Working Paper 2000-15 / Document de travail 2000-15

# Private Capital Flows, Financial Development, and Economic Growth in Developing Countries

by

**Jeannine N. Bailliu**

**Bank of Canada**  **Banque du Canada**

ISSN 1192-5434
ISBN 0-662-29250-2

Printed in Canada on recycled paper

Bank of Canada Working Paper 2000-15

July 2000

# Private Capital Flows, Financial Development, and Economic Growth in Developing Countries

**by**

**Jeannine N. Bailliu**

International Department
Bank of Canada
Ottawa, Ontario, Canada K1A 0G9
jbailliu@bank-banque-canada.ca

# Contents

## Acknowledgments

I would like to thank Ken Kletzer, Mike Dooley, Menzie Chinn, Larry Schembri, James Powell, Robert Lafrance, Mark Kruger, and Helmut Reisen for helpful comments and suggestions. Any remaining errors or omissions are mine. Financial support for an earlier version of this paper was received from the University of California Pacific Rim Research Program.

## Abstract

An important issue in the debate over the desirability of freer capital mobility for developing countries is whether capital flows have significant effects on economic growth. Proponents of capital account liberalization cite the growth-promoting attributes of capital inflows as a key benefit of financial integration for developing countries. Unfortunately, there is little empirical evidence to confirm or refute this claim, except for several studies that establish a positive link between inflows of foreign direct investment (FDI) and economic growth. This paper helps to fill the gap in the literature by investigating the role of private capital flows in the determination of economic growth using panel data for 40 developing countries from 1975–95. Unlike existing empirical work, this paper focuses on the effects of a broad measure of capital flows on economic growth, rather than on a more specific category, such as FDI, and it emphasizes the role played by the domestic financial sector in the process linking capital flows and growth. A dynamic panel-data methodology is used that controls for country-specific effects and accounts for the potential endogeneity of the explanatory variables. This study finds evidence that capital inflows foster higher economic growth, above and beyond any effects on the investment rate, but only for economies where the banking sector has reached a certain level of development. The results thus suggest that the domestic financial sector plays a pivotal role in ensuring that international capital flows do indeed promote economic growth in developing countries.



*JEL classification: F21, F43, O50*
*Bank classification: Economic growth; Capital flows; Financial development*



## Résumé

Pour déterminer si une plus grande mobilité des capitaux est souhaitable pour les pays en développement, il est important de chercher à établir si les mouvements de capitaux ont des effets tangibles sur la croissance économique. Les partisans de la libéralisation des flux de capitaux soutiennent que les effets stimulants de ceux-ci sur la croissance comptent parmi les principaux avantages de l'intégration financière pour ces pays. Malheureusement, exception faite de quelques études ayant établi un lien positif entre les investissements étrangers directs et la croissance économique, le petit nombre de travaux empiriques consacrés à la question ne permettent ni de confirmer, ni de réfuter cette affirmation. Dans le but de combler en partie cette lacune, l'auteure analyse le rôle des flux de capitaux privés dans la croissance économique au moyen de données longitudinales portant sur 40 pays en développement et s'étendant sur la période 1975-1995. L'étude se distingue des travaux empiriques déjà réalisés sur le sujet en ce qu'elle se concentre sur les effets d'un indicateur général des mouvements de capitaux sur la croissance économique, plutôt que sur l'incidence d'une catégorie précise, par exemple les investissements étrangers directs. Elle insiste aussi sur le rôle que joue le secteur financier intérieur dans la relation entre ces mouvements et la croissance. L'auteure fait appel à une méthode dynamique basée sur des données longitudinales qui tient compte des effets propres à chaque pays ainsi que de

l’endogénéité possible des variables explicatives. Elle arrive à la conclusion que les entrées de capitaux favorisent la croissance économique au-delà des simples effets qu’elles produisent sur le niveau des investissements, mais seulement dans les économies dont le secteur bancaire a atteint un certain niveau de développement. Ces résultats semblent donc indiquer que le secteur financier intérieur joue un rôle central en ce qui concerne la capacité des flux de capitaux internationaux de favoriser la croissance économique des pays en développement.

*Classification JEL : F21, F43, O50*
*Classification de la Banque : Croissance économique; Mouvements de capitaux; Développement du système financier*

# 1. Introduction

The past decade has witnessed a dramatic increase in international capital flows to developing countries. Net private capital flows to developing nations increased more than sixfold to reach US$230 billion per year during 1995–97 from around US$36 billion per year during 1987–89 (World Bank 1998). Several factors contributed to this rapid growth, including the deregulation of financial markets in industrialized countries, the important advances made in information and communication technologies, and the move towards economic liberalization in the developing world. As part of the latter trend, many developing countries adopted measures to liberalize their capital accounts, hoping to fuel economic growth by attracting foreign investment. As barriers to international capital movements were removed in the late 1980s and early 1990s, a consensus emerged among policy-makers that capital mobility was beneficial to developing countries. This was in line with mainstream economic thinking that unfettered financial flows were advantageous, as they allowed capital to move freely around the globe to find the most productive investments.

The belief that free financial flows are desirable because they lead to a more efficient global allocation of capital has come under scrutiny since the Asian crisis. There is a concern that developing countries that experience large inflows of foreign capital, as many Southeast Asian countries did prior to the crisis, make themselves vulnerable to sudden and destabilizing withdrawals. Many policy-makers, notably Malaysia's Mahathir Mohamad, have called for renewed curbs on capital flows. Some prominent economists have also questioned whether unrestrained capital movements are beneficial and whether capital controls, under certain circumstances, may be called for.[1]

An important issue in the debate over the desirability of freer capital mobility for developing countries is whether capital flows have significant effects on economic growth. Proponents of capital account liberalization cite the growth-promoting attributes of capital inflows as a key benefit of financial integration for developing countries. Unfortunately, there is little empirical evidence to confirm or refute this claim, except for several studies that establish a positive link between inflows of foreign direct investment (FDI) and economic growth.[2]

1. See Bhagwati (1998) and Rodrik (1998).
2. For example, see Borensztein et al. (1998), who conducted an econometric analysis of the relationship between FDI and growth in a sample of 69 countries from 1970–89. They found evidence that FDI stimulates growth, but only for host economies that have reached a minimum threshold stock of human capital.

The lack of empirical evidence on the consequences of financial integration for economic growth is partly due to the fact that the literature on capital flows in recent years has focused on shorter-term considerations, such as the determinants of capital flows and the role of capital flows in inducing financial and currency crises.[3] This research agenda has likely been influenced by a series of recent currency crises in emerging markets (Mexico, Southeast Asia, and Russia), and thus the emphasis on shorter-term issues in this literature is not surprising. There is no doubt that existing work in this field has improved our understanding of what determines international capital movements and what role they could play in instigating currency crises. However, to achieve a more complete understanding of the potential ramifications of financial globalization for developing countries, ongoing research should address the longer-term consequences of capital flows as well as the short-term repercussions.

This paper helps to fill the gap in the literature by investigating the role of net private capital flows in the determination of economic growth. More specifically, the claim that capital inflows foster economic growth is empirically investigated by drawing on the experiences of a large number of developing countries over the past two decades, and determining whether there is any evidence to suggest that countries that have received relatively larger amounts of net private capital flows over this period have, *ceteris paribus*, grown more quickly. Unlike existing empirical work, this paper focuses on the effects of a broad measure of capital flows on economic growth, rather than on a more specific category, such as FDI.[4] To the author's knowledge, no existing study has examined the cross-country evidence on the effects of net private capital flows on economic growth in the context of an econometric framework that controls for other determinants of growth. Rodrik (1998) looked at the correlation between a broad measure of capital account liberalization and economic growth in a sample of 100 countries from 1975–89, but he did not control for other determinants of growth in his analysis.[5, 6]

3. See Calvo et al. (1994) and Frankel and Rose (1996).
4. It would have been interesting to study the effects of other categories of capital flows, such as portfolio flows, on economic growth, but that was not possible owing to problems with data availability. Indeed, the time series on disaggregated capital-flow data are relatively short for many developing countries, except for FDI, and thus there were too few observations to be used in the context of a cross-country growth regression.
5. Rodrik uncovered a negative relationship between capital account liberalization and growth in his study, which he interpreted as evidence against the premise that freer capital mobility is beneficial to developing countries. His evidence should be viewed with caution, however, because he does not control for other determinants of growth in his analysis.
6. The extent of capital account liberalization in this study is measured as the proportion of years for which a country had no capital account restrictions.

Another distinguishing feature of this study is that it emphasizes the role played by the domestic financial sector in the process linking capital flows and growth. Theoretical arguments that have been presented for or against a positive link between capital inflows and economic growth have focused on whether capital flows promote economic growth by increasing the domestic investment rate and/or by leading to investments associated with positive spillovers, such as the transfer of technology or skills.[7] In addition to those two channels, this paper considers the potential effects of capital flows on growth through its influence on domestic financial intermediation—a channel that has received much less attention in the literature. This latter channel is based on an extensive literature that has developed over the past decade, drawing on developments in endogenous-growth theory, linking domestic financial development and economic growth. This body of work, reviewed by Levine (1997), emphasizes how increased domestic financial intermediation can promote growth through its effects on capital accumulation. This literature thus suggests that to the extent that capital inflows lead to increased financial intermediation, they will have a positive influence on economic growth.

The three channels to growth emphasized in this paper—that capital flows can promote growth by increasing the domestic investment rate, by leading to investments associated with positive spillovers, and/or by increasing domestic financial intermediation—will likely involve the intermediation of foreign funds by the domestic financial system. Thus, the existing level of development of the financial system, reflected in its ability to exercise functions such as mobilizing savings, helping to allocate capital, and facilitating risk management, could play a role in determining the extent to which capital flows affect growth. Consider a capital inflow that occurs when a domestic bank borrows from a foreign bank to finance a project being undertaken by a domestic firm. The efficiency with which the domestic bank channels the borrowed funds into a productive investment project, in addition to its ability to properly evaluate the investment project, will likely influence the extent to which, if at all, this capital inflow ultimately contributes to higher economic growth. This study therefore examines whether there is evidence to corroborate this view that the level of domestic financial development is a factor in the link between capital inflows and economic growth. This is done in the econometric analysis by interacting the financial-development and capital-flow variables, thus allowing for the possibility that

7. Critics of this view assert that this scenario will occur only if international capital markets deliver an efficient allocation of resources, which they claim is often not the case in developing countries, because of policy-induced distortions. This perspective is described in more detail in Section 2.

the effect of capital inflows on growth might differ by level of domestic financial development.

The relationship between private capital flows and economic growth is estimated using panel data for 40 developing countries from 1975–95.[8] The capital-flow variables employed include net private capital flows recorded through the balance of payments and estimates of net repatriated capital flight. In addition to the capital-flow variables, the econometric specification used includes as explanatory variables other important determinants of the growth rate. A dynamic panel-data methodology is used that controls for country-specific effects and accounts for the potential endogeneity of the explanatory variables. This study finds evidence that capital inflows foster higher economic growth, above and beyond any effects on the investment rate, but only for economies where the banking sector has reached a certain level of development. The results thus suggest that the domestic financial sector plays a pivotal role in ensuring that international capital flows do indeed promote economic growth in developing countries.

This paper is organized as follows. Section 2 motivates the empirical analysis by reviewing the theoretical foundations underlying the premise that capital inflows lead to higher economic growth. Section 3 describes the empirical methodology. Section 4 presents the estimation results. Section 5 concludes.

## 2. Theoretical Foundations

This section motivates the empirical analysis by reviewing the theoretical foundations underlying the premise that capital inflows lead to higher economic growth, as well as the view that the level of domestic financial development is a factor in the link between capital inflows and economic growth. The relationship between capital inflows and growth is first examined in the context of a simple endogenous-growth model. This framework will highlight the various channels to growth emphasized in this paper: that capital flows can promote growth by increasing the domestic investment rate, by leading to investments that are associated with positive spillovers, and/or by increasing domestic financial intermediation. It will also show how the existing level of development of the financial system plays a role in determining the extent to which capital flows influence growth. This section concludes with a discussion of how the relationship between capital inflows and

8. Appendix 1 lists the 40 countries.

growth might change if one of the key assumptions of the framework—that international capital markets deliver an efficient allocation of capital—is relaxed.

## 2.1 Capital inflows in a simple endogenous-growth model

The relationship between capital flows and growth can be examined using a simple endogenous-growth model called the AK model. An endogenous-growth framework highlights the potential effects of changes in financial variables (i.e., financial development and capital flows) on steady-state growth through their influence on capital accumulation. The presentation of the AK model in this section draws heavily on Pagano (1993), who used it to illustrate the potential effects of financial development on growth in a closed economy. The framework is then extended to incorporate international capital flows.

In the closed-economy version of the AK model, the aggregate production of the economy is given by:

$$Y_t = AK_t, \tag{1}$$

where output is a linear function of the aggregate capital stock. This type of production function can be viewed as a reduced form for either a framework in which the economy is competitive with external economies, as in Romer (1989), or one in which $K_t$ is assumed to be a composite of physical and human capital, as in Lucas (1988), where the two types of capital are reproducible with identical technologies.[9] There is no population growth in this model and the economy produces only one good, which can be consumed or invested. By assuming that the capital stock depreciates at a rate of $\delta$ per period, gross investment equals

$$I_t = K_{t+1} - (1 - \delta)K_t. \tag{2}$$

In this model, financial intermediaries are responsible for transforming savings into investment. In doing this, they absorb resources so that a dollar saved by households will generate less than a dollar's worth of investment. Let us assume that a fraction, $\phi$, of each dollar saved is available for investment, whereas 1-$\phi$ is retained by the financial intermediaries as a reward for the services supplied. This transaction cost can be seen as the spread between lending and borrowing rates charged by banks. In the closed-economy version of the model, capital market equilibrium requires that the fraction of savings by

9. In Romer (1989), each firm faces a technology with constant returns to scale, but productivity is an increasing function of the aggregate capital stock, $K_t$.

domestic residents left after financial intermediaries have taken their share must equal gross investment. Thus, equilibrium in the capital market ensures that

$$\phi S_t = I_t . \tag{3}$$

Using equations (1) through (3) and dropping the time indices, the growth rate of output, g, can be written as follows

$$g = A\left(\frac{I}{Y}\right) - \delta = A\phi s - \delta , \tag{4}$$

where s denotes the gross savings rate. Equation (4) thus represents the steady-state growth rate of a closed-economy AK model with financial intermediation. This equation reveals two main channels through which financial development can affect economic growth. Financial development is assumed to occur as a result of increased financial intermediation, although it could also be influenced by other factors—such as financial innovation or government policies. The first channel involves the efficiency with which savings are allocated to investment. As banks engage in increased intermediation, they are likely to become more efficient at what they do, and thus the spread between their lending and borrowing rates falls. This results in an increase in the proportion of savings channelled to investment; thus, g will increase in equation (4) as a result of an increase in $\phi$.

Second, an increase in financial intermediation can affect growth if it improves the allocation of capital. An important function of a financial intermediary is to allocate funds to those projects where the marginal product of capital is highest. In this model, an improvement in the allocation of capital translates into higher growth, because it increases the overall productivity of capital, A. As financial intermediation increases, banks are assumed to gain experience in evaluating alternative investment projects and are thus better able to select high-yielding projects.[10] In addition, they are able to channel a larger proportion of funds to projects where the marginal product of capital is higher, because they are also better able to provide risk sharing and can thus induce individuals to invest in riskier but more productive investments.[11]

10. Greenwood and Jovanovic (1990) develop an endogenous-growth model that emphasizes the informational role of financial intermediaries in fostering growth by improving the allocation of capital.
11. Bencivenga and Smith (1991) highlight the risk-sharing role of banks in their endogenous-growth model. In their framework, financial intermediation enables individuals to pool liquidity risks and can promote higher growth, by shifting the composition of savings towards more capital accumulation and by reducing unnecessary capital liquidation.

This framework can be extended to incorporate international capital flows. Let us assume that foreign residents are now allowed to invest in this economy. For simplicity, let us suppose that they invest through the financial intermediaries. If capital flows in, on net, then a larger pool of savings will be available for investment than in the absence of capital flows. Thus, in the presence of international capital flows, the capital market equilibrium becomes

$$\phi^*(S_t + NCF_t) = I_t^*, \tag{3'}$$

where $NCF_t$ represents net international capital flows. The steady-state growth rate is now given by

$$g^* = A^*\frac{I^*}{Y} - \delta = A^*\phi^*\frac{(S + NCF)}{Y} - \delta = A^*\phi^*s^* - \delta. \tag{4'}$$

The steady-state growth rate of the AK framework with financial intermediation and international capital flows depicted in equation (4') can now be compared with the growth rate of the closed-economy AK model with financial intermediation. This comparison will highlight the various channels through which capital flows can influence economic growth in this simple endogenous-growth model. First, capital flows can promote growth if they lead to an increase in the investment rate. Thus, g* will be higher than g if s* is larger than s, all else being equal. For the savings rate to increase in the presence of international capital mobility, capital must flow in on net (i.e., $NCF_t > 0$), capital flows must be used to finance investment and not consumption, and investment financed by foreign capital must not crowd out domestically financed investment.

Second, capital flows can foster economic growth if they lead to investments that are associated with positive spillovers. The potential benefits that capital flows can entail by generating positive externalities have been emphasized in the FDI literature, although those types of benefits could also arise with other types of capital flows. Blomström (1991) discusses the different channels through which positive externalities associated with FDI can occur. First, foreign investment could increase competition in the host-country industry and hence force local firms to become more productive, by adopting more efficient methods or by investing in human and/or physical capital. In addition, since firms with foreign participation often have important linkages with domestic firms, they can influence the industrial structure of the host economy. In particular, they can help restructure key sectors of the economy by making them more competitive and export-oriented.[12] Second, if foreign

12. For more details, see the United Nations Centre on Transnational Corporations (1995).

investment leads to increased training of labour and management, this could influence the rest of the economy if employees switch to locally owned firms or become entrepreneurs. And third, foreign investment can be accompanied by technology transfer. Since many new technologies are developed and adapted by firms in industrialized countries, foreign investment may be the most important way for developing economies to gain access to them.[13] In the framework presented in this section, if capital flows lead to investments that generate positive spillovers, then this will increase the social marginal productivity of capital, so that A* will tend to be higher than A, all else being equal.

The third way in which capital flows can have a positive influence on economic growth is if they lead to an increase in domestic financial intermediation. It was shown how an increase in financial intermediation in the context of a closed economy could foster higher growth if the intermediation makes the local banks more efficient at converting savings into investment (i.e., if the spread falls), and/or better able to allocate savings to the most productive investment projects. Thus, to the extent that capital flows are intermediated by domestic financial institutions—which they typically are—they will tend to have a positive effect on growth by making the banking sector in the local economy more efficient (i.e., $\phi^* > \phi$) and/or better at selecting productive investment projects (i.e., A*>A).

This simple framework also shows that the level of domestic financial development plays a role in the process linking capital inflows and economic growth. Consider two economies with different levels of financial-sector development. Let us suppose that the country with the more developed financial system is country 1 and the other is country 2. All else being equal, we would expect that $A^1 > A^2$ and $\phi^1 > \phi^2$. Thus, even if both countries receive an equal amount of net capital inflows, this model predicts that the country with the more developed financial system will have a higher growth rate, because its financial sector is more efficient at converting the foreign funds into productive investments, and better able to allocate them to the most productive investment projects.

## 2.2 Capital inflows in the presence of distortions

The framework presented in the previous section implicitly assumes that international capital markets allocate resources efficiently, and thus that capital inflows are motivated by the investment opportunities in the local economy. The predominant view among

13. Findlay (1978) and Wang (1990) have developed theoretical models linking foreign investment and increased technical progress.

economists, at least until very recently, was that this was an appropriate assumption to make when analyzing the effects of capital flows on economic growth in developing countries. Indeed, the increase in capital flows to developing countries starting in the late 1980s was deemed to be a positive development, given that it was interpreted as being the result of investors seeking out more productive investments in the developing world.

Some economists, however, expressed concern, even prior to the Mexican peso crisis in late 1994, that at least part of the capital flowing into emerging markets since the late 1980s may have been the result of excessive optimism or a response to the wrong incentives. McKinnon and Pill (1997) pointed out the possibility that investors might be overly optimistic as to the prospects in a reforming developing country and that this could lead to overborrowing, and ultimately a financial crisis. Dooley (1994) argued that at least some of the capital inflows into developing countries in the early 1990s were motivated by government guarantees rather than profitable investment opportunities created by economic reforms. As pointed out by Powell (1998), such guarantees could take the form of a commitment to a fixed or quasi-fixed exchange rate, implicit or explicit guarantees to domestic financial institutions, and/or international guarantees to provide financial support should the country encounter difficulties. The views shared by these economists, however, did not gain popularity until after the Asian crisis.

The topic of international capital mobility in the presence of distortions has been examined more recently in a body of work analyzing the Asian crisis. A few theoretical models, notably those of Krugman (1998) and Corsetti et al. (1998), have been developed focusing on moral hazard as an important cause of the crisis. These kinds of models, although not developed specifically to study the effects of capital flows on economic growth, present frameworks in which policy distortions can lead to large capital inflows that are channelled into speculative investments. Krugman (1998) and Corsetti et al. (1998) emphasize the moral hazard associated with financial intermediaries that are both poorly regulated and whose liabilities are implicitly guaranteed by the government. Such intermediaries have an incentive to engage in excessive risky lending and to finance their speculative projects through external borrowing. As long as foreign creditors believe that they will be bailed out by the government, a situation arises where local banks are the recipients of large capital flows that they then channel into largely unproductive investments.

Capital flows occurring in this context are not likely to be growth-promoting. Indeed, even though capital inflows motivated by distortions might lead to an increase in the

investment rate, this will not contribute to higher growth unless the investment is productive. In terms of spillovers, this kind of speculative investment is not likely to generate any positive externalities, either in the financial or non-financial sectors of the economy.

Thus, in summary, this section has argued that capital inflows are more likely to foster higher growth in developing countries if they are motivated by, and hence channelled into, productive investments, and if they lead to investments that generate positive spillovers through either the real or financial sector of the economy. In addition, it was argued that the effect of capital flows on economic growth is likely to be more pronounced the more developed the domestic financial sector.

## 3. Empirical Methodology

To test the hypothesis that capital flows have a positive effect on economic growth in developing countries and that financial development plays a role in that process, this study uses a dynamic panel-data methodology to estimate a cross-country growth regression.[14] This methodology makes it possible to control for country-specific effects and to account for the potential endogeneity of the explanatory variables. This section first describes the econometric specification used, and then discusses the expected signs on the explanatory variable coefficients and outlines the estimation method employed.

The following equation describes the general specification used:

$$y_{i,t} - y_{i,t-\tau} = \alpha_i + \lambda y_{i,t-\tau} + V_{i,t-\tau}\beta + X_{i,t-\tau}\delta + \varepsilon_{i,t}, \qquad (5)$$

where $y_{i,t}$ is the natural log of real per-capita GDP in country i and time period t, $\alpha_i$ is a country-specific effect, $V_{i,t-\tau}$ is a row vector of growth determinants measured at the beginning of the $(t-\tau, t)$ period, $X_{i,t-\tau}$ is a row vector of growth determinants measured as averages over the $(t-\tau, t-1)$ period, and $\varepsilon_{i,t}$ is an error term. Five-year periods are employed (i.e., $\tau = 5$), which is typical in the literature; five years is thought to be long enough to eliminate business-cycle effects, but short enough to capture important changes that occur over time for a particular country.

14. The cross-country growth regression is the econometric specification typically used in the empirical literature that studies the determinants of growth rates across countries, which is based on work by Kormendi and Meguire (1985) and Barro (1991). It uses growth theory as a guide to select a set of explanatory variables—the growth rate of per-capita GDP is then regressed on these selected variables. The specification used here is thus not based on the reduced form of a specific model, but it is consistent with growth theory.

The country-specific effect, $\alpha_i$, is designed to capture the determinants of a country's growth rate that are not already controlled for by the other explanatory variables. It thus accounts for unobservable characteristics that vary across countries, but not over time. The country-specific effect could be either a *fixed* effect (i.e., a constant that varies for each cross-sectional unit), or a *random* effect (i.e., a random variable drawn from a common distribution with mean $\alpha$ and variance $\sigma_\alpha^2$). As is discussed in more detail below, the methodology employed in this paper makes it possible to estimate the coefficients of interest without having to restrict the country-specific effects to being either fixed or random.

The general specification in equation (5) is consistent with a variety of neoclassical and endogenous-growth models. In a neoclassical framework, the variables measured at the beginning of each five-year period can be viewed as the initial levels of state variables, whereas those measured as averages over the period can be seen as control variables (Barro and Sala-i-Martin 1995). The former variables account for the initial position of the economy, whereas the latter capture differences in steady-state levels across countries. In an endogenous-growth model, an economy is assumed to always be in its steady state, and therefore the explanatory variables capture differences in steady-state growth rates across countries. This specification is thus general enough that it can accommodate both major types of growth models, and it does not need to make an assumption about whether the countries in the sample are in their steady states or not. The empirical specification can be used to explain either what determines differences in transitional growth rates across countries as they converge to their respective steady states (consistent with a neoclassical framework), or what determines differences in steady-state growth rates across countries (consistent with an endogenous-growth framework).[15]

In estimating the relationship between capital flows and growth, it is important to control for other determinants of the growth rate, to ensure that the estimated coefficient captures the effect of capital flows on growth and not the influence of some other variable(s). The control variables used were selected based on the fact that they have been identified in the literature as important determinants of growth rates across countries.[16] Two of the variables employed in the estimation are measured at the beginning of each period, and thus

15. This applies to the effects of all explanatory variables on growth, including capital flows. The endogenous-growth framework presented in Section 2 emphasizes how capital flows can influence the steady-state growth rate of per-capita output. The same channels could be stressed in a neoclassical model, except that in this case capital flows would have an effect on the transitional growth rate through their influence on the steady-state level of per-capita output.
16. Appendix 2 describes all of the variables used in the analysis.

would proxy for initial conditions in a neoclassical model. The first is per-capita income (in natural log form). According to neoclassical theory, the coefficient on per-capita income represents the convergence effect and thus should be negative.[17] In endogenous-growth models, there is no convergence effect, since economies do not depart from their steady states, and therefore the coefficient is expected to be zero. The second variable is a measure of the stock of human capital. Growth theory, whether neoclassical or endogenous, predicts that the coefficient on the stock of human capital should be positive, as countries that have more human capital will tend to have higher growth rates.

The other control variables are measured as averages over each five-year period, and include the real share of government consumption, a measure of openness to international trade, the real investment rate, and a measure of financial-sector development. As Barro and Sala-i-Martin (1995) point out, the government consumption variable is intended to capture public expenditures that do not directly affect productivity but will entail distortions of private decisions. The coefficient on that variable is thus expected to be negative. On the other hand, the anticipated effect of international trade on growth is positive. As discussed by Edwards (1993), the literature on endogenous growth emphasizes that economies that are more open to international trade can grow more rapidly by taking advantage of larger markets and becoming more efficient. Finally, as the endogenous-growth model in Section 2 showed, increases in the investment rate, in the level of financial-sector development, and in capital inflows are expected to lead to higher economic growth.

Given that financial markets in developing countries are dominated by banks, the financial-sector variable focuses on the banking sector.[18] Following King and Levine (1993), the ratio of domestic assets held by commercial banks to the total held by both commercial banks and the central bank is employed as a proxy for the level of development of the banking sector. This variable captures the size of the commercial-banking sector compared with the size of the central bank. Thus, one would expect the ratio to rise as the banking sector becomes more developed and a larger proportion of funds in the economy are intermediated by commercial banks. The capital-flow variables employed include net private capital flows recorded through the balance of payments and estimates of net repatriated capital flight to proxy for net private capital flows that are not recorded through

17. If convergence holds, then a country with a relatively lower level of initial per-capita GDP will grow faster, since it is that much farther away from its steady state and must catch up.
18. As Rojas-Suarez and Weisbrod (1995) point out, in developing countries most household savings are held in the form of bank deposits, and bank loans represent the most important source of external finance for firms.

the balance of payments. The capital-flight variable was constructed based on the World Bank's residual method, which measures the residual of sources of funds over uses of funds, where the former includes all net official flows plus net flows of FDI, and the latter comprises the current account deficit and additions to reserves.[19]

To provide a consistent estimation of equation (5), a panel-data generalized method of moments (GMM) estimation technique is used, following Caselli et al. (1996). This technique makes it possible to address two important econometric problems that arise in estimating cross-country growth regressions. First, some of the explanatory variables in a cross-country growth regression are likely to be endogenous and, if this is the case, then an estimation using ordinary least squares (OLS) would yield biased and inconsistent estimates.[20] Second, even if an instrumental-variables (IV) estimation technique is used to account for the endogeneity of some of the regressors, the estimates would still be inconsistent, given that the country-specific effect is correlated with at least one of the explanatory variables. Indeed, the country-specific effect in equation (5) is correlated with initial real per-capita GDP. This becomes clear when equation (5) is rewritten as a dynamic model in the level of real per-capita GDP, as follows:

$$y_{i,t} = \alpha_i + \gamma y_{i,t-\tau} + V_{i,t-\tau}\beta + X_{i,t-\tau}\delta + \varepsilon_{i,t}, \qquad (6)$$

where $\gamma = 1 + \lambda$. Thus, by construction, the lagged dependent variable in equation (6) is correlated with the country-specific effect (i.e., $E(\alpha_i y_{i,t-\tau}) \neq 0$). An IV estimation procedure would yield inconsistent estimates whether the country-specific effects are assumed to be random or fixed.[21]

The GMM estimation technique employed in this paper addresses both of these issues. This methodology involves first rewriting the growth regression expressed in equation (5) as a dynamic model in the level of real per-capita GDP, as was done in equation (6). Equation (6) is then first-differenced to eliminate the country-specific effects:

---

19. For a discussion of this and other methods used to estimate capital flight, see Claessens and Naudé (1993).
20. For instance, there might be a two-way causality between the level of financial market development in an economy and its growth. Greenwood and Jovanovic (1990) provided theoretical backing for this premise by developing an endogenous-growth model where the activities of financial intermediaries result in higher growth, which in turn leads to the expansion of financial institutions; thus, a two-way causality between financial market development and growth emerges in their framework.
21. Nickell (1981) showed that the standard within-group estimator for dynamic models with fixed effects generates estimates that are inconsistent when the number of periods in the panel is small relative to the number of cross-sectional units.

$$y_{i,t} - y_{i,t-\tau} = \gamma(y_{i,t-\tau} - y_{i,t-2\tau}) + (V_{i,t-\tau} - V_{i,t-2\tau})\beta + (X_{i,t-\tau} - X_{i,t-2\tau})\delta + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \quad (7)$$

Next, three assumptions are made that imply a set of moment restrictions that can be used in the context of a GMM estimation and, hence, generate consistent estimates of the parameters in the growth equation. The first assumption is that the error term is serially uncorrelated. This implies that there is no $\tau$-order serial correlation. The second assumption is that the variables representing initial conditions are predetermined; those variables measured at the beginning of the $(t-\tau, t)$ period are considered to be predetermined for time t and beyond. The third assumption is that the control variables are weakly exogenous. In other words, those variables measured as averages over the $(t-\tau, t-1)$ period are considered to be predetermined for time $t+\tau$ and beyond.

Given the set of identifying conditions made, the lagged values of the explanatory variables can be used as instruments in the estimation of (7). In equation (7), the state variables lagged one period and the control variables lagged two periods will be valid instruments. For instance, when estimating the growth rate from 1980–85 on initial conditions for 1980 and the other explanatory variables averaged from 1980–84, the initial conditions for 1975 would be valid instruments. Moving up one period, when estimating the growth rate from 1985–90 on initial conditions for 1985 and the other explanatory variables averaged from 1985–89, the initial conditions for 1975 and 1980 and the other explanatory variables averaged from 1975–79 would be valid instruments.

Given that the consistency of the GMM estimates depends on the soundness of the instruments, two specification tests are employed to test the validity of the instruments.[22] The Sargan test is used to verify independence between the instruments and the error term. The null hypothesis in this case is that the instruments and the error term are independent. The Difference-Sargan test is used to verify that the error term is not serially correlated, as assumed. Under the null hypothesis, there is no $\tau$-order serial correlation. Thus, a failure to reject the null for both tests would be evidence in support of the fact that the instruments are indeed valid. Both the Sargan and Difference-Sargan tests are distributed as chi-square under the null hypothesis.

Equation (7) was estimated on a sample of 40 developing countries using data from 1975–95 set up in five-year periods. The countries, listed in Appendix 1, were selected based on data availability.[23] Not all data series are complete for all countries; in other words, the

22. For more information on these specification tests, see Arellano and Bond (1991).
23. All developing countries were potential candidates for the sample, except for very small countries that had populations of less than one million. Countries with key data series missing, or with too many missing observations in key series, were eliminated from the sample.

panel-data set is unbalanced. The GMM procedure outlined in this section can accommodate unbalanced panels, thus enabling the use of a larger number of observations than if there had been a requirement for the panel to be balanced. The next section presents and discusses the estimation results.

## 4. Estimation Results

Table 1 shows the results of the GMM estimation under various specifications. As indicated by the adjusted $R^2$s, the model used explains about a third of the variation in the growth rates in our sample. The results of the two specification tests suggest that the GMM estimates are consistent. Indeed, the reported p-values for the Sargan and Difference-Sargan tests show a failure to reject the null hypotheses in both cases across all the regressions.

The signs of the coefficients on the explanatory variables other than the capital-flow variables are generally statistically significant and consistent with theory. The coefficient on the government's share of real GDP is negative, whereas the coefficients on the investment rate, the international trade variable, and the measure of banking-sector development are all positive. The coefficient on the measure of human capital is not statistically significant in most of the regressions, but when it is the coefficient is negative, contrary to what is expected from theory. This result is apparently not unusual in cross-country growth studies that use panel data. Pritchett (1996) explores some reasons for this apparent puzzle. Finally, the coefficient on initial real per-capita GDP is negative when it is statistically significant. This suggests that there is a convergence effect in this sample of developing countries and thus that poorer countries, all else being equal, tend to grow relatively more quickly.

This study finds evidence that private capital inflows do indeed promote economic growth, above and beyond any effects on the investment rate, but only for economies where the banking sector has reached a certain level of development.[24] As shown in the second column in Table 1, the coefficient on the interaction term between net private capital flows and the measure of banking-sector development is positive and statistically significant. Interestingly, the coefficient on net capital flows is negative and statistically significant in both the first and second regressions in Table 1. This suggests that net capital flows will have a positive effect on growth only for those countries that have developed banking sectors; otherwise, the effect of net capital flows on growth is negative.

24. This effect on growth is above and beyond any effects that net capital flows may exert on the investment rate, given that the investment rate is included as an explanatory variable.

## Table 1

### Estimation results

**Dependent variable: growth rate of real per-capita GDP**
**GMM estimates for 1975–95 using five-year periods**

| | | | | |
|---|---|---|---|---|
| Initial real per-capita GDP | -0.1843 | -0.1564*** | -0.1660*** | -0.1919 |
| | (0.0208) | (0.0170) | (0.0136) | (0.0138) |
| Average years of schooling | -0.0052 | -0.0174* | -0.0142 | 0.0074 |
| | (0.0114) | (0.0106) | (0.0095) | (0.0084) |
| Investment/GDP | 0.0970** | 0.0196 | 0.0489 | 0.1211*** |
| | (0.0432) | (0.0577) | (0.0376) | (0.0444) |
| Government consumption/GDP | -0.1882* | -0.1122 | -0.3465*** | -0.1347** |
| | (0.1016) | (0.1325) | (0.0623) | (0.0630) |
| (Exports+imports)/GDP | 0.0742*** | 0.0536** | 0.0740*** | 0.0828*** |
| | (0.0146) | (0.0278) | (0.0126) | (0.0108) |
| Banking-sector development | 0.0609*** | 0.0561*** | 0.0192** | 0.0190** |
| | (0.0199) | (0.0218) | (0.0089) | (0.0094) |
| Net capital flows/GDP | -0.0589* | -0.2664*** | | |
| | (0.0324) | (0.1010) | | |
| (Net capital flows/GDP) X | | 0.4575** | | |
| (Banking-sector development) | | (0.2273) | | |
| Repatriated capital flight/GDP | | | 0.0367** | 0.0156 |
| | | | (0.0191) | (0.0552) |
| (Rep. capital flight/GDP) X | | | | 0.0323 |
| (Banking-sector development) | | | | (0.1449) |
| Number of observations | 150.00 | 150.00 | 141.00 | 141.00 |
| Adjusted R-squared | 0.32 | 0.32 | 0.32 | 0.36 |
| Sargan test | 0.33 | 0.33 | 0.25 | 0.25 |
| Difference-Sargan test | 0.56 | 0.62 | 0.34 | 0.32 |

Notes: (1) The standard errors (corrected for heteroscedasticity using White's method) are in parentheses.
(2) (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 per cent levels, respectively.
(3) The figures reported for the Sargan and Difference-Sargan tests are p-values.

Based on the estimated coefficients for the net capital-flows variable and the interaction term, it is found that the overall effect of net capital flows on growth will be positive as long the banking-sector variable is larger than 0.58. Thus, as long as the domestic assets of commercial banks represent more than 58 per cent of the total assets of those banks and the central bank, the estimated effect of net capital flows will be positive. In other words, in countries where a significant amount of financial intermediation is performed by commercial banks, as opposed to the central bank, net capital flows will tend to promote growth.

The result that capital inflows are detrimental to growth in countries with relatively underdeveloped banking sectors can be interpreted in light of the discussion in Section 2 on capital flows in the presence of distortions. It is possible that the countries in the sample with a low level of financial-sector development are also characterized by important distortions in the financial sector. The banking sector might be poorly developed because of government policies that both repress financial development and distort incentives for foreign investors.[25] In such a case, capital inflows could be motivated by the government-imposed distortions, rather than by productive investment opportunities in the country, and the banking sector is not likely to be efficiently allocating savings to productive investment projects.

The coefficient on net repatriated capital flight is positive and statistically significant, suggesting that this kind of capital inflow is associated with positive spillovers. In the regression including the interaction term between net repatriated capital flight and banking-sector development, both the coefficients on net repatriated capital flight and on the interaction term are not statistically significant. Thus, it appears that repatriated capital flight fosters economic growth, regardless of the level of domestic financial development. The result that the domestic financial sector does not play a role in the link between repatriated capital flight and growth may be due to the fact that this type of capital flow, by its very nature, tends to circumvent the domestic financial system.

25. Roubini and Sala-i-Martin (1992) develop a model that suggests that governments might choose to repress the financial sector, even though such a policy depresses long-run growth, because it increases the demand for money and delivers easy inflationary revenues.

# 5. Conclusion

Using panel data for 40 developing countries from 1975–95, this study finds evidence that capital inflows foster economic growth, above and beyond any effects on the investment rate, but only for economies where the banking sector has reached a certain level of development. For countries with poorly developed banking sectors, the effect of capital flows on growth is found to be negative. This result could be caused by a correlation between a low level of financial-sector development and government-imposed distortions in the financial sectors of the sample countries. In this case, capital flowing into countries with underdeveloped banking sectors could be motivated by government-imposed distortions and would hence be channelled into speculative rather than productive investments.

The findings of this paper suggest that the domestic financial sector plays a pivotal role in ensuring that international capital flows do indeed promote economic growth in developing countries. Although this premise has been gaining popularity in recent years, there has been no available econometric evidence, to the author's knowledge, to support it.[26] As financial integration becomes a reality for an increasing number of developing countries, it is important that we develop a better understanding of how international capital flows affect economic growth and how the domestic financial sector influences this process. This study takes a first step in that direction.

26. A recent World Bank (1997) study emphasizes the role played by the banking sector in the process of financial integration in developing countries, and states that (p. 229) the banking system "is one of the main channels through which the benefits of integration materialize."

# References


Arellano, M. and S. Bond. 1991. “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.” *Review of Economic Studies* 58: 277–297.

Barro, R. 1991. “Economic Growth in a Cross Section of Countries.” *Quarterly Journal of Economics* 106(2): 407–444.

Barro, R. and X. Sala-i-Martin. 1995. *Economic Growth*. New York: McGraw-Hill.

Bencivenga, V. and B. Smith. 1991. “Financial Intermediation and Endogenous Growth.” *Review of Economic Studies* 58(2): 195–209.

Bhagwati, J. 1998. “The Capital Myth: The Difference between Trade in Widgets and Dollars.” *Foreign Affairs* 77(3): 7–12.

Blomström, M. 1991. “Host Country Benefits of Foreign Investment.” In *Foreign Investment, Technology and Economic Growth*, edited by D. McFetridge, 93–109. Calgary: The University of Calgary Press.

Borensztein, E., J. De Gregorio, and J-W. Lee. 1998. “How Does Foreign Direct Investment Affect Economic Growth?” *Journal of International Economics* 45(1): 115–35.

Calvo, G., L. Leiderman, and C. Reinhart. 1994. “The Capital Inflows Problem: Concepts and Issues.” *Contemporary Economic Policy* 12(3): 54–66.

Caselli, F., G. Esquivel, and F. Lefort. 1996. “Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics.” *Journal of Economic Growth* 1(3): 363–90.

Claessens, S. and D. Naudé. 1993. “Recent Estimates of Capital Flight.” World Bank Policy Research Working Paper No. 1186.

Corsetti, G., P. Pesenti, and N. Roubini. 1998. “Paper Tigers: A Model of the Asian Crisis.” <URL:http://www.stern.nyu.edu/~nroubini/asia/AsiaHomepage.html>.

Dooley, M. 1994. “Are Recent Capital Inflows to Developing Countries a Vote for or Against Economic Policy Reforms?” Department of Economics, University of California, Santa Cruz Working Paper No. 295.

Edwards, S. 1993. “Trade Policy, Exchange Rates and Growth.” NBER Working Paper No. 4511.

Findlay, R. 1978. “Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology: A Simple Dynamic Model.” *Quarterly Journal of Economics* 92(1): 1–16.

Frankel, J. and A. Rose. 1996. “Currency Crashes in Emerging Markets.” NBER Working Paper No. 5437.

Greenwood, J. and B. Jovanovic. 1990. “Financial Development, Growth, and the Distribution of Income.” *Journal of Political Economy* 98(5): 1076–1107.

King, R. and R. Levine. 1993. “Finance and Growth: Schumpeter Might be Right.” *Quarterly Journal of Economics* 108(3): 717–737.

Kormendi, R. and P. Meguire. 1985. “Macroeconomic Determinants of Growth: Cross-Country Evidence.” *Journal of Monetary Economics* 16(2): 141–163.

Krugman, P. 1998. “What Happened to Asia?” <URL: http://web.mit.edu/krugman/www>.

Levine, R. 1997. “Financial Development and Economic Growth: Views and Agenda.” *Journal of Economic Literature* 35(2): 688–726.

Lucas, R. 1988. “On the Mechanics of Economic Development.” *Journal of Monetary Economics* 22 (1): 3–42.

McKinnon, R. and H. Pill. 1997. “Credible Economic Liberalizations and Overborrowing.” *American Economic Review* 87(2): 189–193.

Nickell, S. 1981. “Biases in Dynamic Models with Fixed Effects.” *Econometrica* 49(6): 1417–1426.

Pagano, M. 1993. “Financial Markets and Growth: An Overview.” *European Economic Review* 37 (2–3): 613–622.

Powell, J. 1998. “Micro- and Macro-Level Financial Reform in Canada.” In *Financial Reform in Developing Countries,* edited by J. Fanelli and R. Medhora. Ottawa: International Development Research Centre.

Pritchett, L. 1996. “Where Has All the Education Gone?” Policy Research Department, The World Bank, Working Paper No. 1581.

Rodrik, D. 1998. “Who Needs Capital-Account Convertibility?” <URL: http://www.ksg.harvard.edu/rodrik/papers.html>.

Rojas-Suarez, L. and S. Weisbrod. 1995. “Financial Fragilities in Latin America: The 1980s and 1990s.” Occasional Paper No. 132. Washington, DC: International Monetary Fund.

Romer, P. 1989. “Capital Accumulation and the Theory of Long-Run Growth.” In *Modern Business Cycle Theory,* edited by R. Barro. Cambridge, MA: Harvard University Press.

Roubini, N. and X. Sala-i-Martin. 1992. “Financial Repression and Economic Growth.” *Journal of Development Economics* 39(1): 5–30.

United Nations Centre on Transnational Corporations (UNCTC). 1995. World Investment Report 1995: Transnational Corporations and Competitiveness. New York: UNCTC.

Wang, J-Y. 1990. “Growth, Technology Transfer, and the Long-Run Theory of International Capital Movements.” *Journal of International Economics* 29(3–4): 255–271.

World Bank. 1997. *Private Capital Flows to Developing Countries: The Road to Financial Integration.* New York: Oxford University Press.

____. 1998. *Global Development Finance 1998.* Washington, DC: World Bank.

# Appendix 1: List of Countries

**(40-country sample)**

| | |
|---|---|
| Argentina | Malaysia |
| Benin | Mexico |
| Bolivia | Niger |
| Brazil | Pakistan |
| Cameroon | Panama |
| Central African Republic | Paraguay |
| Chile | Peru |
| Colombia | Philippines |
| Costa Rica | Rwanda |
| Ecuador | Senegal |
| El Salvador | Sierra Leone |
| Gambia | Sri Lanka |
| Ghana | Syria |
| Guatemala | Thailand |
| Honduras | Togo |
| India | Tunisia |
| Indonesia | Uruguay |
| Kenya | Venezuela |
| Korea | Zambia |
| Lesotho | Zimbabwe |

# Appendix 2: Sources and Definitions of Variables

Dependent Variable:

1. *Growth rate of real per-capita GDP over a five-year period*
   [calculated using data on real per-capita GDP taken from the World Bank's World Development Indicators]

Explanatory Variables:

2. *Real per-capita GDP at the beginning of each five-year period*
   [calculated using data on real per-capita GDP taken from the World Bank's World Development Indicators]

3. *Ratio of real investment to real GDP measured in five-year averages*
   [calculated using real investment and real GDP data taken from the World Bank's World Development Indicators]

4. *Average years of secondary schooling of the male population aged 25 and over at the beginning of each five-year period*
   [taken from the Barro-Lee data set on educational attainment]

5. *Real government share of GDP measured in five-year averages*
   [calculated using real government consumption and real GDP data from the World Bank's World Development Indicators]

6. *Ratio of real (exports + imports) to real GDP measured in five-year averages*
   [calculated using real export, import, and GDP data from the World Bank's World Development Indicators]

7. *Ratio of deposit money banks domestic assets to domestic assets of both deposit money banks and the central bank measured in five-year averages*
   [figures on both types of assets were taken from the International Monetary Fund's (IMF) International Financial Statistics]

8. *Ratio of net private capital flows to GDP measured in five-year averages*
   [calculated as ((-current account balance) - change in official reserves - net flows on debt from official creditors) / GDP, where the current account, reserve figures, and GDP were taken from the IMF's International Financial Statistics and the debt data were taken from the World Bank's World Debt Tables]

9. *Ratio of net repatriated capital flight to GDP measured in five-year averages*
   [calculated as -(current account + net FDI + change in reserves + change in external debt)/GDP, where the first three items and GDP were taken from the IMF's International Financial Statistics and the change in external debt was taken from the World Bank's World Debt Tables]

# Bank of Canada Working Papers
## *Documents de travail de la Banque du Canada*

**Working papers are generally published in the language of the author, with an abstract in both official languages.** ***Les documents de travail sont publiés généralement dans la langue utilisée par les auteurs; ils sont cependant précédés d'un résumé bilingue.***

### 2000

| | | |
|---|---|---|
| 2000-14 | Employment Effects of Nominal-Wage Rigidity: An Examination Using Wage-Settlements Data | U.A. Faruqui |
| 2000-13 | Fractional Cointegration and the Demand for M1 | G. Tkacz |
| 2000-12 | Price Stickiness, Inflation, and Output Dynamics: A Cross-Country Analysis | H. Khan |
| 2000-11 | Identifying Policy-makers' Objectives: An Application to the Bank of Canada | N. Rowe and J. Yetman |
| 2000-10 | Probing Potential Output: Monetary Policy, Credibility, and Optimal Learning under Uncertainty | J. Yetman |
| 2000-9 | Modelling Risk Premiums in Equity and Foreign Exchange Markets | R. Garcia and M. Kichian |
| 2000-8 | Testing the Pricing-to-Market Hypothesis: Case of the Transportation Equipment Industry | L. Khalaf and M. Kichian |
| 2000-7 | Non-Parametric and Neural Network Models of Inflation Changes | G. Tkacz |
| 2000-6 | Some Explorations, Using Canadian Data, of the *S*-Variable in Akerlof, Dickens, and Perry (1996) | S. Hogan and L. Pichette |
| 2000-5 | Estimating the Fractional Order of Integration of Interest Rates Using a Wavelet OLS Estimator | G. Tkacz |
| 2000-4 | Quelques résultats empiriques relatifs à l'évolution du taux de change Canada/États-Unis | R. Djoudad and D. Tessier |
| 2000-3 | Long-Term Determinants of the Personal Savings Rate: Literature Review and Some Empirical Results for Canada | G. Bérubé and D. Côté |
| 2000-2 | GAUSS™ Programs for the Estimation of State-Space Models with ARCH Errors: A User's Guide | M. Kichian |
| 2000-1 | The Employment Costs of Downward Nominal-Wage Rigidity | J. Farès and S. Hogan |

### 1999

| | | |
|---|---|---|
| 99-20 | The Expectations Hypothesis for the Longer End of the Term Structure: Some Evidence for Canada | R. Lange |

Copies and a complete list of working papers are available from:
*Pour obtenir des exemplaires et une liste complète des documents de travail, prière de s'adresser à:*

Publications Distribution, Bank of Canada
234 Wellington Street Ottawa, Ontario K1A 0G9

Diffusion des publications, Banque du Canada
234, rue Wellington, Ottawa (Ontario) K1A 0G9

E-mail / Adresse électronique: publications@bank-banque-canada.ca
WWW: http://www.bank-banque-canada.ca/