The fact that the wealth increase is now partially taken in leisure implies that the short-run rises in consumption are reduced from the order of 11% to 4.5%-5.0%. As noted previously, if $\alpha > \beta$, then for factor markets to clear, labor must move to the traded sector, and, as seen from Fig. 3.1, L_T immediately climbs from 0.098 to 0.115. Given the simultaneous increase in leisure, this

requires employment in the nontraded sector, L_N , to decrease substantially, from 0.187 to 0.144. This is precisely the opposite short-run response to that occurring when labor is supplied inelastically.

For reasons discussed in more detail in Cerra et al. (2009), the real exchange rate remains close to its (unchanged) steady-state value, although there is some slight initial appreciation. But overall, real exchange-rate movements play little role in the equilibrating process. Rather, in the short run, the net increase in demand for the nontraded good is met by a reduction in the accumulation of nontraded capital, which falls at an almost precipitous rate [Fig. 1.1]. In contrast, the increase in the demand for the traded good is more than met by a combination of the transfer and the additional output, which allows the rate of debt-to-accumulation to move downward, again initially at a rapid rate [Fig. 1.2].

Over time, capital and debt both decline by 8.7%; with the country being initially solvent ($K > pN$), this implies a long-run erosion in wealth of 8.7%. Thus, following the initial plunge in the shadow value of wealth in response to the transfer, the shadow value will gradually increase during the transition as wealth declines. This, together with the fact that the price remains virtually unchanged, is reflected in the very slight dips in consumption and leisure that occur during the transition and partially offset the initial increases. In particular, with the fall in leisure during the transition being on the order of only half a percentage point [from 0.740 to 0.735], any further adjustments in labor allocation must take place almost entirely directly between the two productive sectors. Now, given the declining capital stock and the relative sectoral capital intensities, both capital and labor must move from the traded to the nontraded sector, in order to provide the necessary additional nontraded output. Thus, following its initial shift to the traded sector, labor will reverse that move and migrate back to the nontraded sector, compensating for the gradual reduction in the capital stock. Because of the sluggishness of capital, during the transition the capital-labor ratios in both sectors exceed their steady-state values.²¹ As a result, following its initial discrete drop, domestic production of nontraded output begins to turn around, while traded output begins to subside gradually over time.

The direct effect of the transfer is to lower the rate of debt accumulation, which slows considerably at first. However, the reduction in traded output, coupled with the generally sustained upward trend in traded consumption,

²¹ We illustrate the capital intensity only in the traded sector, since both k_N and k_T move together.

negates this initial decline, and, after approximately four periods, debt starts to expand, eventually settling at 8.7% below its original pre-transfer level. The abrupt reversal in the accumulation of debt is reflected in the interest rate. The initial appreciation of the exchange rate immediately pushes down the ratio $N/(pK)$, lowering the borrowing costs, and with debt decreasing, this descends from 5.0% to 4.58% after three years. At that point, the accumulation of debt reverses that decline, and the interest rate gradually returns to its long-run equilibrium of 5% [Fig. 2.2].

Finally, we can trace out the implications for welfare, which we measure in terms of the equivalent variations of consumption flows. The short-run increments in consumption and leisure immediately following the transfer imply a short-run improvement in welfare of around 14%. Over time, the retreat of consumption and leisure after the lessening of wealth causes a gradual decrease in welfare, which makes up for the initial increase and leads to a net present value jump in welfare of 11.3%.

7.2 Nontraded sector is capital intensive: ($\beta > \alpha$)

Reversing the sectoral capital intensities so that $\beta > \alpha$ sharpens the contrast between the two cases of fixed and flexible labor supply. With an inelastic labor supply, Cerra et al. (2009) showed that with labor migrating from the traded to the nontraded sector, and with the latter being more capital intensive, a long-run accumulation of capital and debt would ensue. In contrast, we now find that because the wealth resulting from the transfer induces labor to up its leisure time, it will tend to switch from providing labor to leisure, with only a slight move upward in employment in the nontraded sector of 0.32%, causing a long-run loss in both capital and debt of 5.8%.

In the short run, due to the sectoral capital intensities, the growth in leisure stemming from the wealth effect approximately balances with the relative price effect in the traded good sector, and L_T ascends by a negligible amount; see Fig. 3.1. Therefore, in the short run, the gain in leisure is obtained by reducing employment in the nontraded goods sector. Following the initial impact, the pattern of the subsequent dynamics is generally similar to those obtained for the case $\alpha > \beta$. Hence, over time, with leisure remaining generally stable, the increase in employment in the nontraded sector, which restores nontraded employment approximately to its pre-transfer level, is met by migration from the traded good sector, which in the long run plummets by 19.5%.

The fact that the capital stock and debt both decline over time generates two further contrasting responses between an elastic and an inelastic labor supply when $\beta > \alpha$. The first involves the long-run GNP, which is seen to drop substantially, by 7.3% over the long run. This compares to Cerra et al. (2009), who find that a pure transfer actually led to a slight increase in total output. The second difference is in the response of the borrowing rate, which follows a path very similar to that obtained when $\alpha > \beta$, but is the mirror image of that reported by Cerra et al.

8. Productive Government Spending in the Traded and Nontraded Sector

The long-run effects arising from transfers allocated to productive government spending are summarized in the third and fourth rows of Table 3(A) and 3(B). In both cases, the long-run changes in leisure are modest, being much less than for the pure transfer. This is because of the positive wealth effect on leisure being largely offset by the higher wage rate resulting from the enhanced productivity, with its inducement to supply more labor. At the same time, the direct increases in productivity resulting from the transfers being tied to production have substantial relative price effects. For example, if $\alpha > \beta$, a transfer tied to the productivity enhancement of the traded sector causes the relative price of nontraded output to climb by 14.8%; however, when applied to the nontraded sector, the decrease is 9.2%.

In the long run, the response in the relative price clearly outdoes that due to leisure. Moreover, comparing Figs. 2.1 and 4.4, the same is true along the transitional path, although if $\beta > \alpha$, leisure is more responsive in the short run. Overall, however, the adjustment in leisure plays a relatively minor role, in which case we find that the responses to tied transfers as detailed by Cerra et al. (2009) require relatively minor adjustments to account for the endogeneity of labor supply and, accordingly, require no further discussion here.

9. Welfare

As can be seen from Table 3, there are many conflicting responses to the transfer, obviously implying the existence of tradeoffs among them. Table 4 summarizes the long-run percentage changes in several key macroeconomic variables, including the real exchange rate, long-run capital accumulation (growth), export production, aggregate production, and long-run gain in welfare, according to each type of allocation. Several interesting observations can be made from this table.

(i) The relative welfare gains resulting from the three allocations of the transfers obtained by Cerra et al. (2009) for fixed labor do not change significantly when labor is supplied elastically. In both cases, though, they are sensitive to the size of government spending relative to its socially optimal level.

(ii) The change in long-run GNP is a poor indicator of the change in welfare. This is particularly true for the pure transfer, where in both cases it is associated with a loss of around 7.2%, while long-run welfare advances by 11-12%. This is because it is ignoring the benefits associated with additional leisure. It also reverses the welfare ranking between allocation to the traded sector and allocation to the nontraded sector.

(iii) Major declines in the size of the traded sector happen irrespective of the allocation of the transfers and are a poor indication of welfare changes. In fact, the smallest declines in the size of the nontraded sector correlate with the smallest welfare gains.

None of the three polar allocations is optimal. If $\alpha > \beta$, the welfare gain of 11.3% obtained for the pure transfer can be improved further to 11.5%, by setting $\lambda = 0.3, \phi = 0.8$. That is, 70% of the transfer should be allocated to tax reduction and 30% allocated to productivity enhancement, with 80% of that being allocated to the nontraded sector. This will bring the economy to the socially optimal allocation and will be associated with a 1.3% real depreciation of the exchange rate, accompanied by a 3.1% decrease in the capital stock, a 15.8% reduction in traded output, and a 2.6% shrinkage in total output. If $\beta > \alpha$, we see that the welfare gain of 13.8% obtained from enhancing the productivity in the nontraded sector can be improved further to 14.4% by setting $\lambda = 1, \phi = 0.8$. In other words, none of the transfer should be allocated to tax reduction; instead, all should be allocated to productivity enhancement, with 80% of that going to the nontraded sector. This will bring the economy to the socially optimal allocation and will yield a 6.8% real depreciation of the exchange rate, along with a 21.3% expansion in the capital stock, a 9.7% fall in traded output, and a 10.6% boost to total output.

10. Conclusions

The consequences of the international transfer of resources are one of the longstanding issues in international economics. The existing literature on this topic makes the strong assumption that labor is supplied inelastically. In this paper, we have relaxed this constraint, assuming instead that aggregate labor is supplied elastically, by allowing agents to have a labor-leisure choice. This is important, since along with the relative price (real exchange rate), the level

of employment is a key channel through which an economy can make necessary short-run adjustments.

The results we obtain are quite strong. We show that the elasticity of the labor supply is pivotal to determining the impact of transfers on the recipient economy, but to what degree depends upon the following: whether the transfers are untied and can be fully devoted to debt reduction and consumption, or whether they are tied to productivity enhancement in either of the productive sectors. The underlying reason for this dichotomy is the existence of two potential effects of the transfer—a wealth effect and a relative price effect—the relative importance of which depends upon its allocation.

A pure transfer devoted to debt reduction has a wealth effect, which leads to proportionate increases in both consumption goods and in leisure. Being balanced in this way, it has only a weak transitory relative price effect, so the impact of the enhanced wealth on leisure is therefore the dominant effect. In this case, the introduction of an endogenous labor supply becomes crucial in producing notable qualitative and quantitative differences from those obtained when the labor supply is fixed.

In contrast, if the transfer is devoted to productivity enhancement, two additional effects come into operation. The first is that being directly applied to the production of one good or the other, it has a substantial direct impact on the relative price. Second, in either case, the rise in productivity raises the wage rate, thereby inducing an increase in the aggregate labor supply and offsetting the lift in leisure due to the wealth effect. In fact, the overall response in leisure is small, both in the long run and during the transition, and is overwhelmingly dominated by the relative price effect. Thus, given this small response, whether aggregate labor is supplied elastically or is constrained to be fixed turns out to be unimportant insofar as the effects of tied transfers are concerned.

We conclude by noting two directions in which this analysis could be usefully extended. The first is in regard to further sensitivity analysis, particularly with respect to the production side. Recent work by Morshed and Turnovsky (2006) has shown that the elasticity of substitution is important in determining the speed of convergence of the exchange rate. While this will influence the transitional dynamics, we nevertheless expect that the internal structure of the system will ensure that the contrast we have emphasized will largely remain intact. The second area worth exploring concerns the implications of the transfers for the distribution of wealth and income. Tekin-Bouza and Turnovsky (2011) explored this question assuming a fixed labor supply, and it will be of

interest to examine the degree to which the dichotomous role of the labor supply we have obtained in this paper extends to the distributional dynamics.

Table 1. The Benchmark Economy

Preference parameters:	$\gamma = -1.5, \theta = 0.5, \rho = 0.05, \eta = 2.5.$
Production parameters:	<i>I.</i> $\alpha = 0.35, \beta = 0.25$; <i>II.</i> $\alpha = 0.25, \beta = 0.35$
Productivity parameters:	$A = 2, B = 1.7$
Depreciation rate:	$\delta_k = 0.05$
World interest rate:	$r^* = 0.03$
Premium on borrowing:	$a = 0.15$
Weight on the premium:	$\xi = 1$
Government Expenditure:	<i>I.</i> $G_T = 0.018, G_N = 0.032$; <i>II.</i> $G_T = 0.018, G_N = 0.032$
Elasticities of government expenditures:	$v_1 = 0.15, v_2 = 0.15$
Transfers:	$TR = 0.0$

Table 2. Key Steady-State Equilibrium Ratios

A. Traded Sector More Capital Intensive: $\alpha=0.35, \beta=0.25$

$\frac{K_T}{L_T}$	$\frac{K_N}{L_N}$	$\frac{pK_T}{X}$	$\frac{K_N}{Y}$	$\frac{pK}{X+pY}$	$\frac{N}{X+pY}$	L_T	l	p	$\frac{X}{X+pY}$	$\frac{G_T}{G}$	$\frac{pG_T}{X}$	$\frac{G_N}{Y}$	$\frac{pG}{X+pY}$
5.573	3.450	3.500	2.500	2.877	0.380	0.098	0.715	1.258	0.377	0.368	0.118	0.123	0.121

B. Nontraded Sector More Capital Intensive: $\alpha=0.25, \beta=0.35$

$\frac{K_T}{L_T}$	$\frac{K_N}{L_N}$	$\frac{pK_T}{X}$	$\frac{K_N}{Y}$	$\frac{pK}{X+pY}$	$\frac{N}{X+pY}$	L_T	l	p	$\frac{X}{X+pY}$	$\frac{G_T}{G}$	$\frac{pG_T}{X}$	$\frac{G_N}{Y}$	$\frac{pG}{X+pY}$
4.357	7.039	2.500	3.500	3.116	0.411	0.115	0.725	0.905	0.384	0.354	0.088	0.101	0.096

Table 3.
A. Steady-State Responses to Permanent Changes $\alpha = 0.35$, $\beta = 0.25$ (traded sector is more capital intensive)

	K	N	k_r	k_N	P	L_T	I	X	Y	Z	C_T	C_N	C
Benchmark $G_T = 0.018, G_N = 0.032$ $T = 0.05, TR = 0.0$	1.190	0.198	5.573	3.450	1.258	0.098	0.715	0.196	0.258	0.520	0.186	0.148	0.373
Pure Transfer ($\lambda = 0$) $G_T = 0.018, G_N = 0.032$ $T = 0.018, TR = 0.04$	1.087 (-8.7)	0.181 (-8.7)	5.573 (0.0)	3.450 (0.0)	1.258 (0.0)	0.080 (-18.3)	0.734 (+2.6)	0.160 (-18.3)	0.256 (-0.5)	0.483 (-7.2)	0.191 (+2.6)	0.152 (+2.6)	0.383 (+2.6)
Tied Transf ($\lambda = 1, \phi = 0$) $G_T = 0.046, G_N = 0.032$ $T = 0.05, TR = 0.04$	1.156 (-2.9)	0.220 (+11.5)	5.573 (0.0)	3.450 (0.0)	1.444 (+14.8)	0.080 (-18.0)	0.714 (-0.1)	0.185 (-5.9)	0.283 (+10.0)	0.594 (+14.1)	0.214 (+15.1)	0.148 (-0.7)	0.427 (+14.6)
Tied Trans ($\lambda = 1, \phi = 1$) $G_T = 0.018, G_N = 0.067$ $T = 0.05, TR = 0.04$	1.322 (+11.1)	0.199 (+0.8)	6.470 (+16.1)	4.005 (+16.1)	1.142 (-9.2)	0.079 (-19.1)	0.719 (+0.5)	0.167 (-14.8)	0.324 (+25.7)	0.537 (+3.2)	0.197 (+5.9)	0.173 (+16.1)	0.394 (+5.8)

Quantities in parentheses are percentage changes

B. Steady-State Responses to Permanent Changes $\alpha = 0.35$, $\beta = 0.25$ (nontraded sector is more capital intensive)

	K	N	k_r	k_N	P	L_T	I	X	Y	Z	C_T	C_N	C
Benchmark $G_T = 0.018, G_N = 0.032$ $T = 0.05, TR = 0.0$	1.624	0.194	4.357	7.039	0.905	0.115	0.725	0.181	0.321	0.472	0.172	0.190	0.343
Pure Transfer ($\lambda = 0$) $G_T = 0.018, G_N = 0.032$ $T = 0.006, TR = 0.04$	1.530 (-5.8)	0.183 (-5.8)	4.357 (0.0)	7.039 (0.0)	0.905 (0.0)	0.093 (-19.5)	0.747 (+3.0)	0.146 (-19.5)	0.322 (+0.3)	0.437 (-7.3)	0.177 (+3.0)	0.195 (+3.0)	0.354 (+3.0)
Tied Transfer ($\lambda = 1, \phi = 0$) $G_T = 0.055, G_N = 0.032$ $T = 0.05, TR = 0.04$	1.672 (+3.0)	0.237 (+22.1)	4.357 (0.0)	7.039 (0.0)	1.073 (+18.5)	0.094 (-18.3)	0.727 (+0.2)	0.176 (-3.2)	0.361 (+12.5)	0.563 (+19.3)	0.204 (+19.3)	0.190 (0.0)	0.408 (+18.7)
Tied Transfer ($\lambda = 1, \phi = 1$) $G_T = 0.018, G_N = 0.084$ $T = 0.05, TR = 0.04$	2.053 (+26.4)	0.208 (+7.0)	5.440 (+24.8)	8.788 (+24.8)	0.766 (-15.3)	0.092 (-20.0)	0.731 (+0.8)	0.153 (-15.5)	0.443 (+38.2)	0.493 (+4.5)	0.183 (+7.0)	0.238 (+25.3)	0.366 (+6.6)

Table 4. Welfare Analysis
Long-run changes and welfare gains for transfers of 0.04²²

(A) Traded Sector More Capital Intensive ($\alpha = 0.35, \beta = 0.25$)					
Starting from initial allocation: $G_T = 0.018; G_N = 0.032; T = 0.05; TR = 0.0$					
	$\% \Delta \tilde{p}$	$\% \Delta \tilde{K}$	$\% \Delta \tilde{X}$	$\% \Delta \tilde{Z}$	% Long-run Welfare Gain
pure transfer ($\lambda=0$): $G_T = 0.018; G_N = 0.032; T = 0.018$	0.0	-8.7	-18.3	-7.2	11.3
spent on G_T only ($\lambda=1; \phi=0$): $G_T = 0.046; G_N = 0.032; T = 0.05$	14.8	-2.9	-5.9	14.1	7.7
spent on G_N only ($\lambda=1; \phi=1$): $G_T = 0.018; G_N = 0.067; T = 0.05$	-9.2	11.1	-14.8	3.2	10.3
Opt. alloc. ($\lambda=0.3; \phi=0.8$)²³: $G_T = 0.020; G_N = 0.039; T = 0.027$	-1.3	-3.1	-15.8	-2.6	11.5
(B) Nontraded Sector More Capital Intensive ($\alpha = 0.25, \beta = 0.35$)					
Starting from initial allocation: $G_T = 0.018; G_N = 0.032; T = 0.05; TR = 0.0$					
	$\% \Delta \tilde{p}$	$\% \Delta \tilde{K}$	$\% \Delta \tilde{X}$	$\% \Delta \tilde{Z}$	% Long-run Welfare Gain
pure transfer ($\lambda=0$): $G_T = 0.018; G_N = 0.032; T = 0.006$	0.0	-5.8	-19.5	-7.3	12.2
spent on G_T only ($\lambda=1; \phi=0$): $G_T = 0.055; G_N = 0.032; T = 0.05$	18.5	3.0	-3.2	19.3	9.3
spent on G_N only ($\lambda=1; \phi=1$): $G_T = 0.018; G_N = 0.084; T = 0.05$	-15.3	26.4	-15.5	4.5	13.8
Opt. alloc. ($\lambda=1; \phi=0.8$): $G_T = 0.027; G_N = 0.070; T = 0.05$	-6.8	21.3	-9.7	10.6	14.4

²² A transfer of 0.04 units corresponds to 8% of initial GDP in Case 1 and 9% in Case 2.

²³ If $TR=0.04$ at the beginning, the level of government spending that would maximize intertemporal welfare is $G^T=0.025; G^N=0.043$ and $T=0.068$ in Case I; $G^T=0.034; G^N=0.062$ and $T=0.096$ in Case II. These numbers are very close to what we find while looking to maximize the % long-run welfare gain. The slight deviation from the optimal level is due to the fact that the size of the transfer is not quite big enough to reach the optimal level of both spendings and taxes.

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The Turkish Economy after the Global Financial Crisis*

*Dani Rodrik***

Abstract

The global financial crisis has demonstrated that a financially open economy has many areas of vulnerability. Even when a country keeps its own house in order, it remains at the mercy of developments in external financial markets. So, one lesson to bear in mind is that policymakers need to guard against not just domestic shocks, but also shocks that emanate outward from financial instability elsewhere. To accomplish this, complete financial openness is not the best policy. A second lesson is that Turkey's prevailing growth strategy can neither be sustained nor generate enough employment. Therefore, it would be a mistake for the country to return to the *status quo ante* and resuscitate a model that fails to make adequate use of domestic resources. Most importantly, Turkey has to learn to live with a reduced reliance on external borrowing. The paper discusses the needed realignments in fiscal and exchange-rate policies.

JEL codes: F41, G01, G15

Keywords: Turkish economy, financial crisis, financial open economy, fiscal and exchange-rate policies.

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1. Introduction

Turkey has emerged from yet another financial crisis. This one may not have been its own doing, but that has not lessened the pain. In fact, in many ways, Turkey was hit harder by the global financial crisis of 2008-2009 than by any of the previous instances of a sudden stop in capital inflows. And this happened despite the admirable resilience of domestic banks and the dramatic cuts in interest rates that the Central Bank undertook. Unemployment reached historic heights, and the drops in GDP and industrial output were exceptionally severe.

Macroeconomic instability has long been the bane of Turkey's economy. In the past, the culprits were easy to identify. One could blame irresponsible monetary policies, unsustainable fiscal expenditures, poor financial regulation, or inconsistent exchange-rate policies. It is to the country's credit that, as it came out of the 2001 crisis, Turkey succeeded in fixing these traditional sources of fragility. Monetary policy is now pursued within an inflation-targeting framework and governed by an independent Central Bank. Fiscal policy has been generally restrained, and the public debt-to-GDP ratio is stable or declining. Banks have strong balance sheets, and regulation and supervision are much tighter than before. The currency is floating. When it comes to macroeconomic management, Turkey has adopted all the best practices.

The crisis has demonstrated that a financially open economy has many areas of vulnerability. Even when a country puts its own house in order, it remains at the mercy of developments in external financial markets; crises and contagion are endemic in an era of financial globalization. So, lesson number one is that policymakers need to guard against not just domestic shocks, but also shocks that emanate outward from financial instability elsewhere. This has important implications for those responsible for deciding on the optimal degree of financial integration to aim for in middle-income countries like Turkey. In particular, it suggests that complete financial openness is not the best policy. A counter-cyclical approach to the capital account—encouraging inflows when finance is scarce but discouraging them when finance is plentiful—is needed.

A second lesson has to do with Turkey's growth strategy. The Turkish economy grew at quite rapid rates in the years before the most recent crisis, and it has quickly reverted to respectable growth rates following the rebound. This can be interpreted as the reward for the solid macro-economic policies pursued since 2001. However, there are too many disconcerting elements in this economic picture. In particular, domestic savings have fallen (instead of rising, as they should have done in an environment of increased macro-

stability and confidence), and unemployment has remained stubbornly high. The external deficit has kept on widening. Investment has remained lower than required. All of these factors put the sustainability of the economic boom into question. Even if the sub-prime mortgage crisis had never taken place, Turkey's traditional pattern of growth would have run into problems. Therefore, it would be a mistake for the country to return to the *status quo ante* and resuscitate a model that fails to make adequate use of domestic resources. Most importantly, Turkey has to learn to live with a reduced reliance on external borrowing.

I begin this paper by comparing the present crisis to the two previous ones (in 1994 and 2001) Turkey went through since having become financially globalized. By juxtaposing the trends in the major economic indicators during these three crises, we can discern common elements as well as important differences. The main point that emerges from this comparison is that Turkey is exiting the present crisis with a significantly higher level of unemployment and a greatly overvalued exchange rate in real terms.

Next, I present two growth narratives that differ in terms of the constraints they assume restrict the Turkish economy and thus have conflicting implications for policy. The first narrative views financing as the key constraint, while the second one emphasizes a profit squeeze in tradables. Depending on which of these one views as the dominant narrative, the resulting approach to adopt to the external accounts and exchange-rate policy would take very different forms. Unfortunately, a quick overview of the evidence does not allow a clear-cut conclusion to be reached, since the Turkish economy presents elements of both types of constraints. Nevertheless, it is possible to draw some broad policy conclusions, and I will close the paper with these.

2. How does the present crisis compare to previous ones?

Financial crises in emerging markets may be sparked by various causes, but they tend to follow similar scripts. They begin with a sharp turnaround in financial flows—what Guillermo Calvo has memorably called a “sudden stop.” This drying up of credit, in turn, sets off a chain of events: the value of the domestic currency collapses; domestic banks are starved of liquidity, so they begin to call in their loans; and firms need to retrench and lay off workers. The economy needs to generate an external surplus in short order, which requires a sharp fall in domestic demand. This now adds a demand shock to the initial supply shock, and this further aggravates the cost to output. Eventually the depreciated currency helps revive demand for domestic tradables, the panic subsides, and capital begins to move in again.

Turkey has gone through three of these crises since it opened up its capital account in 1989. The first instance was 1994, when a misguided attempt to keep domestic interest rates low led to a sudden capital outflow. The second was in 2001, when a minor political crisis threw the sustainability of an exchange-rate-based stabilization program into question and led to a massive withdrawal of funds. And the third happened in 2008 as a result of the global flight to safety that the US sub-prime mortgage crisis sparked.¹

Since the turnaround in capital flows was the instigator of each of these crises, it is useful to look at these episodes against the backdrop of the events that were roiling the financial markets. In the accompanying charts, I plot the time series for the three crises against a time scale displaying calendar quarters when peak amounts of inflowing funds occurred.² Financial inflows reached their peaks in 1993: I, 2000: II, and 2008: II, respectively, so these quarters are taken as t=0 for the three crises.

Figure 1. Net Financial Flows (% of XGS)

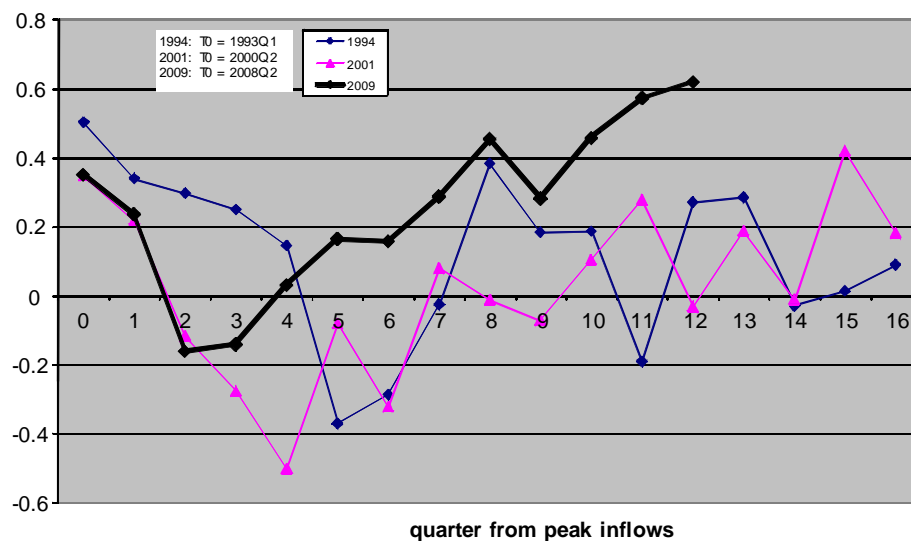


Figure 1 compares the patterns of financial flows during these three crises. It clearly shows that Turkey was a large net recipient of financial inflows at the onset of each crisis. At their peak, *net* inflows amounted to somewhere between 35 percent and 50 percent of the gross volume of exports of goods

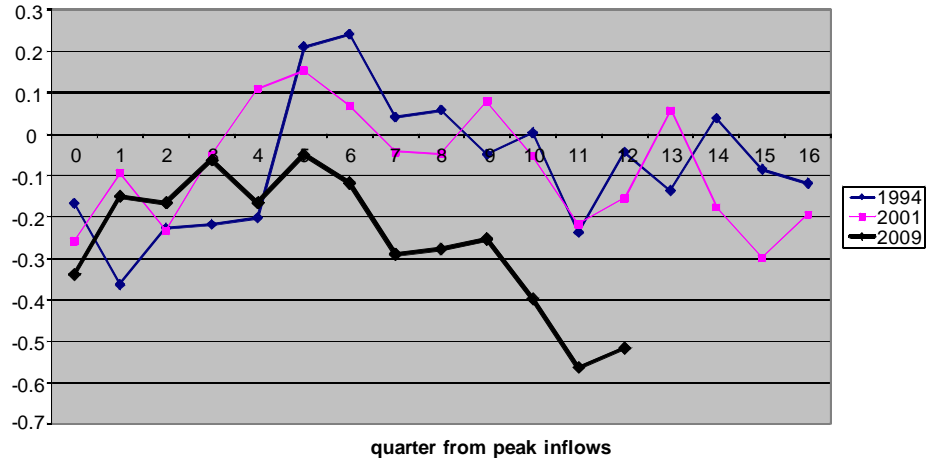
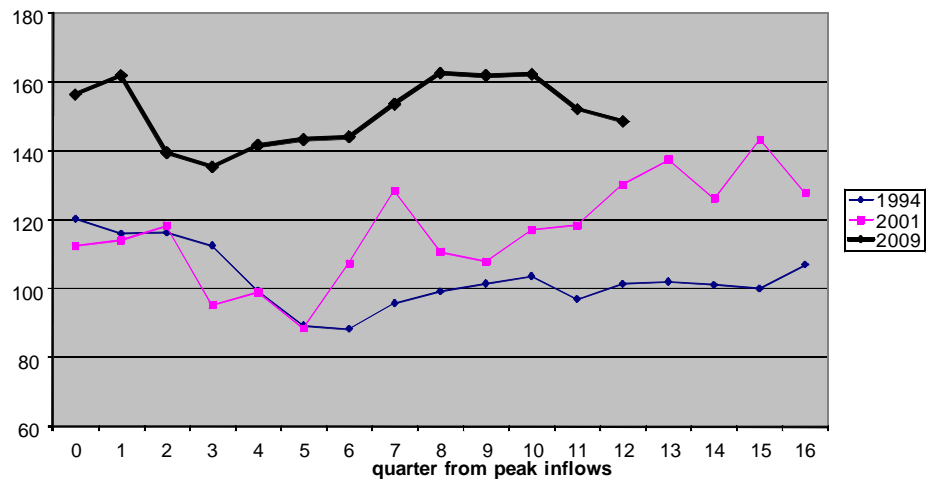
¹ See Uygur (2010) for a detailed discussion of Turkey's performance during the recent crisis, along with an evaluation of the policies followed.

² Unless specified otherwise, all data come from the Central Bank's online data-retrieval facility.

and services. The figure also shows the rapidity of the turnaround. In 2001 and 2008, these large inflows not only quickly evaporated, but within two quarters they had been replaced by sizable net outflows. The first three quarters of the 2001 and 2008 crises, in fact, bear an uncanny resemblance to each other.

But thereafter an interesting divergence sets in. For the 2001 crisis, it took roughly two years for financial inflows to turn positive once again. In the current crisis, the resumption of capital inflows happened much more quickly, and by $t=5$ (2009: III), Turkey had become a sizable recipient of inflows once again. Financial inflows continued to increase still further, and, within three years (2010: II, the latest quarter for which we have data), net inflows had reached levels that exceeded previous peaks. What happened was that the stabilization of global financial market conditions and the policy-driven sharp reduction in interest rates in the advanced economies produced a resurgence in capital flows to emerging markets. Turkey was among the beneficiaries. As we shall see, however, this may well turn out to be a mixed blessing.

When foreign financing dries up, the current-account deficit has to be quickly reduced and eliminated. As Figure 2 shows, the Turkish economy entered all three crises with a large current-account deficit. And in all three cases, there was a subsequent major adjustment in the current account over a period of five to six quarters. The current-account balance turns positive typically within a year-and-a-half of peak inflows. But the evidence from the older crises (1994 and 2001) also shows that this adjustment tends to be temporary. Three years after these crises, Turkey was again running large current-account deficits. In the most recent crisis, the widening of the current-account deficit has been even more spectacular (in relation to the value of exports). The huge current-account imbalance Turkey was running by the middle of 2011 is, of course, the counterpart of the larger financial inflows shown in Figure 1.

Figure 2. Current Account Balance (% of XGS)**Figure 3. Real Effective Exchange Rates**

The adjustment in the external balance is achieved in part through a significant realignment of the real exchange rate. In the crises of 1994 and 2001, the real exchange rate depreciated on the order of 30-40 percent. A similar depreciation took place in 2009 as well, but as Figure 3 shows, it was much more short-lived. By the second quarter of 2009, the Turkish lira had already begun to reverse its slide. This was clearly linked to the more rapid resumption of capital inflows after the latest crisis. What Figure 3 also reveals is that Turkey entered this crisis with a stronger lira than had been the case for either

of the previous two crises. This rapid currency appreciation is doubly problematic. I will return to the currency-competitiveness issue below.

Another distinguishing feature of the most recent crisis is that the adverse effects on the real economy were deeper and felt much sooner than in the earlier crises. Figures 4, 5, and 6 depict the comparative outcomes in industrial production, real GDP, and unemployment. Both real GDP and industrial production took a severe tumble as soon as financial flows turned around, and their fall was more pronounced than anything seen to date. The decline in real GDP during the first quarter of 2009 was the worst on record since 1945. But the recovery in economic activity has also been comparatively rapid. By the end of 2009, even though the Turkish economy stood considerably below its previous growth path, the worst was clearly over. As Figure 4 shows, industrial production has followed the path of the 2001 crisis fairly closely in bouncing back, even though the initial downturn was more severe.

Figure 4. Industrial Production (peak inflows quarter=100)

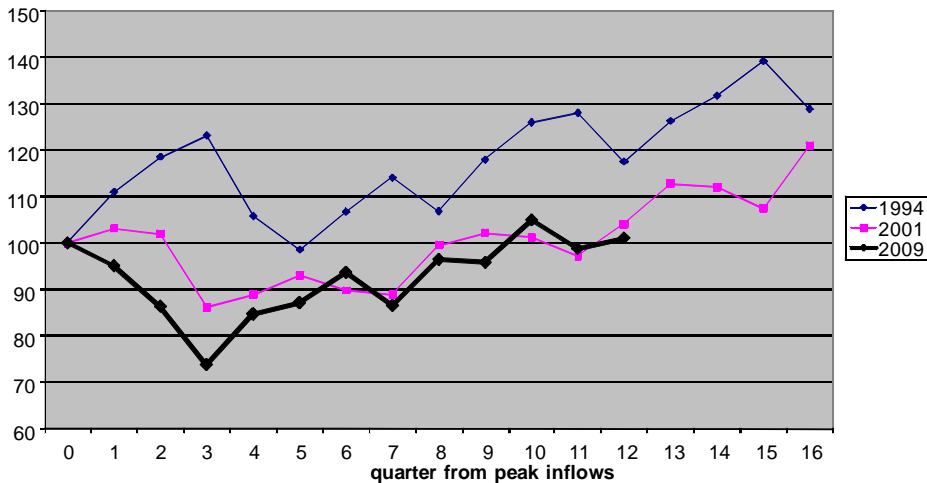
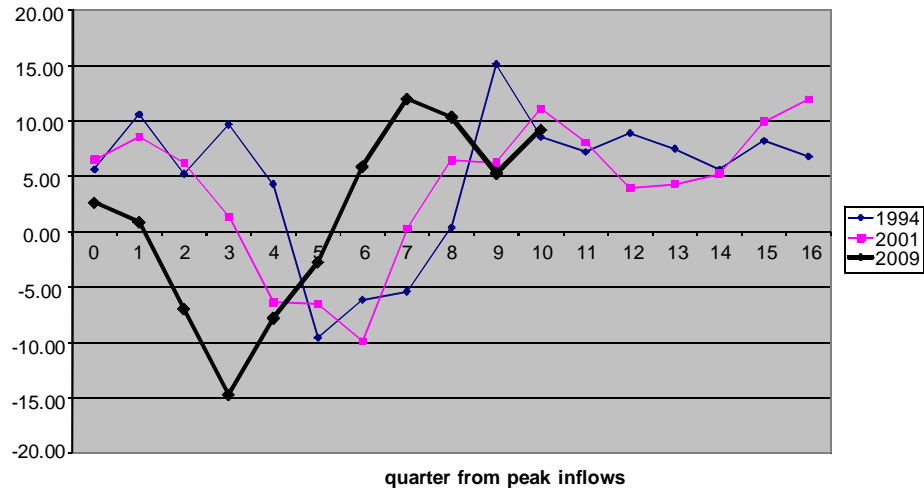
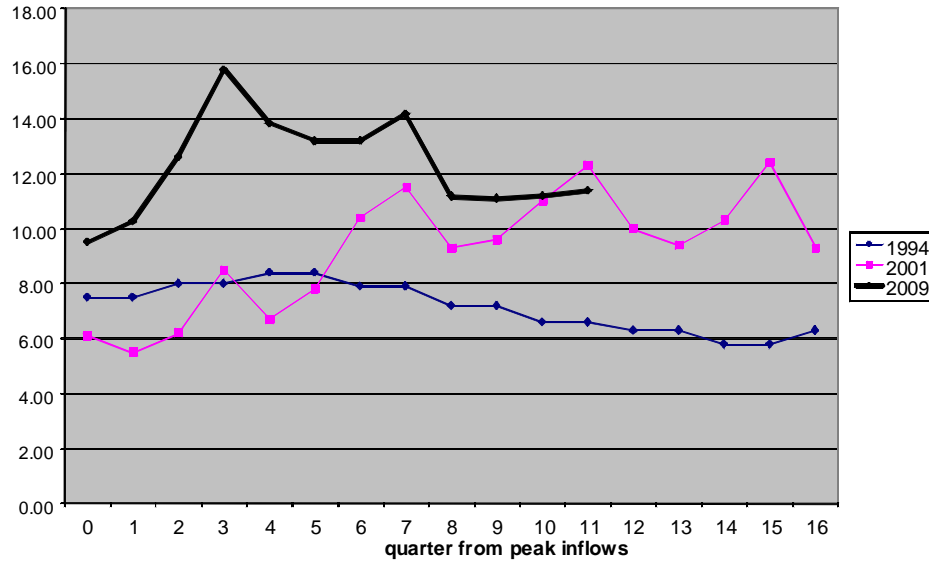


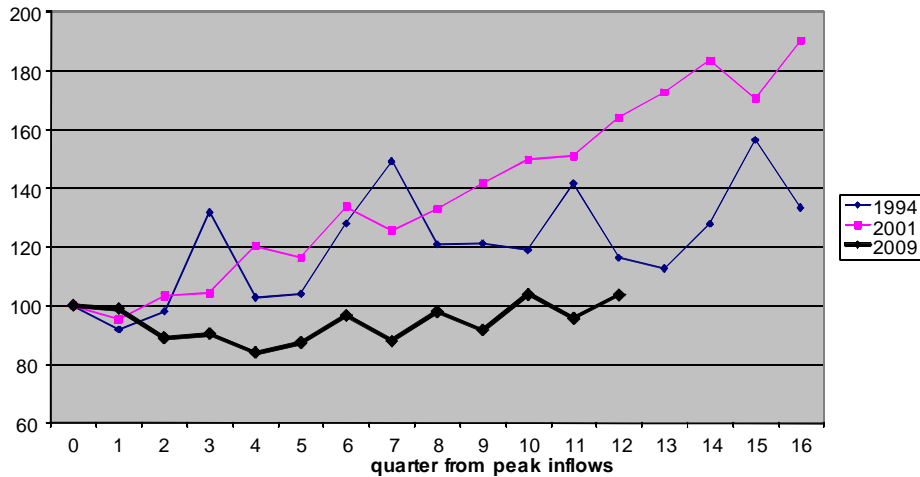
Figure 5. GDP Growth Rate (%)

However, it is more difficult to justify optimism when considering the unemployment front (Figure 6). The rate has come down somewhat since having reached a record-breaking level, nearly 16 percent, in 2009:1. Nevertheless, the fact remains that joblessness was already persisting at much higher levels at the onset of the 2008-09 crisis than in the preceding crises. Unemployment has remained stubbornly high—above 10 percent—despite rapid growth since 2001, and this is one of the blemishes on Turkey's recent performance. Going forward, any sensible growth strategy will have to make employment creation a central plank.

Figure 6. Unemployment Rate (%)



A final dissimilarity between the most recent crisis and its predecessors relates to export performance (Figure 7). In the past, a key driver of recovery had been a rapid run-up in exports, largely given impetus by a competitive currency. As Figure 7 shows, exports took a very different path during the 2008-09 crisis. Export volume fell until early 2009 and has recovered very slowly – much more sluggishly than in the other post-crisis periods. This fairly weak export response has been due, in the first instance, to the fall in global demand, which resulted in a worldwide collapse in trade. This prevented external demand from operating as an adjustment mechanism for Turkey and other emerging markets. At the same time, the short-lived real depreciation of the Turkish lira must be seen as a causative factor. As the lira began to appreciate again in 2009, it undercut companies’ incentives to export. For both sets of reasons, exports have not contributed much momentum to economic activity in the aftermath of the latest crisis.

Figure 7. Export Quantum (peak inflows quarter=100)

These comparisons and quick overview reveal that, despite its many strengths, the Turkish economy has emerged from the current crisis with some serious weaknesses. On the plus side, the resumption of capital inflows is indicative of a renewed vote of confidence on the part of financial markets in the underlying health of the Turkish economy. The quick rebound in economic activity likewise suggests remarkable flexibility in the economy. However, on the negative side, unemployment is still high by Turkish standards, and the real exchange rate remains overvalued. How alarming are these dark spots in the picture of economic recovery? The answer depends in large part on what we think is an appropriate growth model for Turkey.

3. Two contending growth narratives

In developing countries, growth is driven by structural change. It requires moving their resources—predominantly labor—from low-productivity activities, such as traditional agriculture and informal occupations, to modern and mostly tradable activities like manufacturing that are high-productivity. The more rapid this movement, the higher the growth rate of the economy. That so many developing countries remain poor, with the rate of convergence rarely turning positive, is indicative of the magnitude of the inherent market failures that are holding them back, not to mention the governance issues that bedevil many Third World societies. Such a poor business environment exerts a disproportionate tax on the modern parts of the economy, preventing rapid structural change. This is why growth is never an automatic process in the

developing world; it requires proactive policies in addition to sound macroeconomic fundamentals.

Among the various constraints that prevent the take-off of modern tradable activities, two in particular stand out. First, modern industrial activities will be too slow to expand if credit is hard to access or there is not enough of it. Second, investments in these activities are often discouraged by low private returns, despite the presence of high *social* returns, due to a range of learning spillovers or institutional shortcomings. Of course, under-developed countries do not suffer from just one or two maladies but from a whole host of problems. It is not uncommon for the corporate sector to be plagued both by poor finance and by poor returns. But as desirable as it may appear to be to try to tackle and resolve all such blockages simultaneously, this is neither practical nor necessary. As the experience of successful countries demonstrates, what is required is strategic prioritization. If we can identify the leading bottlenecks, we can address the problems sequentially. As part of such a project, it is of great practical importance to determine whether it is poor finance or poor returns that acts as the most onerous constraint (Hausmann, Rodrik, and Velasco, 2008).

Until recently, the mental model that dominated the conventional wisdom about economic growth was based on the presumption of capital shortage. This model held that low savings and weak financial markets at home were first-order constraints on economic growth and development. Thus, greater access to investable funds from abroad and improved financial intermediation would provide a powerful boost to domestic investment and growth along with better smoothing of consumption. As some of the downsides of financial globalization became more evident, proponents of this view began to recognize the potential for financial instability and crises. But the conclusion that they drew was that sufficiently vigilant regulation and supervision would eliminate the attendant risks. Given the presumed importance of access to international financing, the model required that national policymakers give the utmost priority to implementing appropriate regulatory structures in their financial markets.

We can restate this argument in the form of a three-pronged syllogism: (1) Developing nations are constrained by financing shortages and therefore need foreign capital to grow. (2) But foreign capital can be put at risk if prudent macroeconomic policies and appropriate prudential regulation are not pursued. (3) So developing countries must become ever more committed to erecting appropriate safeguards as they open themselves up to capital flows. This syllogism remains at the core of the case for financial globalization (Rodrik and Subramanian, 2009).

Recent evidence has thrown some cold water on the very premise of this syllogism. The cross-country evidence of the growth benefits of capital-account openness turns out to be inconclusive. Even more damaging, it appears that the countries that have grown most rapidly in recent decades are those that have relied less—not more—on foreign capital. In addition, financially globalized developing countries have experienced less, not more, consumption smoothing. These results are at variance with the presupposition that poorer nations need foreign financing in order to develop. To make sense of what is going on, we need a different mental model.

The alternative narrative goes as follows. While some nations may be severely constrained by inadequate access to financing, others—and perhaps a majority—are constrained primarily by poor returns. The inadequate appetite for investment, due either to low social returns or to low private appropriability of social returns, is particularly acute in tradables, which are the essential source of growth. In such settings, capital inflows exacerbate the investment constraint through their effect on the real exchange rate. The real upward movement of the home currency that accompanies capital inflows reduces the profitability of investment in tradables and depresses the private sector's willingness to invest. It thereby reduces economic growth. So openness to foreign financing ends up being a handicap rather than an advantage.

These two syndromes—poor financing and poor returns—can be differentiated by posing the following hypothetical question to would-be entrepreneurs and investors in an economy: if you were to receive an unexpected inheritance of \$25 million, where would you invest it? In an economy where the most challenging constraint is lack of financing, this sudden windfall serves to relax the constraint and therefore permit the undertaking of investment projects that would not have been possible otherwise. Entrepreneurs in such an economy are therefore likely to respond to the question with a long wish list of sectors: agribusiness, tourism, call centers, auto parts, pharmaceuticals, and so on. These are all areas where profitable investments could be made if financing were available at reasonable cost.

On the other hand, when the restrictive constraint is low returns, the windfall provides no additional inducement to invest—at least not in the home economy. In this alternative economy, the respondent is most likely to fall into a long silence, scratch his head, and then say something like: “Can I take the money to Switzerland instead?”

As real-world counterparts to these two prototype economies, think of Brazil and Argentina. In Brazil, private entrepreneurs have no shortage of investment ideas, and even with real interest rates at double-digit levels until

recently, the investment rate stood relatively high. When the financing constraint is relaxed in Brazil, either because interest rates fall or foreign financing becomes more plentiful, domestic investment rises. In Argentina, on the other hand, a different case altogether presents itself. Here the business climate is marked by great uncertainty brought about by erratic government policies and constant changes in the rules of the game. Hence, the tendency is for private investment to remain subdued, even when financing is plentiful and cheap. What fosters private investment in the Argentine economic environment is a big boost in the relative profitability of tradables, which offsets the other distortions. So when the government was actively managing the exchange rate in recent years to maintain an undervalued peso, the private sector responded with an investment boom in tradables—despite the continuing lack of confidence in the government's economic policymaking. The Argentine economy grew rapidly during this period—more rapidly, in fact, than Brazil's.

As these examples suggest, determining desirable economic policies first requires an assessment of the nature of the main limiting constraint on the economy. If it is financing, we should look favorably upon capital inflows and moderately large current-account deficits, even though they are likely to yield undesirable currency appreciation to the point of overvaluation. The costs of such overvaluation are likely to be more than offset by the benefits of having increased availability of investable funds. For an economy like Brazil's, it is obviously more important to stimulate finance than it is to enhance returns. But the same set of economic policies would be disastrous in Argentina, where capital inflows and currency appreciation would not spur domestic investment (at least not in tradables); they would instead lower domestic savings and boost consumption (as they indeed did in the 1990s).

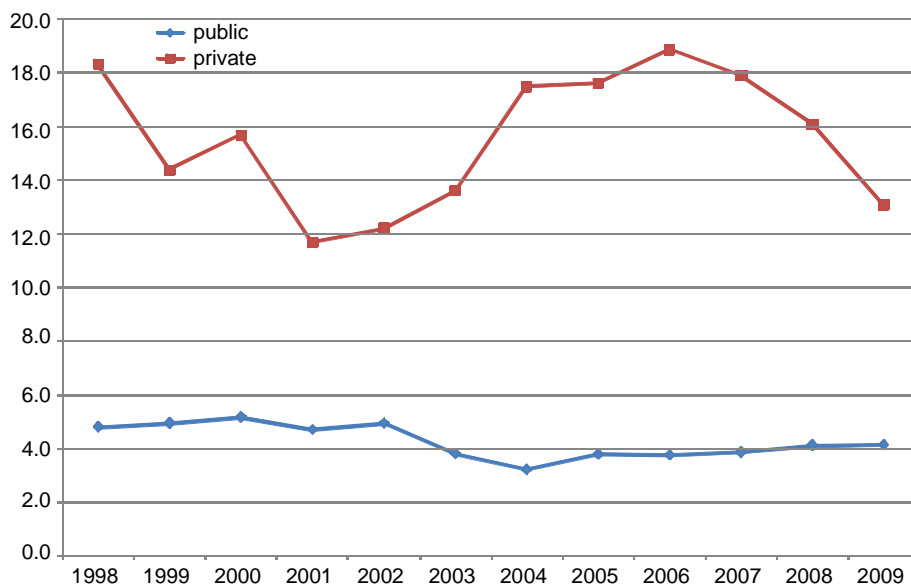
The question that faces Turkey, then, is essentially this: is Turkey more like Brazil or more like Argentina? It turns out that this is not an easy question to answer. I will provide a first pass through the evidence here, leaving a more detailed analysis for another occasion (or for others).

3.1 Reading the tea leaves of the Turkish economy

As it came out of the 2001 crisis, Turkey came to rely increasingly on foreign borrowing to fuel its growth. The widening of the current-account deficit went along with a sizable real rise in the value of the lira. What does this most recent experience tell us about the nature of the constraint that is holding Turkey back?

First, consider the evidence that would suggest that Turkey is, like Brazil, a financing-constrained economy. Real interest rates have tended to be quite high, at double-digit levels—at least until the recent crisis. Among emerging markets, Turkey's real interest rates are, in fact, second only to Brazil's (Kannan, 2008). Such steep rates render the cost of domestic financing prohibitive for all but the most profitable investments. Despite this, however, private investment has held its own, hovering in the 16-18 percent range (in relation to GDP) prior to the crisis (Figure 8). This is not so impressive when compared to Asian countries, but it must be considered a decent performance nevertheless, and indicative of the presence of high returns in general, given the cost of capital. The explanation lies in the high level of foreign borrowing in recent years, which has clearly helped sustain domestic investment and counteracted somewhat the adverse effects of high interest rates in Turkey.

Figure 8. Private and Public Investment (% of GDP)

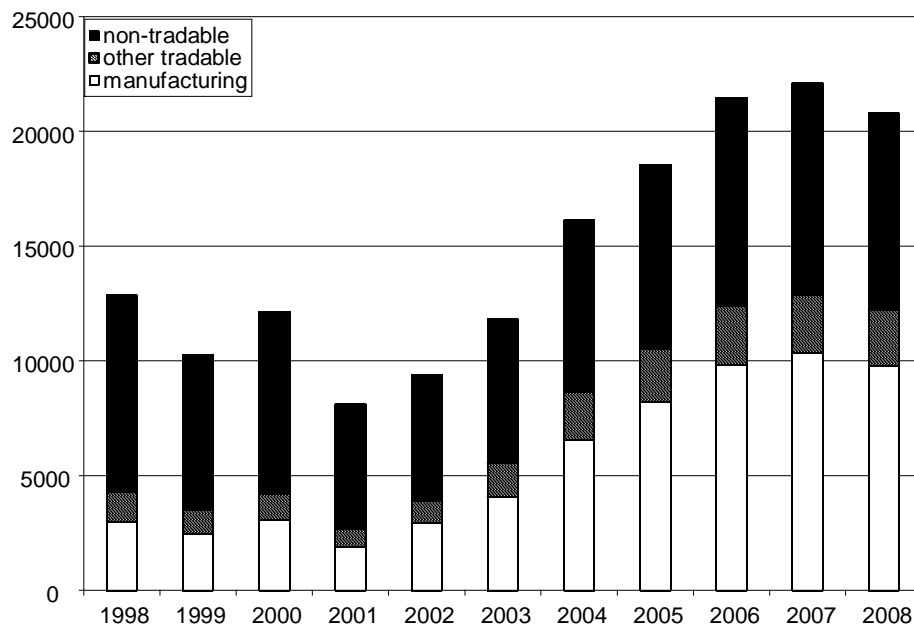


Source: State Planning Organization (SPO)

Second, the composition of investment has been moving in the direction of tradables, and manufacturing in particular (Figure 9), which is perhaps an even more striking factor. In 2000, manufacturing made up a quarter of total investment; by 2008, this ratio had increased to almost 50 percent! This is a remarkable transformation, rendered all the more so by the fact that the real exchange rate had appreciated by around 20 percent in the interval. A somewhat similar picture can be seen when we turn to exports, where significant

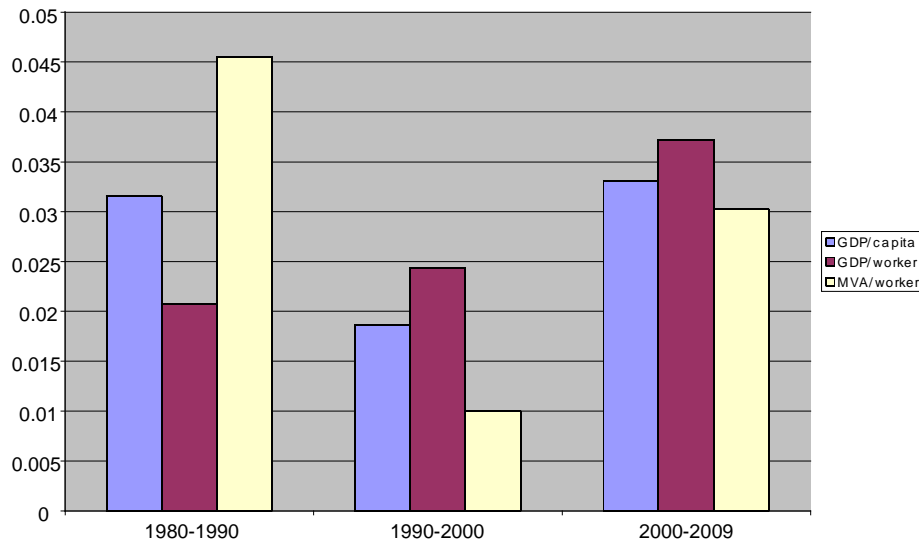
gains in both expansion and diversification were recorded in recent years (see World Bank, 2008, Chap. 2). Taken together, the strength of manufacturing investment and of exports, despite the currency's strength, is another piece of evidence suggesting private returns are high.

**Figure 9. Composition of Fixed Capital Formation
(at 1998 TRL, in Millions)**



Source: SPO

Third, the recent track record of economic growth and industrial productivity on the back of foreign borrowing has been impressive. Figure 10 summarizes economic outcomes during three separate periods of Turkey's recent history: the 1980s, the 1990s, and 2000-2008. For each period, the chart displays the growth rates in three measures of productivity: GDP per capita, GDP per worker, and manufacturing value-added per worker. The post-2000 period looks uniformly good, irrespective of which measure of productivity growth we focus on. With the exception of the growth in MVA per worker, post-2000 performance outclasses that of all previous periods.

Figure 10. Performance by Period (annual rates of growth)

Source: World Bank, World Development Indicators and SPO.

It is clear that recent economic growth has come at the expense of widening current-account deficits and a pushing up of the real exchange rate. But the indicators reviewed above suggest that this growth has overall been healthy in a number of respects: it has come through higher investment in tradables, especially in manufacturing, which has exhibited a strong performance despite some degree of overvaluation of the currency. So far, the picture suggests an economy that is constrained more by financing unavailability than by low returns.

Now consider the other side of the story. First, it is worth reiterating that aggregate investment remains low in Turkey, despite the support it receives from foreign investors. At its peak in 2006, gross capital formation amounted to 23 percent of GDP (Figure 11), which is considerably lower than the rates recorded by high-performing Asian economies. It may be true that Turkey invests more than would be expected for a country where real interest rates are so high, but it is equally true that there is considerable upside room for boosting the investment component of the economy. There is no reason why the Turkish economy cannot grow even more rapidly (and, indeed, it will certainly have to if the excess supply of labor is to be absorbed in the coming years).

Figure 11 shows why industrial investment remains less than it should be, regardless of the condition of the current account. The domestic savings rate fell during the 2000s and still remains quite depressed. The record figure of 23 percent of GDP in 2006 was only achieved thanks to a substantial influx of funds from abroad, amounting to 6 percent of GDP. Ideally, Turkey's investment rate should be closer to 28 percent. However, as long as it remains outside the Eurozone, it dare not risk running current-account deficits that are not sustainable and "safe," i.e., below 6 percent—and, indeed, even this number may be too high. Violating this guideline would leave the country at risk of sustaining periodic sudden bouts of capital flight. In other words, with domestic savings so low, there are inherent limits to the extent to which the current account can help to provide the financing for domestic investment, even if we assume that the biggest constraint on the economy lies on the financing side. Regardless of the nature of the constraint, raising growth in the future will necessitate a dramatic expansion in domestic savings.

Figure 11. Saving and Investment (% of GNP)

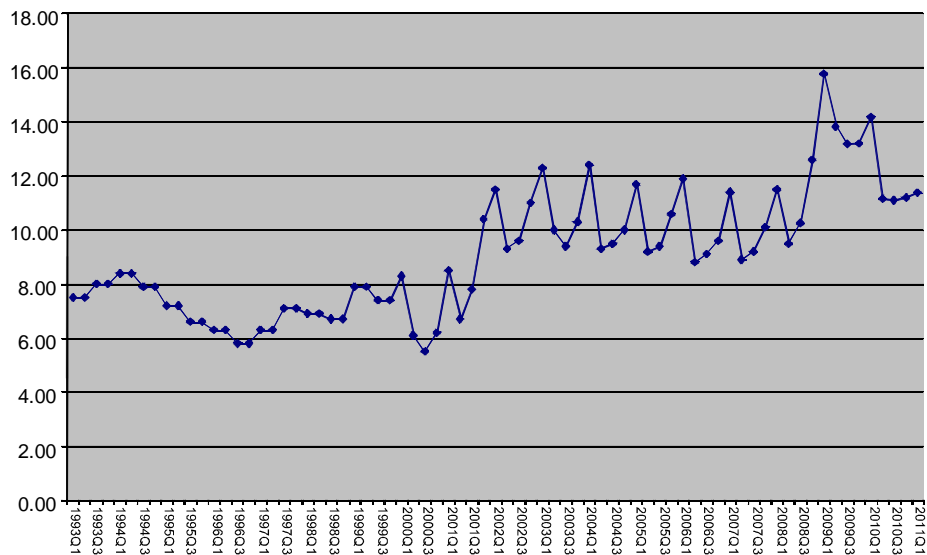


Source: SPO

One aspect of Turkey's economy that fairly cries out for a rethink of economic strategy is its dismal record on employment creation and on unemployment. As Figure 12 demonstrates, Turkey's unemployment rate jumped from a range of 6-8 percent during the 1990s to a new plateau of 9-12 percent fol-

lowing the 2001 crisis. In the wake of the latest crisis, unemployment may well get stuck at even higher levels still. This is both an economic and social problem. On the economic front, it would mean a gross underutilization of domestic resources. On the social front, it would be the harbinger of political tensions and divisions that could worsen if left unresolved. If both scenarios are to be avoided, any strategy for healthy economic growth will need to feature job creation at its center. The goal should be both a higher growth rate and greater expansion of high-productivity sectors with good employment potential.

Figure 12. Unemployment Rate (%)



The bottom line is this. Foreign borrowing does contribute to economic growth in Turkey, because private returns in tradables are relatively high and current-account deficits permit greater investment than would be possible otherwise (despite the associated reduction in competitiveness). However, this model places too low a ceiling on the sustainable rate of economic growth and does not permit a rapid enough generation of jobs to prevent unemployment from rising. Faster growth would require, under the prevailing strategy, an unsustainably large external deficit. The only alternative is to move to a model of growth that breaks the link between growth and the current-account deficit. This alternative strategy would require a formidable effort to mobilize domestic savings among the population; at the same time, it would have to ensure that high private returns in tradables were maintained.

4. Concluding Remarks

We can summarize the story outlined here as follows. Turkey *needs* to grow more rapidly; and it *can* also grow more rapidly. The country has a growth potential that its recent performance, successful as it may have been, has not fully exploited.

An economic-development model that relies on foreign savings and large current-account deficits can generate respectable growth, but it runs into inherent problems. For one thing, given the present low level of domestic savings, a substantial rise in domestic investment would push the external deficits to heights that would clearly be unsustainable and dangerous. And second, even moderate reliance on foreign financing, as we have seen during the recent crisis, leaves the domestic economy vulnerable to sudden losses of confidence abroad that are followed by withdrawals of funds locally. A comparison with Brazil is again instructive here. Brazil entered the 2008-09 crisis with a much smaller external imbalance than Turkey, and as a result it has experienced a much shallower recession.

If growth is going to be financed domestically, Turkey will need a permanently higher savings rate. The government fiscal policy has a critical role here. The most direct way to lift domestic savings is to increase the structural surplus of the public sector. The medium-term programs of the government must target a large enough fiscal surplus to leave room for the Central Bank to move interest rates to a permanently lower plateau. The resulting rise in public saving will reduce capital inflows, prevent the current-account deficit from worsening, and help sustain a more competitive currency. This step is critical in moving Turkey onto a new growth path.

But more will need to happen for all the pieces to fall into place. A few numbers can help quantify the nature of the challenge facing Turkey in moving to an alternative growth model. First, a sustainable and safe current-account deficit for Turkey should not exceed 3 percent of GDP, so let's take that number as the upper limit on the resource transfer from abroad. Second, a desirable target for the domestic investment effort would be around 28 percent, to ensure that high enough growth keeps unemployment in check. This implies a domestic savings rate of at least 25 percent, which is a whopping 9 percentage points higher than the 16 percent achieved by the Turkish economy in the years just prior to the 2008-09 crisis (see Figure 11). Obviously, such a large run-up in savings cannot be achieved through a rebalancing of public-sector accounts alone. So is this target at all realistic?

The record of fast-growing countries—not just Asian economies but also Chile since the mid-1980s—suggests a positive answer. All these economies experienced significant savings transitions at the start of their growth accelerations (Rodrik, 2000). A positive growth dynamic is, in fact, a pivotal factor in sustaining a rapid expansion in private (and especially corporate) savings. Indeed, when economic growth rises in a sustained manner, it also induces higher savings. For companies, the prospect of strong earnings growth leads them to retain a greater share of their earnings, which in turn feeds into higher investment and growth. A determined fiscal effort, along with a competitive currency, then, has the potential to foster the private savings required to close the gap.

If a shift in fiscal policy forms the first plank of the new growth strategy, a second could be the signaling of a new policy attitude towards the exchange rate. Currently, the official line is that the Central Bank intervenes in currency markets only to smooth short-term fluctuations, without taking a stand on the medium-term level of the lira. This has to be replaced with a clear statement of preference for avoiding overvaluation. The Central Bank, the Treasury, and the Finance Ministry would need to cooperate and coordinate when capital inflows threatened to push the value of the currency up. Policy-makers have many policy instruments to resort to in order to stem upward movement of the currency; a combination of sterilized intervention, prudential restrictions on inflows, liquidity requirements aimed at limiting foreign borrowing, and other fiscal measures are effective if deployed with sufficient determination. None of this needs to be inconsistent with inflation targeting as long as the performance of tradables features prominently in the Central Bank's evaluation of potential growth of the real economy, and fiscal policy allows enough room for monetary policy to be counter-cyclical with respect to capital inflows.

The key point is that private-sector saving and investment behavior is unlikely to be transformed unless there is a credible shift in the policy profile with regard to both the fiscal stance and the exchange rate.

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The Boom in Capital Flows to Developing Countries: Will It Go Bust Again?*

*Yılmaz Akyüz***

Abstract

This paper argues that the policy of quantitative easing and maintaining close-to-zero interest rates in advanced economies, notably the US, has been generating a surge in speculative capital flows to developing countries in search of yield and creating bubbles in foreign exchange, asset, credit and commodity markets. This latest generalized surge constitutes the fourth post-war boom in capital flows to developing countries. All previous ones ended with busts, causing serious damage to recipient countries. The conditions driving the recent boom in capital flows and commodity prices are not sustainable, and they are likely to be followed by a sharp downturn. Various scenarios that can bring them to an abrupt end are discussed. Examining the policy responses and financial and macroeconomic developments in major emerging economies, the paper concludes that deficit commodity-rich economies that have been enjoying the dual benefits of global liquidity expansion – that is, the boom in capital flows and commodity markets – are most vulnerable to a possible reversal and urges them to manage capital flows more effectively.

JEL codes: F21, F32, F34, F44.

Keywords: Boom-bust cycles, global liquidity, capital flows, foreign exchange markets, commodity markets, developing countries.

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1. Introduction

The post-war period has seen three generalized boom-bust cycles in private capital flows to developing and emerging economies (DEEs), and we now appear to be in the boom phase of the fourth one. These booms have started under conditions of global liquidity expansion and low US interest rates, and all the previous ones ended with busts. The first one ended with a debt crisis in the 1980s, when US monetary policy was tightened, and the second one with a sudden shift in the willingness of lenders to maintain exposure in East Asia as financial conditions tightened in the US and the macro-economic situations of recipient countries deteriorated because of the effects of capital inflows. The third boom developed alongside the subprime bubble and ended with the collapse of Lehman Brothers and the flight to safety in late 2008.

Unlike previous episodes, the Lehman reversal did not cause serious or widespread dislocations in developing countries (DCs) because of generally strong payments and reserve positions, reduced mismatches on balance sheets, and, above all, the short duration of the downturn. Indeed, it was soon followed by a rapid recovery in 2009 as major advanced economies (AEs), notably the US, responded to the crisis brought about by excessive liquidity and debt by creating still larger amounts of liquidity to bail out troubled banks, lift asset prices, and lower interest rates.

This quantitative easing and close-to-zero interest rates in the US have generated a surge in speculative capital inflows to DEEs offering higher interest rates and better growth prospects, giving rise to bubbles in currency, asset, credit, and commodity markets. Major deficit DEEs, such as Brazil, India, South Africa, and Turkey, have seen their currencies appreciate faster than surplus DEEs have. This development has paralleled an increased reliance on foreign capital to help them meet their growing external shortfalls. For their part, most East Asian countries have been successful in maintaining strong payments positions, but they have also been facing credit and asset bubbles. While it is almost impossible to predict how and when the current surge in capital flows will end, there can be little doubt that the conditions driving it at this time cannot be sustained indefinitely. Consequently, the major recipients are all exposed to the risk of a sudden stop and reversal—and, hence, to balance-of-payments and/or financial-market instability, to an even greater extent than that suffered after the Lehman collapse.

This paper examines the causes, nature, and effects of the current boom in capital flows to DEEs from a historical perspective, and the possible consequences of its reversal. Discussions will focus on private capital flows to

DEEs, including both the DCs as traditionally defined and the emerging economies of Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS), which are now generally considered to be in the same class of investment risk as the DCs. However, for historical comparisons, data will also be presented for the DCs alone.¹ A distinction will be made between capital inflows and outflows. *Capital inflows* refer to the acquisition of domestic assets by private non-residents, while the sale of assets is defined as negative inflows. *Capital outflows* refer to the acquisition of foreign assets by private residents, including foreign companies and individuals that have established residence in DEEs, and sales are defined as negative outflows. *Net private capital flows* are the difference between net capital inflows and net capital outflows.²

The first two post-war cycles are briefly discussed in the following section. Section C examines private capital flows in the new millennium, including the factors driving the pre-Lehman surge in inflows, their brief reversal, and the reasons for their quick recovery. It is argued that the factors that gave rise to sharp swings in capital flows have also contributed to gyrations in commodity prices since the early years of the 2000s. Section D examines the changes in the composition of capital flows in comparison with previous cycles and their implications for the exposure of DEEs to the risk of instability and crises. This is followed in Section E by an examination of the impact of capital flows on the exchange rates, current accounts, and asset markets of DEEs in recent years. Section F discusses the possible developments that would end the current boom and the exposure of different categories of DEEs to a sudden stop and reversal. After a brief review of the policy response of DEEs to the boom, it is concluded that stronger, comprehensive, and permanent measures of con-

¹ Many of the emerging economies of CEE and the CIS did not exist as independent states before the 1990s. Here DEEs correspond to what the IMF WEO (October 2010) calls “Emerging and Developing Countries” plus the Newly Industrialized Economies (NIEs), Hong Kong (China), Korea, Singapore, and Taiwan Province of China. Until October 2009, the IMF’s *World Economic Outlook* included NIEs among “Emerging and Developing Countries,” but they are now treated as advanced economies.

² This study uses data both from the IMF and the IIF (Institute of International Finance). These differ in country coverage, methodology, and classification of capital flows. The IMF data include all DEEs as defined above, whereas IIF data include the 30 most important emerging economies. In terms of coverage of items, IMF data are also more comprehensive. IMF data are organized around three categories: direct, portfolio, and other investments. The IIF distinguishes between equity and debt for both inflows and outflows. For inflows, a further distinction is made between portfolio and direct equity and between commercial bank lending and non-bank lending. Historical comparisons here rely on the IMF data, whereas both data sets will be used for the more recent period.

trol are needed in order to contain the build-up of fragility and imbalances that could eventually inflict serious damage when the boom ends with a bust.

2. Previous post-war boom-bust cycles

Until the second half of the 1970s, private capital inflows to DCs consisted primarily of foreign direct investment (FDI), and the main recipients were Latin American countries.³ They were either tariff-jumping investments aimed at access to heavily protected domestic markets or investments for the exploitation of natural resources to be exported back to AEs. Portfolio inflows and private borrowing from international financial markets were almost non-existent, and sovereign borrowing was limited. Total private inflows to DCs were not only small but also relatively stable.

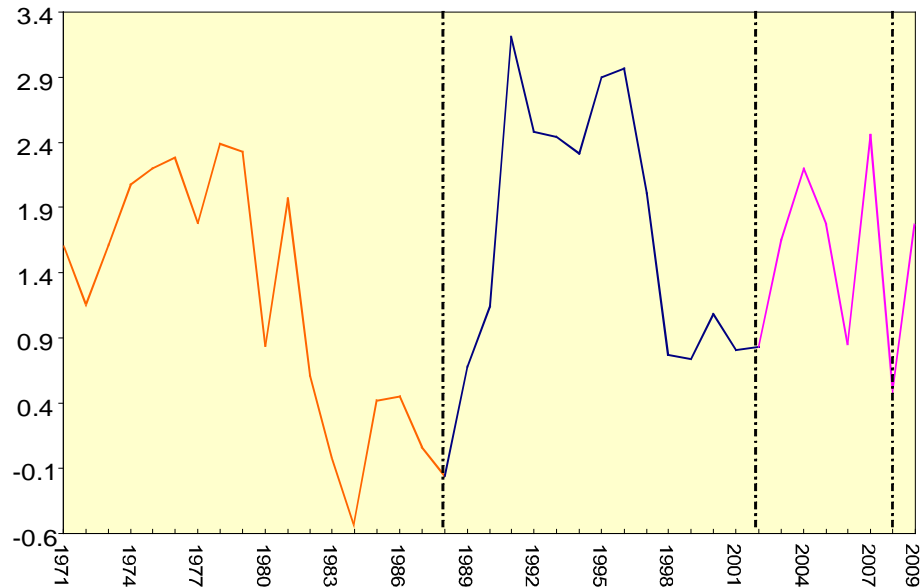
This picture changed in the 1970s with the first post-war boom in capital inflows to DCs (Figure 1). Much of this was in international commercial lending. FDI inflows remained relatively small, and there was hardly any portfolio investment. Lending was driven primarily by a rapid expansion of international liquidity associated with oil surpluses and growing US external deficits and facilitated by financial deregulation in AEs and the rapid growth of Eurodollar markets. Excess liquidity was recycled into syndicated bank credits at variable interest rates, and many of these were denominated in dollars. Borrowing from private markets was viewed as more attractive by DCs than loans from multilateral financial institutions because they did not come with policy conditionalities. Moreover, with booming commodity prices, real interest rates on these loans were often negative. Latin America was the main recipient. Feeding the boom in foreign borrowing were the Bretton Woods Institutions (BWIs) and the US, whose encouragement of the activity was prompted by their fear that the oil-price shocks could lead to a collapse of global demand and contraction of world output.

This boom ended when the US Fed shifted to monetary tightening in order to bring inflation under control. Hikes in policy interest rates in the early 1980s immediately increased the burden of external debt of DCs as rates on their outstanding loans were swiftly adjusted. At the same time, commodity prices and export earnings faltered as recession in the US, triggered by contractionary monetary policy, took hold. The combination of a heavier debt burden and reduced capacity to service it resulted in several recipient countries falling into arrears. A sharp cutback in bank lending followed, forcing many debtor countries to generate trade surpluses to make net transfers abroad

³ For a further discussion of previous post-war cycles, see UNCTAD TDR (2003).

through cuts in investments, imports, and growth. The result was a debt crisis and a lost decade for many DCs, notably in Latin America.

**Figure 1. Net Private Capital Flows to DCs, 1971-2009
(Percent of GDP)**



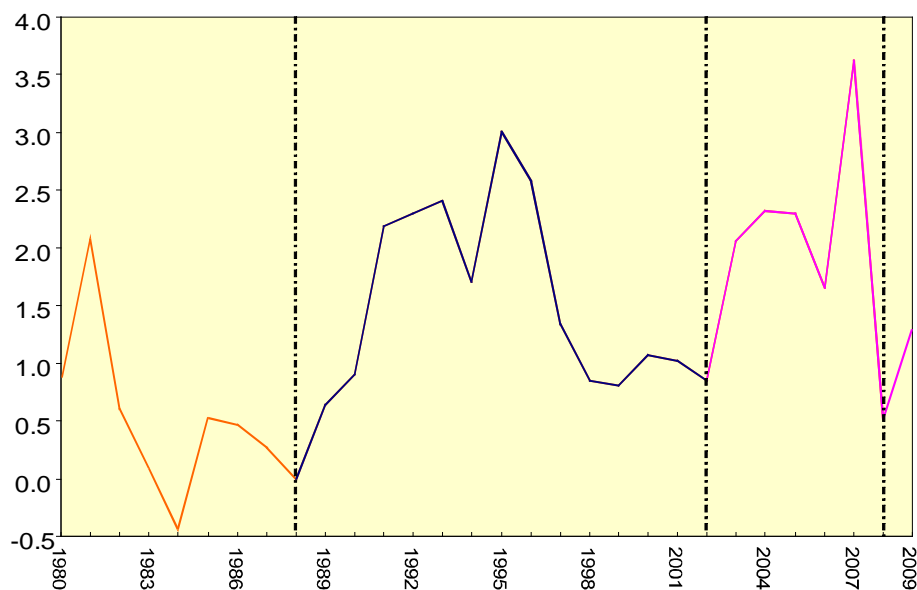
Source: IMF, WEO, 2010 database, IFS; UNCTAD, Trade and Development Report 2003.

Note: Real flows are nominal flows adjusted for changes in the United States GDP deflator.

The second boom came after almost 10 years of denial of access for most DEEs to international financial markets (Figures 1 and 2). Once again, it was associated with rapid expansion of liquidity and deep cuts in interest rates in the US and Japan. The US entered the 1990s with a recession made worse by the Savings and Loans crisis of the previous decade. The response was a sharp lowering of interest rates, which allowed domestic debtors to refinance their debt at substantially lower rates and banks to build up capital by arbitraging between the Fed and the Treasury and riding the yield curve. Japan also engineered a massive liquidity expansion in response to its recession, brought about by the collapse of stock- and property-market bubbles in the late 1980s. The surge in capital inflows was also greatly encouraged by the success of the Brady Plan for sovereign-debt restructuring in Latin America and rapid liberalization in many DEEs. This time, Latin America, East Asia, and the CEEs

all received large amounts of foreign capital. A larger proportion of inflows went into FDI and portfolio equities than in the first boom of the 1970s.

**Figure 2. Net Private Capital Flows to DEEs, 1980-2009
(Percent of GDP)**



Source: IMF, WEO, 2010 database; BOP.

Despite a crisis in Mexico in 1994 brought on by an unexpected spike in US interest rates and political uncertainty, the generalized boom in capital inflows to DEEs continued, but switched to East Asia. Net private capital flows peaked in 1995 before drying up altogether when the Thai crisis burst on the scene in July 1997 and then spread to several other countries in the region. Capital inflows plummeted as a result of a cutback in international bank lending and a plunge in portfolio inflows. The East Asian crisis was followed by a series of crises in several other emerging economies, including Brazil and Russia in 1998, Turkey in 2000-01, and Argentina in 2001-02.

While the nature, composition, and destination of capital flows varied between these two post-war cycles, there were also important similarities. In both episodes, booms were associated with a rapid expansion of liquidity and low dollar interest rates. Both petered out under tightened financial conditions in the US, including higher interest rates and a stronger dollar. In both episodes, rapid shifts in market assessments of borrowers' risk-return profiles and loss of appetite for risk played a key role in the reversal of capital flows. Deteriorations in the macroeconomic fundamentals and the external positions

of recipient countries were no doubt crucial in causing international lenders and investors to have a change of heart about maintaining exposure. In the first cycle, worsening payments difficulties were largely the outcome of external shocks caused by a sudden change in US monetary policy. In the second cycle, reversals of capital flows were often associated with a deterioration of the external positions of the recipient countries, but in most cases this resulted mainly from the effects of capital flows themselves. And East Asian countries faced rapid outflows despite strong macroeconomic fundamentals and fiscal discipline (UNCTAD TDR, 1998 and 1999).

3. Capital flows in the 2000s

3.1 The third post-war boom

The third boom in private capital inflows started in the early years of the new millennium. Again it was triggered by exceptionally low interest rates and rapid expansion of liquidity in major AEs—factors that subsequently led to the most severe post-war global financial crisis and economic contraction. Fearing asset deflation and recession, the US Fed responded to the bursting of the dot-com bubble and the steep fall in equity markets by bringing policy rates to historical lows. The US policy of easy money and low interest rates was also mirrored in several other AEs. Interest rates in Japan were brought down to almost zero as the government tried to break out of a deflationary spiral. Even the otherwise conservative European Central Bank (ECB) joined in and set interest rates at unusually low levels.

The surge in private capital inflows was also helped by the willingness of surplus DEEs to invest in US Treasuries. China had had twin surpluses in its current and capital accounts since the beginning of the decade, investing both of them fully into reserves, mostly in dollars.⁴ About two-thirds of the oil surpluses of fuel exporters (FEs) earned after 2002 went into reserve accumulation, and the rest was used for FDI and portfolio investment. Large acquisitions of US Treasuries by China and FEs helped to keep long-term rates relatively low, even as the US Fed started to raise short-term rates.⁵ Thus, while widening US external deficits were being financed “officially,” there was plenty of highly-leveraged private money searching for yield in DEEs. A mutually reinforcing process emerged between private flows to DEEs and official flows to the US—the former were translated into reserves in DEEs and

⁴ Here, capital-account surplus is used for surplus on non-reserve financial account.

⁵ Bernanke (2011) argues that not only *net* capital inflows from surplus DEEs but also *gross* capital inflows from Europe, leveraged by issuing sovereign debt and bank deposits, raised net demand for safe US assets and brought down long-term rates.

constituted an important part of official flows to the US, which, in turn, supported lower rates there and private flows to DEEs.

Both net inflows and net flows to DEEs peaked in 2007 before the explosion of the subprime debacle (Table 1, Figure 2). FDI in DEEs increased rapidly with the acceleration of growth, but a major part of the increase in inflows was in portfolio investment. Lending attracted by carry-trade profits due to large interest-rate differentials with major AEs, notably the yen carry-trade, played an important part in this process. Many unleveraged Japanese investors also joined in the search for yield in conditions of near-zero interest rates and stagnant equity prices in that country. Such inflows into target countries, such as Brazil and Turkey, with much higher interest rates often led to appreciation of their currencies, thereby raising the return on arbitrage capital. Short-term money was also attracted by the prospect of currency appreciation in countries like China, where interest rates were relatively low (IIF, October 2008; SAFE, 2011). Favorable interest-rate differentials and upward pressures on currencies made a major contribution to the escalation in private borrowing abroad in several DEEs.

**Table 1. Private Capital Flows to Emerging Economies
(billions of dollars)**

	2003	2005	2007	2008	2009	2010
Net Private Inflows	280	642	1285	594	644	990
Equity	185	360	597	422	490	571
Direct Investment	137	289	500	509	357	371
Portfolio Investment	48	71	97	-86	133	200
Private Creditors	95	282	688	172	154	419
Commercial Banks	24	189	451	29	-10	172
Non-banks	71	93	237	143	164	247
Net Private Outflows	-143	-497	-825	-772	-453	-573
Equity Investment	-46	-89	-277	-229	-268	-269
Resident Lending/Other	-97	-407	-547	-544	-185	-305
Net Private flows	137	145	460	-178	191	417

Source: IIF (October 2010 and June 2011).

The surge in capital inflows was accompanied by rapidly narrowing spreads on emerging-market debt. The average spread, which had peaked at 1400 basis points after the Russian crisis, fell continuously from mid-2002 onwards, coming down to 200 basis points in the first half of 2007. As noted by the IMF GFSR (2004: 66), “liquidity and an increase in risk appetite [were] relatively more significant influences on spreads than fundamentals.” Indeed, most DEEs enjoyed the increased risk appetite and shared in the boom in capital inflows, irrespective of their underlying fundamentals. During 2002-

07, the emerging economies of CEE received as much foreign private capital as Asian DEEs, even though their total income was one-fifth of the total income of Asia, and their economic performance was not as impressive.

3.2 The Lehman collapse and contraction in capital flows

As the subprime debacle started to reverberate across the world, private capital inflows to DEEs initially held up, despite the growing strains in credit and asset markets in the US and Europe. However, with the collapse of a number of leading financial institutions in the US, notably Lehman Brothers, the boom came to a halt in the second half of 2008. Net portfolio equity and debt inflows and net commercial lending all collapsed, turning negative in the course of 2008-09 as non-residents pulled out of equity and bond markets and international banks cut lending. Total net private inflows were more than halved, but resident outflows proved to be more resilient. Consequently, there was a massive drop in net flows from the peak reached in 2007 (Table 1, Figure 2).

There were many reasons for this sudden stop and reversal. First, the volatility racing through financial markets led to extreme risk aversion on the part of international lenders and investors. Before the outbreak of the crisis, premiums on credit-default swaps (CDS) were below 200 basis points for most DEEs. They started to shoot up at the end of August 2008, reaching, on average, almost 600 basis points for Latin America and CEE. Similarly, the average EMBI Global Yield Spread rose from some 170 basis points at the end of 2006 to over 720 basis points at the end of 2008 (IMF GFSR, April 2009; BIS, 2009). This resulted in a narrowing of the margin of return over risk on arbitrage money, thereby triggering a rapid reversal of the carry-trade and a flight to safety into US Treasuries.

Global deleveraging by highly indebted investors, tightened liquidity constraints, and higher margin calls added momentum to the exit, while falling commodity prices forced a rapid decline in investment in commodity-rich economies. Foreign bank subsidiaries in some DEEs also funded their parent banks in AEs during the crisis in order to strengthen the latter's liquidity and overall financial positions (BIS, 2010a). Finally, as it became clear that DEEs would not be immune to the turbulence rocking the AEs, and that prospects for any economic growth there were not encouraging, there was not much appetite for equity investment.

Also, greater international financial instability and the disappearance of appetite for risk were reflected in a strengthening of the dollar vis-à-vis other major currencies, notably the Euro, even though the US was at the center of

the crisis. The dollar in general and US Treasury Bills in particular were regarded as a safe haven, a perception that was reinforced by the reversal of the carry-trade. The surge in dollar funding costs and currency mismatches on corporate balance sheets generated by losses on dollar securities also added to the demand for dollar assets (McCauley and McGuire, 2009).

3.3 The current boom

Both the strength of the dollar and the contraction in capital inflows to DEEs were short-lived. The dollar started to weaken during the first half of 2009. Simultaneously, private capital inflows to DEEs started to recover, led by purchases of equities, although FDI inflows remained weak. According to the IMF WEO (April 2011), after falling from \$1.64 trillion in 2007 to \$484 billion in 2009, inflows would climb back to \$812 billion in 2011. Again, according to the latest estimates by the IIF (June 2011), net private inflows to the 30 most important emerging economies would be some \$1.04 trillion in 2011, compared to an all-time high of \$1.285 trillion in 2007.

As in previous episodes, a key factor in the ongoing boom in capital flows is a sharp cut in interest rates and rapid expansion of liquidity in major AEs, notably the US. This has not been translated into a significant increase in private lending and spending within the US because of problems on both the supply and demand sides of the credit markets. Rather, this excess liquidity has spilled over into the global arena in a search for yield in DEEs, and this has put many of these governments on the defensive, believing that the US is deliberately carrying out a competitive devaluation of the dollar.

Another factor in the post-Lehman surge in capital flows to DEEs is their superior economic performances and prospects for future growth when compared to the AEs. In addition, although interest rates in many major DEEs were initially brought down in reaction to crisis-caused dislocations, the arbitrage gap widened in 2010 as they reversed course and pushed interest rates upward again. At the same time, US interest rates have continued unchanged at very low levels. As a result, the carry-trade has been re-established, and key emerging economies with high interest rates, such as Brazil, India, and Turkey, have become the main targets (IIF, October 2010). Low interest rates in the US, together with the ongoing weakness of the dollar, made the dollar the new funding currency for the carry-trade, replacing traditional carry-trade currencies like the yen and the Swiss franc (BIS, 2010b).

Furthermore, due to the unprecedented difficulties encountered by large financial institutions in the US and Europe and the towering nature of public-sector deficits and outstanding debt there, the crisis has produced a sea change

in investors' perception of geographical risks. Suddenly, AEs are not automatically superior to DEEs as investment destinations. Perhaps for the first time in post-war history, the risk margin between AEs and DEEs has narrowed as certain members of the industrialized world seem likelier to default on their public and private debts. A natural outcome is that DEEs are now given greater weights in the equity and bond portfolios of investors within AEs.⁶ The reduced risk margins, together with increased interest-rate differentials, have widened the arbitrage opportunities beyond those of the pre-Lehman years, making the carry-trade type of borrowing and lending even more attractive.

3.4 Financial and commodity cycles in the 2000s

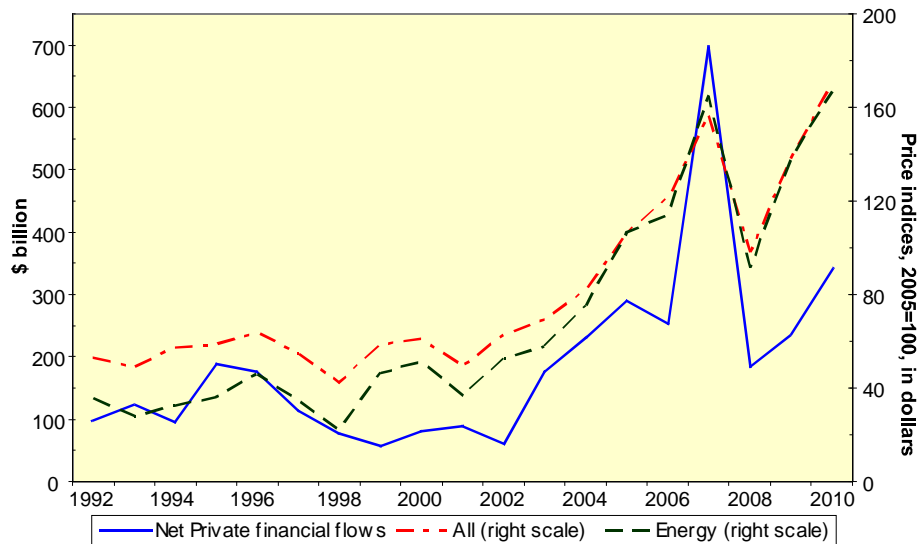
Like capital flows to DEEs, commodity markets have shown considerable swings in the 2000s, according to shifts in the markets' assessment of risks and returns. This is largely because these markets have rapidly become more like financial markets, with several commodities being treated as a distinct asset class and attracting larger amounts of money in search of profits from price movements (Domanski and Heath, 2007; IATP, 2008; Mayer, 2009). During 2003-10, assets allocated to commodity-index trading strategies are estimated to have shot up from \$13 billion to \$320 billion, and the number of outstanding contracts in commodity futures and options soared from 13 million to 66 million (Masters, 2008; World Bank, 2011a; BIS, 2010b).

Evidence suggests that the spreading phenomenon of financialization has reduced the traditional segmentation of commodity markets by ushering in a diversity of new factors to affect real supply and demand for different products. There has thus been an increased correlation among commodities, particularly those subject to index trading, and synchronization of boom-bust cycles in various commodity markets (Tang, 2011, Nissanke, 2011).

The post-2000 swings in commodity markets show a strong correlation with capital flows to DEEs and the exchange rate of the dollar (Figures 3 and 4). The evolution of the stock-market value of a typical commodity-related company and mutual-fund investments in commodities also looks strikingly similar to the boom-bust cycles in capital flows to DEEs—after rising steadily, they both declined in late 2008, but recovered rapidly afterward (Oliver Wyman, 2011).

⁶ The weight of emerging-market equities in the All-Country World Index of the MSCI (Morgan Stanley Capital International) rose from less than 5 percent in 2003 to 13 percent in 2009, and this is expected to increase further in the coming years – see IIF (January 2011) and IMF GFSR (October 2010).

Figure 3. Net Private Capital Flows to DEEs and Commodity Prices, 1998-2010

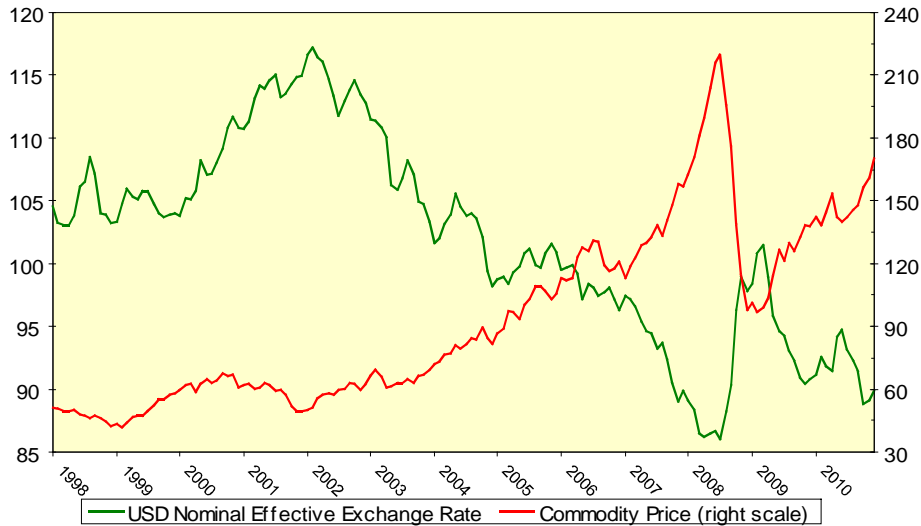


Source: IMF, WEO, 2010 database.

With rapid liquidity expansion and acceleration of growth in the global economy, both oil and non-oil commodity prices started to rise in 2003, gaining further momentum in 2006. The factors driving the boom included the strong pace of economic activity in those DEEs where the commodity-intensity of growth was high, low initial stocks, weak supply response, and a relatively soft dollar. In the case of food, diversion to bio-fuels, droughts, changing demand patterns in DEEs, and the high cost of fertilizers and transport due to high fuel prices all played a role. The upward trend in prices also attracted index-based investments in commodity futures, creating bubble-like increases (Gilbert, 2010).

Despite growing financial strains in the US during 2007 and much of 2008, index trading in commodity futures continued to forge ahead, contributing to the acceleration of price increases. Prices reached a peak in July 2008, when investment in commodity futures reached an unprecedented \$317 billion, and the number of contracts for commodity derivatives rose rapidly (Masters and White, 2009; BIS, 2010b). However, they all experienced a sharp downturn in August 2008, as investors unwound big positions in oil and non-oil futures, more or less at the same time as capital flows to DEEs were reversing and the dollar was starting to strengthen.

**Figure 4. Commodity Prices and the Dollar
(Index numbers, 2005=100)**



Source: IMF (commodity prices) and BIS (nominal effective exchange rate).

This boom-bust cycle in commodity prices in the middle of the subprime crisis was largely due to shifts in market sentiment regarding the future course of prices. Initially, throughout 2007 and much of 2008, the subprime crisis was seen as a hiccup. It was not expected to generate a deep recession or a glut in commodity markets, particularly since DEEs were expected to evade any ripples that might spread outward from the mature markets. Any downturn in economic activity was expected to be short, followed by a rapid and robust recovery. For its part, the IMF was quite optimistic, downplaying the difficulties and revising its growth projections upwards during early summer 2008 (Akyüz, 2010c; IMF WEO Update, July 2008). However, with the economic and financial picture in the US darkening by the day, crowned by the collapse of Lehman Brothers, sentiments turned sour. Almost simultaneously, there was a rushed exit of capital from commodities and DEEs and a flight to the perceived safety of the dollar. By the end of October 2008, food was 27 percent and oil 45 percent below their peaks.

The post-Lehman upturn in commodity prices also coincided with the recovery of capital flows to DEEs and the decline of the dollar. Index trading has played an important part in this. After falling in late 2008 and early 2009, this activity started to gain momentum as commodity prices turned up in spring 2009 on the back of quickening demand from DEEs, notably China. This demand was fanned by an environment of expanding international li-

quidity and historically low interest rates. Investment in commodities reached \$320 billion in mid-2010, a figure last seen during July-August 2008, when commodity prices peaked, while the number of exchange-traded options and futures rose to unprecedented levels (World Bank, 2011a; BIS, 2010b).

The parallel movements in capital flows, commodity prices, and the dollar are driven not only by such common influences as market assessments of risks and return and global liquidity conditions. They are also directly linked to one another. A weaker dollar often leads to higher commodity prices because, *ceteris paribus*, it raises global demand by lowering the non-dollar prices of commodities. Moreover, changes in commodity prices have a strong influence on investments in commodity-rich DEEs. This is not limited to oil and minerals. With increased interest in bio-fuels and hikes in food prices, acquisition of farmland in DEEs has become an attractive form of investment. In Africa alone, such deals made in 2009 are estimated to have reached 56 million hectares (World Bank, 2011b).

4. The changing nature of capital flows and the vulnerability of DEEs to boom-bust cycles

In comparison with previous cycles, private capital flows to DEEs are now manifesting certain distinct features regarding their destination, size, and composition. They are now more synchronized across countries than in the past. The amounts involved are much higher. They are no longer unidirectional, from AEs to DEEs—there are significant resident outflows from DEEs, and capital flows among DEEs have been growing rapidly.

More importantly, the composition of inflows has shifted significantly towards local-currency instruments of recipient DEEs, including highly volatile portfolio equity investments—described as the “canary in the coal mine in emerging-market capital-flow cycles” (IIF, October 2009: 10)—and borrowing and investments related to the carry-trade. With the opening of local stock markets to outsiders and generous incentives for FDI, an ever-greater part of capital inflows has gone into equity investments. On the other hand, because of their stronger payment positions, the need of DEEs for foreign-currency debt has diminished significantly, and the debt of these countries held by non-residents is increasingly dominated in domestic currencies. Likewise, there has been a rapid increase in local-currency debt issued by government and corporate borrowers in emerging economies, from some \$92 billion in 2003 to \$437 billion in 2010, and a growing number of DEEs have opened their domestic debt markets to non-residents (Curran, 2011). Although there are no comprehensive statistics on the extent to which such debt is held by non-

residents, available evidence suggests that debt-related flows “have become increasingly dominated by local market instruments, with creditors eager to take both currency and interest-rate risks.” (IIF, October 2008: 6). Similarly, the IMF GFSR (June 2011: 3) notes that emerging-market corporate bonds are now increasingly seen as substitutes for US corporate high-yield bonds. As a result, the share of direct plus portfolio investment in total inflows to DEEs has been rising—in the pre-Lehman boom, these two accounted for about 70 percent of total inflows, compared to some 40 percent during the 1990s.

The bigger role of portfolio inflows is mirrored in the presence of more non-residents in the securities markets of DEEs. In some Latin American and European emerging economies, the share of non-residents in actively traded shares has come to exceed that of residents. Even many Asian economies with stricter conditions of access have seen rapid growth of the foreign presence in their stock markets (Balakrishnan *et al.*, 2009, and McCauley, 2008, BIS, 2009). The share of non-residents in long-term local-currency-denominated bonds also climbed substantially in several Southeast Asian countries (World Bank, 2009).

These changes in the composition of capital flows have important consequences for the nature of the vulnerability of DEEs to external financial shocks and boom-bust cycles in capital flows. Instability generally results from macroeconomic imbalances and financial fragility built up during the surge in capital inflows in three main areas.

First, surges can produce or contribute to unsustainable exchange rates and current-account deficits. This effect is largely independent of the composition of capital inflows. A surge in FDI could have the same effect on the exchange rate, exports, and imports, as would a surge in portfolio investment or external borrowing. If such imbalances are allowed to develop, sudden stops and reversals could result in currency and balance-of-payments crises, particularly when external liabilities are short-term and denominated in foreign currencies, unless there are adequate reserves or unlimited access to international liquidity.

Second, extensive dollarization of liabilities and currency and maturity mismatches on balance sheets create financial fragility. This would be the case particularly when borrowing is in foreign currency and short-term. When capital flows dry up and the currency dives, mismatches could result in increased debt-servicing troubles and defaults.

Finally, capital surges can produce credit and asset bubbles. Credit expansion can occur when banks borrow abroad to fund domestic lending, currency-market interventions are not fully sterilized, or inflows lower long-term inter-

est rates. The link between capital flows and asset markets becomes more influential with a greater presence of foreigners in domestic markets. Asset bubbles feed on portfolio investments as well as many types of capital inflows that are traditionally included in FDI, such as acquisitions of existing firms and real-estate investments.⁷ Reversal of capital flows could then leave behind a credit crunch and asset deflation, with severe macroeconomic consequences.

The rising proportion of the external liabilities of DEEs that is denominated in their own currencies is something of a game-changer where non-resident lenders are concerned. To be sure, it transfers the currency and interest-rate risks to international lenders and investors, and reduces currency mismatches on balance sheets, which wreaked havoc in past DEE crises. However, it also reinforces the influence of capital flows on domestic securities markets and heightens the risk of exposure to international contagion, as seen during the Lehman mess. Amplifying this exposure even further is the spreading tendency of DEE residents to diversify their portfolios by investing abroad. Indeed, stock prices in DEEs are now almost in lockstep with net private capital flows, and a correlation between global and emerging-market equity returns has become more visible in recent years as the two-way traffic in capital flows between emerging and mature economies has burgeoned (IIF, October 2007; BIS, 2007).

In previous booms, it was the debtors who were highly leveraged, taking on both currency and interest-rate risks by borrowing short-term in foreign currencies. Now international lenders and investors have become increasingly leveraged by borrowing in their own currencies and investing in the local-currency instruments of DEEs. Thus, tightened credit conditions in AEs can lead to a rapid withdrawal by highly leveraged investors from DEEs, causing asset and currency crashes, as observed during the Lehman meltdown. Furthermore, with a heavier foreign presence, domestic bond markets may no longer be relied on as a “spare tire” for local private and public borrowers, providing an escape route when access to external funding is interrupted (Jara, Moreno, and Tovar, 2009). Still, on the basis of past experience, many DEEs believe that running the risk of instability by over-borrowing in local currency is considerably less serious than having exposure to liability dollarization.

⁷ The distinction between direct and portfolio investment is quite arbitrary, and because of the way FDI is defined and recorded, it is not possible to identify the extent to which FDI really consists of investment in productive assets rather than in equities or debt instruments. For a discussion, see UNCTAD TDR (1999), and for the definition and coverage of FDI, see IMF (2010).

5. The impact of recent capital flows on DEEs

In previous boom-bust cycles, surges in capital flows generally created imbalances in all three areas noted above and in almost all major recipient countries. Consequently, when the flows suddenly stopped or reversed themselves, local currencies plunged, widespread debt-servicing pains and outright defaults became more common, and credit crunches and asset deflations began to crop up. The surge of recent years, on the other hand, did not always foster such imbalances in the major DEEs. The reason was that the nature and composition of capital flows had changed, as had the policy response. As a result, the impact on DEEs of the post-Lehman reversal of capital inflows was much less uniform than in the past (BIS, 2010a).

5.1 Build-up of fragility and imbalances during the pre-Lehman boom

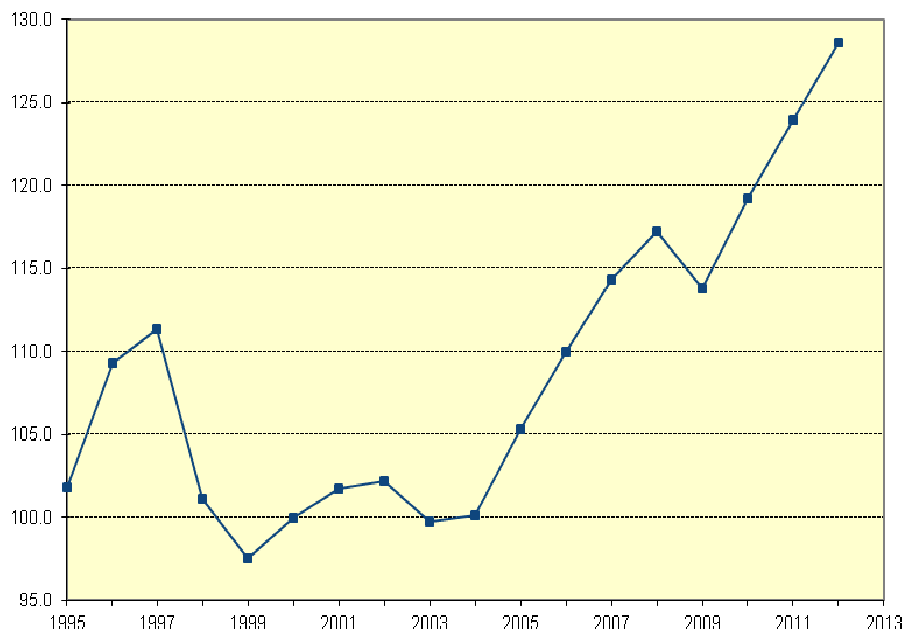
Generalized boom-bust cycles in capital flows are almost fully mirrored by movements of exchange rates of DEEs: rapid appreciation of the currency during surges followed by sudden wilting in the wake of the pull-out of capital. As seen in Figure 5, this pattern was clearly visible during the mid-1990s for the 30 top emerging economies. The 2000s also saw a similar boom-bust cycle in the currencies of major DEEs, except that currency-value rises during the pre-Lehman boom were much faster than those in the 1990s, and the downturn during 2008-09 was more moderate and shorter.

While all the major emerging economies faced upward pressures on their currencies during the pre-Lehman boom, the extent of appreciation varied significantly, depending on the policy response. Drawing on the lessons from the 1997 crisis, most East Asian countries avoided unacceptable upward movement of their monetary units, maintained healthy current-account positions, and accumulated large stocks of international reserves as self-insurance by intervening in the currency market. Conversely, several emerging economies in Latin America and CEE saw sizable appreciation of their currencies, even though some of the Latin Americans had also intervened in the foreign-exchange markets and added much to their international reserves.⁸ Every single emerging economy in CEE ran a current-account deficit during 2002-07, with the average hovering around 6 percent of GDP. This was also true for Turkey and South Africa; in the former, capital inflows added to deficits by leading to a substantial rise in the lira. Brazil, too, experienced overvaluation

⁸ See Akyüz (2010b) for Asia, and Jara, Moreno, and Tovar (2009) for Latin America. See also UNCTAD TDR (2007), IIF (October 2007), and BIS (2007).

of its currency but managed to maintain its current account broadly in balance, thanks to booming commodity prices.⁹

Figure 5. Emerging Markets Real Effective Exchange Rate (2005=100)



Source: IIF (June 2011). 2012 and 2013 are projections.

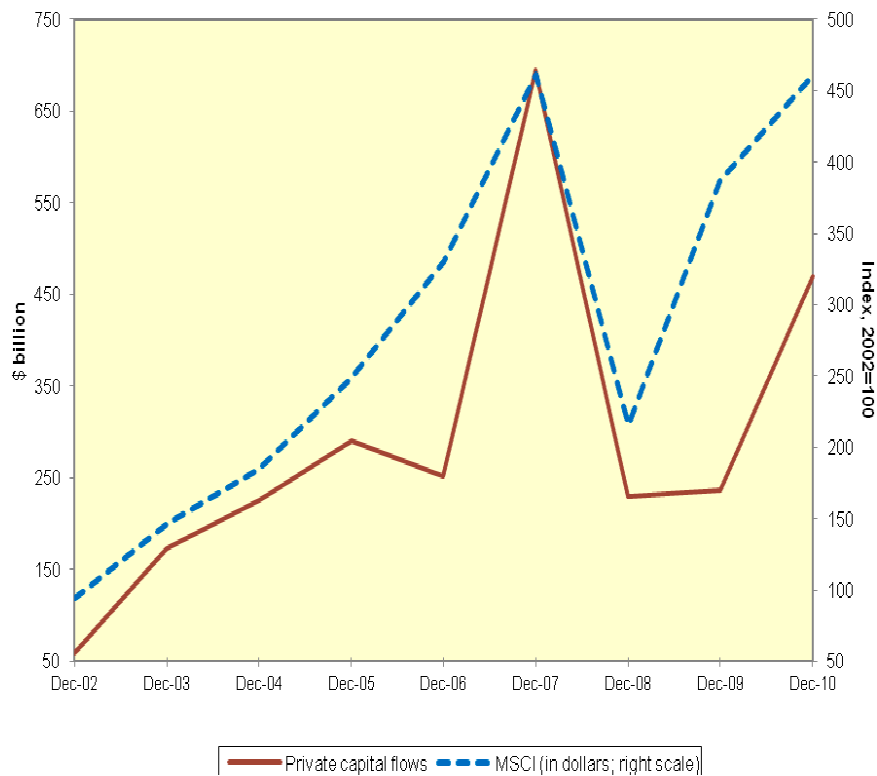
Public borrowing in foreign currencies slowed almost everywhere, but there was a rush into private borrowing in several DEEs. In Asia, private financial and non-financial corporations in India, Korea, and the Philippines are known to have engaged in “carry-trade-style” short-term external borrowing, particularly through low-interest yen-linked loans (ESCAP, 2010; BIS, 2009; and Lee, 2010). In CEE, banks borrowed abroad in both short-term and long-term markets in order to fund their domestic lending (IIF, January 2009). Foreign banks in particular carried considerable currency mismatches on their balance sheets (BIS, 2010a). In Latin America, the degree of currency and maturity mismatches in the corporate sector fell compared to the 1990s, but there was still considerable off-balance-sheet foreign-exchange exposure

⁹ It is estimated, for Latin America as a whole, that terms-of-trade gains after 2002 improved the current-account balance by some 4 percent of GDP; see Jara and Tovar (2008).

through derivative positions, notably in Mexico and Brazil (Jara, Moreno, and Tovar, 2009; BIS, 2009).

During the pre-Lehman surge, domestic equity markets in major DEEs also raced upward (Figure 6). Rapid domestic credit expansion and low interest rates were mostly responsible for this. As in mature economies, monetary policy was expansionary, and interest rates were low by historical standards. However, the flood of capital from abroad also contributed to the rapid expansion of liquidity, since government intervention operations in their foreign-exchange markets could not always be fully sterilized.

Figure 6. Net Private Capital Flows and Equity Market Index in DEEs



Source: IMF, WEO, 2010 database and MSCI.

Equity prices in most emerging economies shot up between 2002 and 2007, both in dollar and local-currency terms. The performance was particularly robust in Brazil, China, India, and Turkey. That such increases more

likely reflected speculative bubbles than improvements in underlying fundamentals was cautioned by the IIF (March 2005: 4): “There is a risk that the pickup in flows into some emerging-market assets has pushed valuations to levels that are not commensurate with underlying fundamentals.” Some Asian countries, notably China and India, also experienced property bubbles that were fueled by cheap money, speculation, and increased foreign demand for commercial real estate (Akyüz, 2010a).

5.2 The Lehman collapse and the reversal of capital flows

With the global flight of money to safety in autumn 2008, there was a generalized downward pressure on the currencies of almost all DEEs (Kohler, 2010). In the end, most saw declines, even those with strong payments and reserve positions. Among the major DEEs, India, Korea, Turkey, and South Africa suffered heavy selling pressures and sinking exchange rates. Brazil, Korea, Mexico, and Singapore established or bolstered bilateral swaps with the US Fed, and some DEEs, including Mexico and Colombia, sought access to the newly established Flexible Credit Line at the IMF. Fleeing capital and falling exports meant large reserve losses for India and Korea, while most countries finding themselves in the same predicament actually welcomed the weakening of their currencies and abstained from using their reserves to try to stabilize them.

Even worse, external adjustment proved highly deflationary for those whose current-account deficits were large, such as Turkey and several countries in CEE. Even though many of these were less dependent on exports for growth, and their trade was not as badly affected as East Asia’s had been, they endured contractions in GDP, and these were commensurate with the losses incurred during the crises of the 1990s and early 2000s. This negative growth could have been much greater had capital flows failed to recover quickly in 2009.

Equity markets in all the DEEs underwent heavy selling pressures following the Lehman implosion. Over 80 percent of the gains enjoyed by these markets during the earlier boom were lost in a matter of months. The property bubble in China came to an end in December 2008, with house prices falling for the first time in many years. This forced the Chinese authorities to take measures to prop up the property market. Other governments came to the rescue of their highly exposed private sectors, which had to repay maturing debt at a time when their access to international markets was practically non-existent. Central banks in Brazil, Mexico, and Russia dipped into their reserves to supply liquidity so that local businesses could keep current on their payments to their international creditors (IIF, June 2009; BIS, 2009). This

interlude of currencies heading downward caused comparatively little damage to corporate financial positions, unlike the earlier Asian Crisis, because of government support, limited exposure to currency risks, and, above all, the short duration of the lull in capital inflows and the nervousness in the foreign-exchange markets.

5.3 Recovery and renewed surge in capital inflows

With the return of capital flows in early 2009, the downward pressures on currencies were soon reversed, and most of them have since seen momentum carry them upward. Several economies with relatively large and growing current-account deficits, notably Brazil, India, Turkey, and South Africa, have had their currencies appreciate faster than East Asian surplus countries—China, Korea, Malaysia, Thailand, the Philippines, and Singapore.¹⁰ Turkey and South Africa, which had had large and widening current-account deficits in the high-spirited pre-Lehman days but saw these narrow significantly during the Lehman collapse, have been witnessing widening deficits and appreciating currencies again. This is also true of Brazil and India, which had managed to maintain broadly balanced current-account positions before the outbreak of the global crisis.

Equity markets bounded back starting in 2009, and the MSCI index for emerging-market equities in local currency leapt by about 60 percent in that year and another 12 percent in 2010. Increases were even faster in dollar terms because of the higher value of local currencies—by 75 percent and 16 percent, respectively. However, with the downside risks of weak or no growth and instability in AEs, and rising inflation in certain DEEs, markets displayed renewed volatility through 2011.

In a number of DEEs, the continued flood of capital has been adding to credit expansion, posing the risk of overheating the economy and guaranteeing a hard landing later—something now recognized by the IMF (2011). In most major emerging economies, including Brazil, China, India, and Turkey, private-sector credit has been rising faster than nominal GDP. China has introduced several measures to tame commodity and housing prices. In Brazil, domestic credit expansion and debt accumulation have become so fast-moving that there are suggestions that the country may be heading for its own subprime crisis (Marshall, 2011). The Central Bank of Brazil tightened

¹⁰ While currency appreciation in surplus Asian countries, notably China, could be seen as a welcome development for its role in reducing global imbalances, it is not clear whether currency movements alone could overcome the problem of underconsumption in China and overconsumption in the US. For a discussion, see Akyüz (2011).

monetary policy and raised interest rates in January 2011 in order to bring inflation closer to its target. The Indian Reserve Bank has also taken similar action. In Turkey, there has been not only a worrisome expansion of credit but also growing current-account deficits, expected to reach double-digit figures as a percentage of GDP. The Central Bank cut the policy rate in August 2011 in an effort to prevent a significant fall-off of growth after a record-breaking first quarter and to engineer an orderly external adjustment.

6. What is next?

The build-up of macroeconomic imbalances and financial fragility in several DEEs that had started with the subprime bubble but was interrupted by the Lehman panic has thus resumed with greater force since early 2009. The extent to which the ongoing wave of capital movements presages instability and another crisis depends very much on how long it will last and how it is managed by the recipient countries. Experience shows that it is almost impossible to predict the timing of stops and reversals in money flows, given that the events that set them off lie in the future. This is true even when the conditions that drive the surge in capital flows are seen to be unsustainable by most observers.

The most recent projections by the IMF WEO (April 2011) and IIF (June 2011) are for further increases in capital inflows to DEEs during 2011-12. How far the boom will continue depends largely on what happens to the attractive attributes of DEES that are now drawing international investors and lenders, including higher interest rates, reduced risk margins, and faster economic growth. The demand for external borrowing remains subdued in many DEEs, and FDI inflows may not return to the levels of the pre-Lehman boom years to take up the slack. Likewise, the recent tightening of monetary policy in several major DEEs in an attempt to tamp down inflation may moderate portfolio investments. Nevertheless, no major let-up in overall capital flows to DEEs is expected as long as the risk-return profile and growth differentials continue to favor them.

A steady return to “normalcy” in the US and Europe, featuring economic growth, an easing of unemployment, and gradual monetary and fiscal tightening, could no doubt stabilize capital inflows to DEEs without the painful accompaniment of sudden stops and reversals. However, such a process is not in sight. The US economy is now marked by deflation-like conditions, and, in order to sustain recovery and accelerate growth, the Fed wants to encourage inflation in both product and asset markets through aggressive monetary easing (Bernanke, 2010). However, so far, there has not been much evidence of

this happening. Rather, US monetary expansion is boosting the quickening pace in commodity, credit, and asset markets in major DEEs, many of which are already risking overheating.

If the easy-money policy in the US, strong growth in the DEEs, and political unrest in some oil exporters continue to support the boom in commodity markets, the Fed could eventually face inflation, but not the kind it wants. In such a case, the onrush of funds into DEEs could be ended in much the same way as the first post-war one was in the early 1980s—that is, by an abrupt shift of the US Fed to a contractionary monetary policy even before the economy fully recovers. However, a wage-price spiral is much less likely to emerge today than in the 1970s: it is a new world for labor, and its bargaining power is now only a shadow of its former self.

As already noted, the continuing high performance of commodity prices depends very much on strong growth in major commodity importers, notably China. Thus, a key question is if China can maintain vigorous growth in the face of sluggish markets in the AEs. As argued elsewhere (Akyüz, 2011), this calls for an expansion of domestic consumption, which, in turn, depends on a rapid increase in the share of household income in GDP. During 2008-09, China reacted to the fall-off in exports not so much with a consumption-centered stimulus package, but with a massive investment program. What followed was considerable excess capacity, not only in property and infrastructure but also in industries like steel, financed by rapid credit expansion and debt accumulation by local governments. As the effects of this package fade out, growth could decelerate to a rate far below the double-digit levels achieved before the global crisis hit, since exports cannot be expected to grow at the kind of rates—some 25 percent annually—seen before. If the US and EU enter a second dip due to mounting debts and growing pressures for spending cuts, China will be in much too weak a position to act aggressively to stoke rapid growth.

Moreover, a continued commodity boom could destabilize China far more than the US. Indeed, higher commodity prices appear to have worsened inflation in China more than in any other major economy. Chinese consumer prices have been rising rapidly, peaking at a rate of 6.5 percent in July 2011, the highest in more than three years. Interest rates and banks' reserve requirements have therefore been raised several times since October 2010 in an effort to bring inflation under control.

Thus, the combination of the slowdown in exports and monetary tightening designed to control inflation is likely to reduce growth in China to below pre-crisis levels. The decline will be even more severe if asset and credit bubbles

come to an abrupt end, and non-performing loans dominate the banking system. Such a scenario in China can, in turn, lead to a rapid turnaround in commodity prices and capital flows to DEEs, notably to commodity-rich countries.

A scenario along the latter lines was recently presented by Oliver Wyman (2011). According to this, the continued boom in commodity prices could cause rampant inflation in China. This could lead to a real appreciation of its currency, as long advocated by the US, but also slow its growth by triggering tighter monetary policy. A major slowdown of growth in China would reduce demand for commodities, both for real use and as hedges against inflation. This, together with the global oversupply built up during the boom, would bring down commodity prices, and the downturn would be aggravated by an exit of large sums of money from commodity futures. This would make investments in commodity-rich countries unviable and loans non-performing. Then risk aversion and a capital flight to safety, meaning out of and away from DEES, would be the order of the day.

Renewed financial turmoil in AEs can also destabilize DEEs by stirring up sentiment toward a flight to safety and bringing on reversal of capital flows and asset price declines. Despite the attention given to rising public debt in the US and the political battle over the debt limit and spending cutbacks, a sovereign debt crisis and sharp increases in rates on US government debt are highly unlikely. Indeed, even after the S&P downgrade, US bond rates have remained very low. The real Achilles' heel of global finance is now Europe, where default looms as an all-too-real possibility in the highly indebted periphery. As long as the EC and the ECB continue to pretend that this is mainly a liquidity crisis, the region will be mired in extreme instability and, eventually, messy defaults, with the attendant consequences for capital flows and financial stability in DEEs.

The flow of capital can also be brought to an end by a balance-of-payments crisis in a major emerging economy. An overnight about-face in the willingness of international creditors and lenders to maintain exposure to one such country with a mounting current-account deficit could set off a reversal of capital flows, leading to a fire sale throughout the DEEs, as in East Asia in the 1990s. Reversals can also happen as a result of a domestic banking and debt crisis brought about by credit, asset, and investment bubbles.

In all likelihood, the end of the current boom in capital flows will be disorderly and coincide with a reversal of the upswing in commodity prices. Those countries that have been enjoying the twin benefits of global liquidity expansion—that is, the boom in commodity prices and capital inflows—are especially vulnerable. Most of these are in Latin America and Africa, and some of them,

e.g., Brazil and South Africa, have been running relatively large current-account deficits despite the commodity bonanza. These countries could thus be hit twice, as happened to Mexico in the early 1980s, by falling capital inflows and commodity prices. The Southeast Asian countries and FEs, which have also been enjoying the run-up in commodity prices, are much less vulnerable because many have been running current-account surpluses, preventing inordinate currency appreciation, and accumulating large stocks of international reserves.

Exporters of manufactures and services that have also been running growing current-account deficits, such as India and Turkey, can benefit from a downturn in commodity prices, notably in oil, as they did during the Lehman bankruptcy and its aftermath, but they could still be laid low by declines in exports and a reversal of capital flows. They could encounter sudden downswings in the value of their currencies, asset price declines, and insolvency of companies in the private sector that suddenly find themselves on the wrong side of interest-rate and exchange-rate arrangements. Turkey, with double-digit current-account deficits, is particularly vulnerable to global financial stresses and a reversal of capital inflows.

The exporters of manufactures with large current-account surpluses and well-stocked international reserves, such as China and a few smaller East Asian economies, are less vulnerable to a new crisis, but they would not totally escape the shock waves. For these countries, a slowdown in capital flows and a softening of commodity prices brought about by exogenous factors could be benign, with a favorable impact on their balance of payments, exchange rates, and price stability. However, a rapid withdrawal of capital and reduced risk appetite on the part of the international investor community could set the stage for a painful asset-market correction and bring down growth considerably.

7. Managing capital inflows

7.1 Currency market interventions

The build-up of external imbalances and financial fragility in several major emerging economies during the current surge in capital flows, including currency appreciation, widening current-account deficits, and credit and asset bubbles, suggests that efforts to control and manage the surge have not always been very successful. A common response has been government intervention in currency markets. This has been widely practiced in East Asia, where various shades of managed floating have been followed since the 1997 crisis and,

in a few major cases, elsewhere. In Latin America, however, with some notable exceptions (e.g., Argentina), such interventions have seldom been practiced; instead, most have adopted inflation-targeting, leaving the currency largely to the free market. Since Central Bank purchases of foreign exchange imply expansion of the monetary base, interventions are often accompanied by efforts to sterilize their side effects on domestic credit conditions. These efforts may take the form of issuing interest-bearing government (or Central Bank) paper, creating fiscal surpluses, and raising reserve and liquidity requirements for the banking system.

Foreign-exchange market interventions in DEEs are relatively successful in stabilizing nominal exchange rates and preventing large-scale appreciation of the currency.¹¹ The consequent piling up of international reserves also provides self-insurance against sudden stops and reversals in capital flows. However, interventions are not of much use against other adverse consequences of an excess of capital flows. First, full sterilization is often difficult to achieve, and credit expansion cannot always be prevented. This may lead to price increases in both product and asset markets, thereby forcing up the real exchange rate. Second, interventions and reserve accumulation do not prevent currency and maturity mismatches on private balance sheets; they can only provide public insurance for private risks. Furthermore, they are costly both to the government and the nation as a whole because income earned on international reserves is typically much lower than the cost of foreign capital and the interest on government debt.¹² Sterilization by issuing government paper can also raise this cost by pushing up interest rates when inflows are largely into equity investments. In any case, accumulating reserves from unsustainable capital inflows has little economic rationale—in effect, this would mean that the foreign money entering the economy is not used for any productive purpose but kept in low-yielding foreign assets as an insurance against its exit!

7.2 Liberalizing outflows

Another response to a surge in capital inflows is to ease restrictions on outward investment by residents. This was practiced in several Asian countries during the pre-Lehman free-for-all, and it has again been introduced by some amid the renewed stream of money unleashed by the quantitative easing in certain AEs. Capital-account opening for resident outflows is clearly an alternative to sterilized intervention and has the advantage of avoiding carry-

¹¹ For a discussion of the issues reviewed in this paragraph and the Asian experience, see Akyüz (2009 and 2010a); for Latin America, see Jara and Tovar (2008).

¹² The annual cost of holding capital inflows in reserves was estimated to be around \$100 billion for DEEs as a whole in 2007; see Akyüz (2008).

ing costs for reserves. Private direct and portfolio investments abroad could also bring greater benefits than international reserves.

However, like interventions, such a policy cannot prevent currency and maturity mismatches on companies' balance sheets or reduce vulnerability to shocks arising from the greater presence of foreigners in domestic asset markets. Furthermore, liberalization of outward investment introduced as a counter-cyclical measure may not be easily rolled back when conditions change. Unlike official reserves, private assets abroad do not provide self-insurance for the economy against payment shortfalls and currency instability. Money going out in good times is not necessarily repatriated when needed. Rather, outflows may continue with full force and even pick up speed when inflows are reversed. In the emerging economies of the CIS, for instance, net private inflows fell by \$120 billion between 2007 and 2008, while net private outflows rose by \$100 billion (IMF WEO, October 2010).

7.3 Capital controls

Given the limits of interventions and liberalization of outward investment in dealing with some of the most damaging effects of money surges, capital controls remain a viable alternative. In principle, they can be applied either by source countries on outflows or by recipient countries on inflows or by both. While much of the recent debate has focused on controls over inflows into recipient countries, some have also called on the US government to manage speculative outflows for its own benefit (Griffith-Jones and Gallagher, 2011).

The US indeed imposed an interest-equalization tax in the 1960s to deter capital flight, but the conditions then were quite different. At the time, the principle of the gold-convertibility of the dollar (at a fixed rate) meant that outflows would deplete US gold reserves without bringing the benefits of a weaker dollar. This is certainly not the case today, when outflows from the US effectively put upward pressure on the currencies of its main trading partners, tantamount to a competitive devaluation of the dollar. On the other hand, it is not clear if control over outflows would lead to faster private spending in the US, since there are impediments to credit expansion on both the demand and supply sides. More importantly, the carry-trade brings considerable advantages to US financial institutions, helping them consolidate their balance sheets, which were gutted by the subprime debacle. Hence, the burden of control falls on the recipient countries.

A myth was promoted after the East Asian crisis to the effect that free capital movements should not cause concern if accompanied by effective prudential regulations. In the wake of the subprime crisis, it is now evident that

conventional regulations cannot secure the stability of the banking system, let alone the stability of capital flows. Still, since international capital flows are partly intermediated by domestic banks, if prudential regulations were appropriately extended to transactions involving foreign assets and liabilities, it would go a long way toward containing the destabilizing infections thrown off by capital rocketing around the world. Specifically, such beefed-up regulations would address the fundamental causes of fragility: maturity mismatches, currency mismatches, and exchange-rate-related credit risks (Akyüz, 2008).

However, even that would not be enough to guarantee stability, since even a higher proportion of capital flows occurs outside the banking system. Almost 70 percent of the total cumulative inflows to DEEs during 2002-07 were in the form of direct and portfolio investments. Thus, measures designed to control the entry of non-residents into equity and bond markets and manage the external borrowing of non-banks would also be needed.

Capital controls recently introduced by DEEs generally consist of market-friendly taxes on selected inward investments rather than direct and comprehensive restrictions.¹³ These are now conveniently called macroprudential, with the growing acceptance of the concept by the mainstream.¹⁴ FDI, among others, has often been exempted from the taxes, even though a surge in direct investment could have the same effect on the currency as other types of inflows. Besides, many inflows classified as FDI do not create new productive assets and are not distinguishable from portfolio investment. There are ways of slowing FDI without closing the doors to foreign investors in productive assets—e.g., through licensing procedures.

Measures recently adopted include taxes on portfolio purchases of fixed-income instruments and equities (Brazil), on foreigners' acquisitions of government bonds and banks' foreign-exchange borrowing (Korea), or on interest income and capital gains earned by foreigners (Thailand and Korea). These taxes are quite low compared to the profit opportunities presented by interest-rate differentials and capital gains from currency appreciation and hikes in

¹³ For a summary, see World Bank (2011a) and IIF (January 2011). For the Asian experience, see Nomura (2010). Some countries already had measures of control in place before the recent surge in capital flows. India, for instance, had ceilings on foreign purchases of sovereign and corporate debt and a withholding tax (Subbarao, 2010). However, this has not been enough to stem the upward pressure on its currency since mid-2009.

¹⁴ Strictly speaking, macroprudential policy refers to regulations applied to banks with a view to preventing practices that may threaten the stability of the financial system and the economy as a whole, as opposed to microprudential policy, which is designed to secure the financial health of individual institutions. For the origin and the current use of the concept, see Clement (2010) and Galati and Moessler (2011).

share prices. When interest-rate differentials and rises in equity prices are in double-digit figures, and the currency is on an upward trend, a 4 percent tax on portfolio investment or a 20 percent tax on capital gains and interest income would not make much of a dent in arbitrage profits and windfalls.¹⁵ Thus, it should not come as a surprise that the Brazilian entry tax is found to have had only a small impact on interest-rate arbitrage and to be ineffective in checking not only the overall volume of capital flows but also inflows into bonds.¹⁶ It is often such half-hearted attempts that lend support to the orthodox contention that capital controls do not work.

Experience shows that when policies fail to manage capital flows, there is no limit to the damage that international finance can inflict on an economy. This is now recognized even by some of the keenest advocates of financial globalization as a key lesson from the subprime catastrophe:

“Looking back on the crisis, the United States, like some emerging-market nations during the 1990s, has learned that the interaction of strong capital inflows and weaknesses in the domestic financial system can produce unintended and devastating results. The appropriate response is ... to improve private-sector financial practices and strengthen financial regulation, including macroprudential oversight. The ultimate objective should be to be able to manage even very large flows of domestic and international financial capital in ways that are both productive and conducive to financial stability.” (Bernanke, 2011: 24).

Likewise, the IMF also appears to be breaking away from its doctrinaire single-minded opposition to restrictions on capital flows, recognizing that for both macroeconomic and prudential reasons, there may be circumstances in which capital controls are a legitimate policy response to capital surges. However, while it is recognized that “controls seem to be quite effective in countries that maintain extensive systems of restrictions on most categories of flows,” those with “largely open capital accounts” are not advised to go in that direction but to use restrictions as a last resort and on a temporary basis (Ostry *et al.*, 2010: 5).

It is not, however, clear if the kind of approach advocated by the Fed and the IMF would protect DEEs against the risks posed by unstable capital flows. In all likelihood, macroprudential regulations would not be sufficient to contain the fragilities that capital flows could create in all three areas discussed above. Moreover, unlike the US, DEEs cannot adopt a policy of benign ne-

¹⁵ Indeed, return on emerging-market fixed-income securities in 2010 is reported to have ranged between 12 percent and 13 percent—see Curran (2011).

¹⁶ IMF GFSR (October 2010). Brazilian controls excluded not only FDI but also dollar borrowing by Brazilian banks and firms.

glect of their exchange rates nor ignore the consequences of unrestricted capital flows; they need to apply restrictions outside the banking system in order to limit external imbalances and head off fragility. Controls over both inflows and outflows should be part of the arsenal of public policy, used as and when necessary and in the areas and doses needed, rather than introduced as *ad hoc*, temporary measures, as advocated by the IMF. The instruments are well known, and many of them were widely used in AEs during the 1960s and 1970s (Swoboda, 1976).

8. Conclusions

At a time when the worst was generally thought to be over, DEEs have started to feel powerful destabilizing impulses from the AEs, notably the US, through capital flows sparked by their self-centered policy responses to the crisis. Bubbles have again been forming in credit, equity, and property markets, currencies are riding upward, and deficits are widening in several leading emerging economies. To contain the damage that would eventually be inflicted by their reversal, DEEs need to take much more determined action and introduce a comprehensive and effective system of controls.

Collectively, DEEs have been running a current-account surplus, and they do not need capital from AEs for external financing. In fact, they have been recycling their twin surpluses to AEs in the form of investments in reserve assets. However, a number of DEEs have been running structural deficits and are dependent on capital inflows to finance imports, investment, and economic growth. There is thus a need to establish, both at the regional and global level, reliable and stable mechanisms for South-South recycling from surplus to deficit countries without going through Wall Street or the City.

Finally, the current headaches produced by unstable capital flows and commodity prices show once again that the international monetary and financial system needs urgent reforms. Ways and means should be found to prevent major reserve-issuing countries from pursuing beggar-thy-neighbor monetary and exchange-rate policies and creating destabilizing impulses for others. The international reserve system should be reformed so that global monetary and financial stability is not left to the whims of the self-seeking policies of a single country enjoying an "exorbitant privilege." The question of regulation of commodity speculation should also be placed squarely on the table in order to put a stop to gambling with the livelihoods of the poorest segment of the world population and to promote food and energy security.

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On the Economic Content of the Gini Coefficient^{*}

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Abstract

This paper argues that the canonical assignment model, which is widely used in the study of wage determination, provides natural links to the standardized tools of inequality analysis, such as the Lorenz curve and the Gini coefficient. I show that an intuitive formula for the Gini coefficient of earnings can be derived using a standard assignment model. Such a model is useful in understanding the potential sources of earnings inequality, since it formulates the Gini coefficient as a function of the dispersion of worker skills, the distribution of firm productivities, and the strength of complementarities in production between capital and labor. The Gini coefficient increases with the dispersion of skills, the dispersion of productivities, and the labor share.

JEL codes: D31, D63, J31.

Keywords: Gini coefficient, earnings inequality, earnings equation, the assignment model.

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1. Introduction

This paper provides an economic interpretation of the Gini coefficient in a formal setting. Using the general framework developed by Tumen (2011), which builds on Sattinger's assignment model with two-sided heterogeneity [see Sattinger (1979, 1993)], a Gini coefficient for the distribution of earnings is derived. Formulating the Gini coefficient within such an assignment model serves two purposes. First, it allows us to think of earnings inequality as a byproduct of the optimal allocation of workers across firms. This is yet another affirmation of equity and efficiency being different concepts. Second, it allows us to analyze earnings inequality by separately characterizing the contribution of each economic parameter. The Gini coefficient is formulated as a combination of the following elements: **(i)** distribution of skills across workers (supply of skills), **(ii)** distribution of productive capital across firms (demand for skills), **(iii)** characteristics of the production technology that each firm uses, and **(iv)** properties of the mechanism ensuring an optimal resource allocation in the economy.

I conclude that the interactions between an increased relative supply of skills and an increased relative demand for skills change the Gini coefficient for the distribution of earnings. The direction of the change depends on the shape and the curvature of the earnings function. To be specific, when the earnings function is convex and increasing in skills – as suggested by the empirical evidence – the model generates two key mirror-image results: an increased relative demand for skills raises the Gini coefficient, as does an increased relative supply of skills.

The proposition that interactions between the demand for skills – which has often been associated with the skill-biased technical-change hypothesis – and the supply of skills determine the degree of earnings inequality is the subject of many papers, including Katz and Murphy (1992), Juhn, Murphy, and Pierce (1993), and Card and Lemieux (2001).¹ Similar to the majority of the papers in this literature, this paper makes predictions about the co-evolution of earnings inequality and the demand and supply conditions for workers of different skill categories. It differs from its predecessors in that it presents the source of earnings inequality as a matching technology that optimally assigns workers to firms in a top-down structure (i.e., with positively

¹ There is a strand of literature, the "revisionists," who argue that earnings inequality is an episodic event [see Lee (1999), Card and DiNardo (2002), and Lemieux (2006)]. Autor, Katz, and Kearney (2008) and Dustmann, Ludsteck, and Schoenberg (2009) reconcile these two views.

assortative matching). I show that the Gini coefficient is directly computable within such a framework.

The main contribution of this paper can be summarized as follows. The canonical assignment model provides a simple framework for analyzing the effect of inequalities among workers' and firms' abilities on the formation of wages. I show that this framework has a natural link – with easy closed-form formulas – to the universally accepted measures of inequality, such as the Lorenz curve and the Gini coefficient. This may improve our understanding of earnings inequality, as it provides us with a simple tool to explicitly formulate the Gini coefficient as a function of the inequality in workers' skills, inequality in firms' productive capacities, and the strength of complementarities between capital and labor in an economy. With the method I have developed, it is possible to independently analyze the effect of a change in the dispersion of skills, the distribution of productivities, or the strength of complementarities on the Gini coefficient. The link to the Gini coefficient is particularly important, since the time-series evolution of Gini coefficients (for incomes) is readily available for many countries. Putting the data and this method together, one can use the actual evolution of the Gini coefficient to arrive at useful results on the evolution of the sub-components of earnings inequality, which may have valuable as well as practical policy implications.

The paper is organized as follows. Section 2 develops the model. Section 3 presents the main results, derives the Gini coefficient, and relates the main results to various literatures. Section 4 is the conclusion.

2. The Model

There are two factors of production: capital and labor. Firms differ in the amount of productive capital they have. Workers differ in the amount of skills they own. Let c be the capital endowment of each firm and G_c be the cumulative density of firms with respect to capital. Similarly, let x be the level of worker skills and G_x be the cumulative density of workers with respect to skills.² Both densities are monotone, strictly increasing, continuous, and have positive support. There are no consumer preferences. There is a one-to-one match between workers and employers. Let $q(c, x)$ be the output produced by a type- c firm employing a type- x worker. The production function $q(c, x)$ is twice continuously differentiable in c and x , with $q_c > 0$, $q_x > 0$,

² For analytical tractability, we assume that the productive capacity of a firm and the skills of a worker are both univariate (rather than being multi-dimensional vectors).

$q_{cc} < 0$, and $q_{xx} < 0$. The output is homogeneous across firms. The aggregate output is the sum of the production from each match. The efficient assignment of workers across firms is the one that maximizes this aggregate output.

Each type- c firm maximizes profits by choosing the skill level x it employs. That is, given c each firm solves the problem

$$\max_x [q(c, x) - w(x)], \quad (2.1)$$

where $w(x)$ is the earnings function. The first-order condition is $w'(x) = q_x(c, x)$. Notice that the magnitude of $w'(x)$ depends on c . This defines a relationship $c(x)$ – the sorting rule – which is discussed below. The second-order condition is $q_{xx}(c, x) - w''(x) < 0$. Differentiating the first-order condition with respect to x yields

$$q_{cx}(c, x) \frac{dc}{dx} = w''(c) - q_{xxx}(c, x). \quad (2.2)$$

The right-hand side of Equation (2.2) is positive by the second-order condition. Therefore, the left-hand side must also be positive. For $\frac{dc}{dx} > 0$ (i.e., positive sorting) to be the optimal solution, the condition $q_{cx} > 0$ must be satisfied. In other words, to match the best workers with the best firms, we need to assume complementarity between skills and capital. This is consistent with the famous assortative-matching theorem presented by Becker (1973). To capture this, I use the Cobb-Douglas form

$$q(c, x) = c^\eta x^{1-\eta}, \quad (2.3)$$

where $\eta > 0$.³

Positively assortative matching features a solution in which the top workers are matched with the top firms. To be precise,

$$N_x \int_x^\infty g_x(t) dt = N_c \int_{c(x)}^\infty g_c(j) dj, \quad (2.4)$$

where $N_x > 0$ and $N_c > 0$ are measures of workers and firms, g_x and g_c are the probability densities of workers and firms, respectively. To get a preliminary impression, suppose for the moment that $\pi\%$ of the workers are

³ I assume constant returns to scale for algebraic simplicity.

above the skill level \bar{x} . Positive sorting implies that $\theta\%$ of the firms must have productivity greater than $c(\bar{x})$. Following Sattinger (1979), and for practical purposes that will soon become obvious, I assume that both workers and firms are Pareto distributed with densities

$$g_x(x) = (\gamma_x - 1)x^{-\gamma_x} \quad \text{and} \quad g_c(c) = (\gamma_c - 1)c^{-\gamma_c}, \quad (2.5)$$

respectively, where $\gamma_x > 2$ and $\gamma_c > 2$ (to ensure finite variances). Empirical and theoretical justifications to use Pareto distributions to represent the distributions of worker skills and firm productivity are provided by Simon and Bonini (1958), Adelman (1958), Axtell (2001), Luttmer (2007), Helpman, Itskhoki, and Redding (2010), and Tumen (2011). Lower γ_k , $k \in \{c, x\}$, means that the dispersion of the distribution and, therefore, the inequality is higher. Solving out the sorting equation (2.4) using these densities gives

$$c(x) = \frac{\theta}{\theta\gamma_c - 1} \frac{\gamma_x - 1}{x^{\gamma_x - 1}}, \quad (2.6)$$

where $\theta = N_c/N_x$. I assume $\theta \in (0, 1)$, which means that the number of workers is always greater than the number of firms. The sorting rule (2.6) defines a relationship between c and x . Obviously, $c'(x) > 0$. How fast c increases with x depends on the number of firms relative to the number of workers, and the distributional properties of workers and firms.

A positive reservation value, w_r , arises in this problem, since all firms operate, and there are some unemployed workers due to $\theta \in (0, 1)$. If x^* is the skill level of the marginal worker, then the competitive labor market forces would require that $w(x^*) = w_r$.

When the assumed functional forms and the sorting rule (2.6) are plugged into the first-order condition, three objects are pinned down: the earnings function, the reservation value, and the distribution of earnings. Below I provide formulas for these three objects.⁴ The first object, the earnings function, is

$$w(x) = \frac{(1-\eta)\theta\gamma_c - 1}{1+\varphi} x^{1+\varphi} + w_r, \quad (2.7)$$

⁴ To focus on the contribution of the paper, I directly give the final formulas, which I have derived by closely following the steps in Sattinger's model. These calculations are well known and are made explicit in Sattinger (1979, 1993) and Tumen (2011).

where

$$\varphi = \eta \frac{\gamma_x - \gamma_c}{\gamma_c - 1} \quad (2.8)$$

characterizes the shape and the curvature of the earnings function. When skills are less dispersed than capital, i.e., $\gamma_x - \gamma_c > 0$, the earnings function is convex in skills ($\varphi > 0$) and is concave otherwise.⁵ In other words, when there are more firms than workers on the right tail, the high demand for top skills produces convexity. On the other hand, when there are more workers than firms on the right tail, i.e., $\gamma_x - \gamma_c < 0$, the higher supply of top-quality workers generates concavity. In what follows, I will assume that the earnings function is convex in skills. The CEO-pay literature documents that small changes in skills result in large compensating differentials at the top of the earnings distribution [see Gabaix and Landier (2008) and Tervio (2008)].⁶ Moreover, Piketty and Saez (2003) find that the top earners have experienced enormous gains over the last three decades. These two insights justify the convexity assumption.

The second object, the reservation value, is

$$w_r = \left(\frac{1-\eta}{1+\varphi} \right) \theta \frac{\eta}{\gamma_c - 1} + \frac{1+\varphi}{1-\gamma_x} \quad (2.9)$$

⁵ Note that Equation (2.7) is derived under the assumption of constant returns to scale (CRS) technology. Deviating from this assumption does not change the principles of the solution we develop, but it does change the results qualitatively. To demonstrate this point, let $\eta > 0$ denote the capital share and $\chi > 0$ denote the labor share in the production technology. With CRS, $\chi = 1 - \eta$. Let's say that we deviate from this assumption and raise χ arbitrarily, which means that $\eta + \chi \geq 1$. A convex earnings function implies that there are more firms on the right tail than workers. Deviating from the CRS assumption by increasing the importance of skills will reinforce the degree of convexity in this example. Similarly, the case $\eta + \chi < 1$, with decreased χ , would weaken the degree of convexity. Analogous arguments can be developed for the effect of η .

⁶ Measurement of x poses a challenge to the empirical implementation of the assignment model. But it is possible to develop methods that allow for the derivation of an empirical distribution resembling the underlying ability distribution. For example, Tervio (2008) uses an assignment model to study the determinants of CEO pay. He uses the contribution that CEOs make to total economic surplus, compared to that of their theoretical lowest-type replacements in the sample. He argues that the underlying ability distribution can be inferred from the joint distribution of CEO pay and market value.

Finally, the probability distribution of earnings in this economy is

$$f(w) = \frac{\gamma_K - 1}{1 + \varphi} \left[\frac{1 - \eta}{(1 + \varphi) \theta^{1 - \gamma_C}} \right]^{\frac{\gamma_K - 1}{1 + \varphi}} (w - w_p)^{-\left(1 + \frac{\gamma_K - 1}{1 + \varphi}\right)}. \quad (2.10)$$

Notice that, due to the Pareto assumptions for the distributions of skills and productivities, the earnings distribution is also of the Pareto form $f(w) = (\gamma_W - 1) \lambda \gamma_W^{-1} w^{-\gamma_W}$, where the scale parameter is

$$\lambda = \frac{1 - \eta}{(1 + \varphi) \theta^{1 - \gamma_C}} \quad (2.11)$$

and the shape parameter is

$$\gamma_W = 1 + \frac{\gamma_K - 1}{1 + \varphi}. \quad (2.12)$$

The shape and scale parameters of the earnings distribution are functions of the (structural) parameters, and, as a result, earnings inequality changes when these parameters are altered. The proposition presented in the next section builds on this phenomenon.

3. Lorenz Curve and the Gini Coefficient

The Lorenz curve and the Gini coefficient are naturally associated with the Pareto distribution. Let \mathbf{F} be the Pareto cumulative density of earnings. Applying the general formulation [see Aaberge (2007) and Cowell (2009)], the Lorenz curve, denoted with \mathbf{L} , is

$$\mathbf{L}(\mathbf{F}) = 1 - (1 - \mathbf{F})^{1 - \frac{1}{\gamma_W}}, \quad (3.1)$$

and the Gini coefficient, $0 \leq \mathbf{G} \leq 1$, is

$$\mathbf{G} = 1 - 2 \int_0^1 \mathbf{L}(\mathbf{F}) d\mathbf{F} = \frac{1}{2(\gamma_W - 1) - 1}. \quad (3.2)$$

Clearly, the Gini coefficient is an increasing function of the earnings dispersion. Earnings dispersion is a function of three objects: dispersion of skills

(Y_x) , dispersion of capital (Y_c) , and the share parameter (η) . The effects of these three parameters on G can be analyzed separately.⁷

Proposition 1:

G increases when

- (i) skills become more dispersed, i.e., Y_x decreases;
- (ii) capital becomes more dispersed, i.e., Y_c decreases; and
- (iii) labor share increases, i.e., η decreases.

Proof: Differentiating Equation (3.2) only with respect to G and Y_x (taking into account that Y_x affects Y_w and φ), I obtain the following expression:

$$\frac{dG}{dY_x} = -\frac{2}{G^2} \left[\frac{1}{1+\varphi} - \frac{Y_x-1}{(1+\varphi)^2} \frac{\eta}{Y_c-1} \right].$$

I need to show that $\frac{dG}{dY_x} < 0$. The question is whether the term in brackets on the RHS is positive or negative. Simple algebra yields

$$1 > \frac{Y_x-1}{1+\varphi} \frac{\eta}{Y_c-1} \Rightarrow 1 > \eta.$$

Thus, everything comes down to whether η is less than or greater than 1. It is less than 1 obviously, which directly implies that $\frac{dG}{dY_x} < 0$. This completes part (i). For part (ii), I get

$$\frac{dG}{dY_c} = -\frac{2\eta}{G^2} \frac{Y_x-1}{(1+\varphi)^2} \left[\frac{1}{Y_c-1} - \frac{Y_x-Y_c}{(Y_c-1)^2} \right].$$

⁷ This result is not specific to the Pareto assumption. It can be extended to alternative settings. For example, the log-normal distribution, which fits into the assignment model [Sattinger (1993)], also has a Lorenz curve counterpart. If $\sigma_c > 0$ and $\sigma_x > 0$ are the standard deviations of the (log-normal) distributions of capital and skills, respectively, then the earnings equation in this setting – the counterpart of Equation (2.7) – can be formulated as $w(x) = C x^{\frac{\eta\sigma_c + (1-\eta)\sigma_x}{\sigma_x}} + w_f$, where C is a positive constant. Obviously, earnings $(w - w_f)$ will be log-normally distributed. It is well-known that the log-normal distribution also has a closed-form Lorenz curve counterpart [see Cowell (2009)]. Other functional forms are also possible. But the Pareto and log-normal distributions are the most frequently used distributions in the study of inequality.

The sign of $\frac{dG}{d\gamma_c}$ would be positive if the expression in brackets on the RHS were negative. This would be possible only if $\gamma_x < \gamma_c$, which is ruled out by the convexity assumption. This completes part (ii). For part (iii), I get:

$$\frac{dG}{d\eta} = -\frac{2}{G^2} \frac{\gamma_x - 1}{(1+\varphi)^2} \frac{\gamma_x - \gamma_c}{\gamma_c - 1} < 0,$$

as required. ■

Part (i) says that as the skills dispersion grows, firms start having access to a larger set of skilled workers. This enlarges the earnings horizon, and earnings inequality then widens. This is consistent with the stylized fact that, over the last few decades, American society has faced a dichotomy in schooling achievement as the high-school graduation rate has fallen (after correcting for the GED holders) while college enrollment among high-school graduates has risen. This points to a higher dispersion of skills in the society [Heckman and Masterov (2007)]. In part (ii), given the distribution of skills, a rise in the dispersion of productive capital makes the skilled workers scarce relative to the number of highly productive businesses. The incremental cost of buying an extra unit of skill becomes more expensive. Therefore, earnings inequality climbs. This story is in line with the skill-biased technical-change hypothesis in that a steady movement upward in the demand for skills has contributed to greater earnings inequality. In part (iii), the marginal product of labor goes up in tandem with the labor share. Under convexity, buying one more unit of skill becomes costlier, and inequality surges.

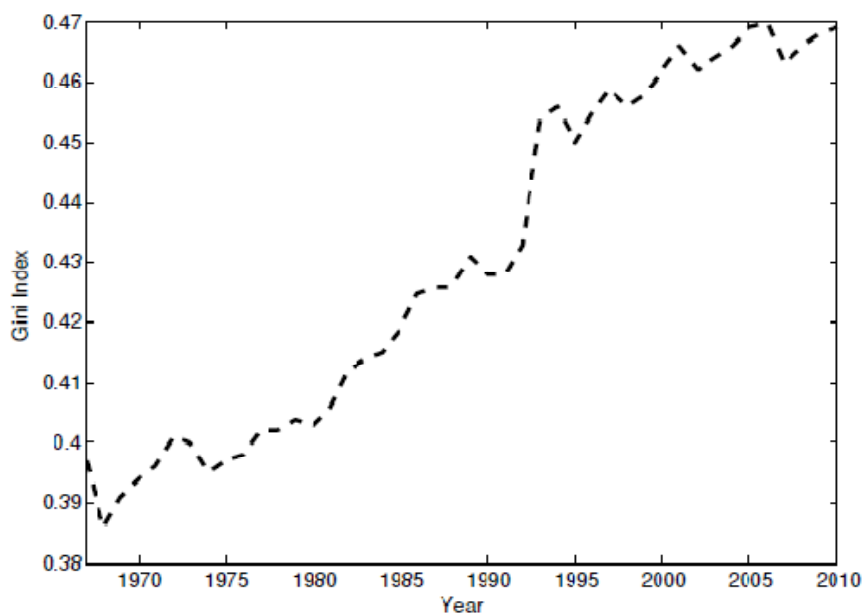
This analysis is useful because it provides an important source of identification. The Gini coefficient has already been calculated in many studies.⁸ The earnings-inequality literature estimates the degree of inequality using data on the demand and supply of skills. The approach developed in this paper opens up a new research direction in the study of earnings inequality. Using this model, one can input the Gini coefficient and answer various questions related to sorting (i.e., the sign and the strength of sorting) as well as the sources of inequality (i.e., whether the evolution of the distribution of skills or of the distribution of productivities drives the changes in inequality). Next, we summarize the data regarding the evolution of earnings inequality and its underlying factors in the United States.

⁸ For example, for the United States, see Kopczuk, Saez, and Song (2010) and calculations by the United States Census Bureau. Gini coefficient estimates are available for many countries.

4. Data and Empirical Implications

In this section, I summarize the findings in the relevant literatures regarding the recent trends in the Gini coefficient and the three variables – Y_{2t} , Y_{1t} , and η_t – that I analyze in Proposition 1. To ensure integrity of the discussion, I focus on the case of the United States.

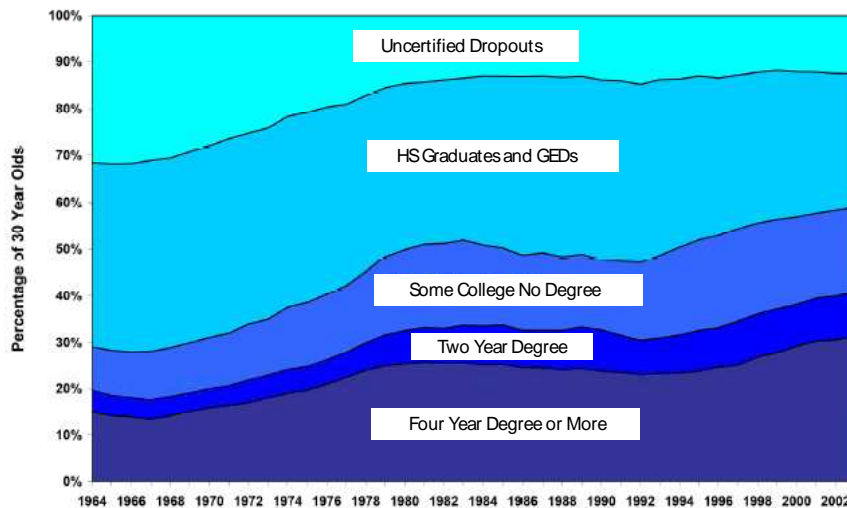
Figure 1. Gini Coefficient – Trends in US Earnings Inequality



Source: United States Census Bureau

The earnings inequality in the United States has displayed a significant upward trend over the last 40 years. Figure (1) plots the time-series evolution of the annual Gini coefficient estimates (from 1967 to 2010) provided by the United States Census Bureau. There is a striking and steady increase in earnings inequality as the Gini coefficient rises from 0.39 in 1967 to around 0.47 in 2010. Proposition 1 shows that, within the framework of the assignment model, such a rise in the Gini coefficient can originate from three sources: an increase in the dispersion of worker skills, an increase in the distribution of firm productivities, and an increase in labor share.

Figure 2. Dispersion of Skills – Trends in the Educational Composition of the US Workforce



Source: Heckman and Masterov (2007).

Figure (2) summarizes the trends in the educational composition of the US workforce using the CPS data. Clearly, the fraction of college- (and above) educated workers has risen relative to the fraction of high-school- (and below) educated workers. The figure makes clear a distinct acceleration in the dispersion of education in the workforce (under the assumption that education resembles skills). According to Proposition 1, Figures (1) and (2) are consistent with each other in that earnings inequality is rising parallel to the rise in the dispersion of skills.

Two distinct literatures clearly document that the dispersion of firm productivity has become more pronounced over the last 40 years. First, the SBTC literature argues that technological improvements have boosted firms' productive capacities, which in turn created strong demand for high-skill workers [see, for example, Katz and Murphy (1992)]. Technological progress has led to a greater proportion of highly productive firms, resembling a fatter right tail (and greater dispersion) for the productivity distribution. Second, the literature on decomposing TFP growth into firm-level productivities documents the jump in the dispersion of firm productivities within the US manufacturing sector [Dunne, Foster, Haltiwanger, and Troske (2004)].⁹ Overall, these studies show that, consistent with the predictions of Proposition 1, higher disper-

⁹ See Faggio, Salvanes, and Van Reenen (2010) for parallel evidence from the UK data.

sion of firm productivity causes more demand for high-skill workers, which is a major source of the increased earnings inequality.

The model's predictions regarding the link between labor share and earnings inequality are inconsistent with the facts. The model predicts that an increased labor share would contribute to more prevalent earnings inequality. However, empirical evidence supports declining labor productivity, rather than increasing, over the past 30 years in the OECD countries [Azmat, Manning, and Van Reenen (2011) and Glyn (2009)]. But, as Figure (1) clearly documents, earnings inequality has been worsening over this period.¹⁰

From the perspective of Proposition 1, greater dispersion of both worker skills and firm productivities contributes positively to earnings inequality, while a lower labor share contributes negatively to it. Thus, I conclude that the positive contributions coming from the skills dispersion and the productivity dispersion outweigh the negative effect coming from the labor share.

5. Concluding Remarks

This paper establishes explicit links between three literatures: the assignment literature, the earnings-inequality literature, and the literature on the statistical theory of inequality. I have shown that it is possible to attribute rich economic content to the Lorenz curve and the Gini coefficient. The model reveals that interactions between the dispersion of skills, the distribution of productive capital, and input shares determine the degree of earnings inequality. The major contribution is that these interactions, which uncover the connections between economic forces affecting earnings inequality and statistical measurement of inequality, can be directly observed over the Lorenz curve and the Gini coefficient. This framework can thus be used to identify the factors that contribute to movements in inequality. It also provides a decomposition theory for the sources of economic inequality.

¹⁰ Note that the convexity assumption is responsible for this result. It is assumed that concavity will result in the prediction that labor share and earnings inequality will move in opposite directions, which is consistent with the facts, but this is at the expense of producing adverse results from other predictions of the model.

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