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Domestic and International Finance: How do they Affect Consumption Smoothing?

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Abstract

This paper uses empirical proxies for the domestic development and international integration of debt and equity markets to assess the role of financial development in international consumption smoothing. First, we find that both domestic and international finance contribute to international consumption smoothing. Second, domestic debt market development is relatively important in explaining consumption smoothing relative to GNP among developed countries, while international debt market integration appears to be the limiting factor among developing countries. Third, both debt and equity market development contribute to the smoothing of consumption relative to GDP, with a somewhat larger role for the former than the latter. Finally, debt and equity market development reveal themselves to be substitutes in that more of one reduces the contribution of the other to consumption smoothing.

Keywords: Consumption Smoothing, Financial Development, International Financial Integration

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1 Introduction

In tandem with the development of a range of proxies for financial market development, researchers have addressed several aspects of the financial development-growth nexus (see Levine, 1996, for an early survey). A main question is whether financial structure, i.e. the relative development of debt and equity markets, matters for growth. The answer, as suggested by Levine (2002) is that financial structure matters relatively little, as the two types of financial market development to some extent are substitutes. More recently, several papers have addressed whether there is a distinct role for international financial integration as proxied by either international capital flow or stock variables in explaining growth. The available evidence does not find clear and robust support for the idea that international financial integration boosts economic growth (see Edison, Levine, Ricci and Slok, 2002, and Prasad, Rogoff, Wei and Kose, 2003), although some studies suggest that different types of international financial integration may have different growth effects (see De Mello, 1999, and Reisen and Soto, 2001). Edison et al. (2002) particularly find that the growth effect of domestic bank or stock market development dominates that of international financial integration, if any.

Relative to the financial development-growth nexus, the link between financial development and consumption smoothing has received little attention in the empirical literature. Theoretical contributions (see Obstfeld and Rogoff, 1998, Chapter 5; Sorensen and Yosha, 1998; and Baxter and Crucini, 1995) have laid out that the feasibility of international consumption smoothing depends crucially on the existence and tradeability of debt and equity instruments. The tradeability of equity, specifically, should allow economies to swap equity shares, or claims to output as proxied by GDP, with the result of smoothing both national income, or GNP, and consumption. The tradeability of debt claims, in turn, enables economies to adjust their consumption streams in the face of temporary output shocks that remain after equity trading. Debt and equity market development hence are expected to be empirically important in explaining the variability of consumption smoothing across countries. The purpose of this paper is to provide a detailed empirical investigation of how in fact financial market development affects consumption smoothing at the national level. A range of empirical proxies for debt and equity market development and efficiency, familiar from the growth literature, are used for this purpose.

Private agents, with few exceptions, only deal with domestic banks and other

financial institutions. If so, international consumption smoothing can only come about through the international interaction of financial institutions. Banks, for instance, may choose to offset their aggregate transactions with their domestic retail customers by entering the international interbank deposit market. Similarly, domestic equity market institutions (brokerage houses, exchanges, clearing and settlement institutions) generally are involved in any transaction that changes a country's portfolio equity balance. This suggests that both domestic financial market development and financial market integration are necessary to bring about effective international consumption smoothing. Parallel to the finance and growth literature, this paper tests for the independent effects of both aspects of overall financial development. International financial market integration is measured by several gross or net debt and equity balances from the capital account of the balance of payments and, alternatively, by dummy variables indicating whether a particular net balance item is positive.

In overall economic development, domestic financial development can be expected to precede international financial integration. The reason is that international financial integration, mostly resulting from the international interaction of financial institutions, presupposes the existence of these (domestic) financial institutions. The existence of an international interbank deposit market, for instance, requires the existence of banking institutions that are active in individual countries. This suggests that for countries just entering international financial markets the bottleneck factor will indeed be the level of international integration of domestically active financial institutions. At higher levels of economic development, there already is some level of international financial integration and, relatively speaking, domestic financial market development becomes more of a bottleneck factor. To see why this is the case, note that even in rich countries a high percentage of households does not have substantial financial assets and only a limited borrowing capacity. Hence, even in rich countries many households can do little to contribute to their own consumption smoothing. For these individuals, there thus can only be international consumption smoothing through national tax and transfer systems and government involvement in international financial markets. This suggests that for rich economies the bottleneck in bringing about better international consumption smoothing will be domestic financial development. Our sample includes developed and developing countries. This allows us to test whether different aspects of financial development are important for countries at different levels of economic development in furthering international consumption smoothing.

As indicated, on the basis of the theory we expect equity market development to help smooth GNP relatively to GDP. Debt market development subsequently helps to smooth consumption relative to GNP, while debt and equity market development together contribute to smoothing consumption relative to GDP. This paper examines these three types of macroeconomic smoothing using a large international data set for the years 1960-2001.

First, we find that proxies for domestic equity market development, in particular the ratio of stock market capitalization to GDP and stock market turnover, are important in smoothing GNP relative to GDP. However, we find no role for our measures of international equity market integration, in particular gross and net stocks of FDI and portfolio equity investments, to explain GNP smoothing. The bottleneck factor thus appears to be domestic equity market development, as this explains differences in GNP variability relatively well.

Second, our proxies for domestic debt market development, i.e. measures of bank credit and overall liquid assets relative to GDP and the bank interest spread, and our proxies for international debt market integration, i.e. gross and net stocks of bank intermediated debts and other debt instruments, all perform well in explaining the smoothing of consumption relative to GNP. Interestingly, domestic debt market integration is found to be more important in smoothing consumption for developed countries, and vice versa. This suggests that for developed countries, with well-established international links between financial institutions, domestic debt market integration is the bottleneck factor.

Finally, we examine the joint role of debt and equity market development in explaining consumption smoothing in the face of GDP shocks. For this purpose, domestic debt market development is measured by bank credit relative to GDP, while domestic equity market development is measured by the stock market capitalization relative to GDP. International debt and equity market integration now are measured as gross debt and equity balances relative to GDP. We find that debt and equity market development have an independent role in explaining consumption smoothing. In fact, debt and equity market development appear to be substitutes in that a lack of one can be made up by more of the other. Moreover, the effectiveness of, say, debt market development to smooth consumption relative to GDP decreases in the extent of equity market development, and vice versa. On the basis of the estimated coefficients, we can compute the implied elasticities of the variability of consumption with respect to debt and equity market development.

In previous work, Van Wincoop (1994) has shown that international risk

sharing can bring non-negligible welfare gains. Asdrubali, Sorensen and Yosha (1996) use a decomposition of variance to compute the relative importance of equity market development (which smooths GNP relative to GDP) and debt market development (which smooths consumption relative to GNP). Sorensen, Wu, and Yosha (2002) show that risk sharing from international cross-ownership of assets, as measured by the smoothing of GNP, is higher in countries that hold a higher amount of foreign equity relative to GDP. Bekaert, Harvey, and Lundblad (2002) find that capital account openness has smaller effects on consumption smoothing than equity market liberalization. Melitz and Zumer (1999) show that in the long run credit plays a smaller role relative to claims on property in risk sharing between countries. Becker and Hoffmann (2003) extend Asdrubali et al. (1996) to a dynamic setting and find that transitory shocks can be smoothed away to a greater extent than permanent shocks because market incompleteness may render permanent shocks a lot harder to insure. Kose, Prasad, and Terrones (2003) show that the risk-sharing and consumption smoothing benefits of financial integration appear to accrue only beyond a certain "threshold" level of financial openness. Easterly, Islam, and Stiglitz (2001) find that a higher level of development of the domestic financial sector is associated with lower output volatility. However, their concern is how domestic financial development can affect output volatility rather than consumption smoothing. Relative to these papers, the contribution of this paper is to examine simultaneously the domestic and international aspects of debt and equity market development in bringing about consumption smoothing.

In the remainder, section 2 presents the underlying theoretical model. Section 3 describes the data and empirical specifications. Section 4 presents and interprets the empirical results. Section 5 concludes.

2 The model

This section lays out the theoretical framework that underlies the later empirical work. There is a representative agent in a small open economy who adjusts his consumption path in the face of domestic output shocks subject to financial market imperfections. Both debt and equity markets exist, but market imperfections imply that the agent can only smooth consumption partially through the use of debt and equity instruments.

2.1 Assumptions

At the beginning of period $t = 1, 2, ...$, the representative agent receives a random output, denoted GDP_t, given as follows[1]

$$GDP_t = \bar{y}_t + \eta_t \ + \varepsilon_t \tag{1}$$

where η_t is a permanent shock and ε_t is a temporary shock The variable $\bar{y}_t$ is the summation of all previous permanent shocks. The permanent shock $\{\eta_t : t = 1, 2, ...\}$ is an i.i.d. sequence with $E(\eta_t) = 0$ and $Var(\eta_t) = \sigma_\eta^2$. Similarly, the temporary shock $\{\varepsilon_t : t = 1, 2, ...\}$ is an i.i.d. sequence with $E(\varepsilon_t) = 0$ and $Var(\varepsilon_t) = \sigma_\varepsilon^2$. The two shocks are assumed to be uncorrelated. Consistent with empirical evidence, GDP in (1) is a non-stationary variable.

The representative individual chooses the optimal consumption level c_t at the beginning of each period t to maximize the expected value of lifetime utility given by,

$$U_t = E_t \left\{ \sum_{\tau=t}^{\infty} \beta^{\tau-t} u(c_\tau) \right\} \tag{2}$$

where β is a discount factor taken to be equal to $\frac{1}{1+r}$ with r being the international interest rate. Following the small country assumption, the interest rate r is taken to be exogenous. In the following, we will take the utility function to be quadratic with $u(c) = c - \frac{a_0}{2} c^2$.

In principle, both equity and debt markets are available to enable the consumer to smooth his consumption path. Equity markets allow the individual to diversify away part of the risk associated with domestic output by selling shares to foreigners (in exchange for riskless foreign debt instruments or a diversified, riskless foreign share portfolio). After the shock is known, the individual may wish to borrow or lend internationally to the extent that he has not already diversified away the risk associated with domestic output. Market imperfections are assumed to limit in practice the extent to which the individual can transact in international equity and debt markets. Straightforwardly, the individual would like to sell all his equity rights to domestic output to obtain perfect income certainty. In practice, we assume that only a share α_s $(0 \leqq \alpha_s \leqq 1)$ of desired (total) equity sales can be realized. Similarly, we will assume that only a share α_c $(0 \leqq \alpha_c \leqq 1)$ of the desired borrowing or lending (after the shock is

[1] Output is similarly subject to permanent and temporary shocks in Becker and Hoffman (2003).

known) can be realized.

The literature has advanced several reasons why perfect risk sharing through equity and debt markets, domestic or international, in reality is not possible (see Lewis, 1999, for a survey). These include, among others, contract writing costs (Levine, 1997), the non-tradeability of goods (Tesar, 1993), the existence of non-tradeable wealth such as human capital (Lewis, 1999), restrictions on the ownership of foreign assets that can take the form of taxes on repatriated earnings (Lewis, 1996), asymmetric information regarding the productivity of assets (Brennan and Cao, 1997), incomplete markets due to imperfect contract enforcement (Kehoe and Perri, 2002), and the incentive effects associated with selling equity to outside international investors (Eijffinger and Wagner, 2001). Factors of this kind limit domestic financial market development as well as international financial integration and, indirectly, a country's ability to smooth consumption through international debt and equity markets. In this paper, we do not spell out the precise micro foundations of the restriction parameters α_s and α_c. In the subsequent empirical work, however, we will take empirical proxies for equity and debt market development and international integration also to be proxies for the equity and debt transaction restriction parameters.

2.2 Optimal consumption under financial market constraints

With actual equity sales to foreigners equal to the maximum possible, it is seen that domestic national income, or GNP, is given by

$$GNP_t = rA_{t-1} + \bar{y}_t \quad + (1 - \alpha_s)(\eta_t \ + \varepsilon_t \ ), \tag{3}$$

where A_{t-1} is the country's net foreign asset position at the beginning of period t before any equity trading. Note that GNP is a non-stationary variable as $\bar{y}_t$ is the sum of previous permanent shocks [2]

Taking into account equity market diversification, we can write the consumer's post-diversification intertemporal budget constraint at period t as follows,

[2] Note that GNP ignores capital gains or losses on the net foreign asset position possibly resulting from a variable interest rate as discussed by Obstfeld (2004).

$$E_t\left\{\sum_{\tau=t}^{\infty}(\frac{1}{1+r})^{\tau-t}c_\tau\right\} = (1+r)A_{t-1}+E_t\left\{\sum_{\tau=t}^{\infty}(\frac{1}{1+r})^{\tau-t}[\bar{y}_t\ +(1-\alpha_s)(\eta_\tau\ +\varepsilon_\tau\ )]\right\} \tag{4}$$

The consumer determines his consumption - and implicitly his international borrowing and lending - so as to maximize lifetime utility subject to the post-diversification intertemporal budget constraint. This yields the following familiar Euler equation,

$$E_t\left\{u'(c_s)\right\} = (1+r)\beta E_t\left\{u'(c_{s+1})\right\} \tag{5}$$

for $s >= t$. This implies $c_t = E_t c_s$ for $s > t$, as we assume $(1+r)\beta = 1$. Recognizing the budget constraint, we can now derive the optimal consumption, c_t^*, if there were no debt market imperfection or $c_t^* = \bar{y}_t\ + rA_{t-1} + (1-\alpha_s)\eta_t\ + \frac{r}{1+r}(1-\alpha_s)\varepsilon_t$. This expression reflects that the representative agents wishes to fully adjust his consumption to permanent income shocks, while he intends to lend (borrow) following positive (negative) temporary income shocks. Correspondingly, we can derive the optimal lending (or borrowing, if negative) in the absence of debt market restrictions, L_t^*, given by $L_t^* = \frac{1}{1+r}(1-\alpha_s)\varepsilon_t$.

As only a fraction α_c of these desired credit market transactions can be realized, we see that actual lending (or borrowing) L_t is given by

$$L_t = \frac{1}{1+r}\alpha_c(1-\alpha_s)\varepsilon_t \tag{6}$$

So the actual consumption, c_t, different from desired consumption, c_t^*, can be seen to be given by

$$c_t = rA_{t-1}+\bar{y}_t\ +(1-\alpha_s)(\eta_t\ +\varepsilon_t\ )-L_t = rA_{t-1}+\bar{y}_t\ +(1-\alpha_s)\eta_t\ +(1-\alpha_c\frac{1}{1+r})(1-\alpha_s)\varepsilon_t \tag{7}$$

The dynamics of GDP, GNP, consumption and the net foreign asset position can now be derived as follows

$$GDP_t - GDP_{t-1} = \eta_t\ +\varepsilon_t\ -\varepsilon_{t-1} \tag{8}$$

$$GNP_t - GNP_{t-1} = (1-\alpha_s)\eta_t\ +(1-\alpha_s)[\varepsilon_t - (1-\frac{r}{1+r}\alpha_c)\varepsilon_{t-1}] \tag{9}$$

$$c_t - c_{t-1} = (1-\alpha_s)\eta_t \ + (1-\alpha_s)[(1-\frac{\alpha_c}{1+r})\varepsilon_t - (1-\alpha_c)\varepsilon_{t-1}] \tag{10}$$

$$A_t - A_{t-1} = \frac{1}{1+r}\alpha_c(1-\alpha_s)\varepsilon_t \tag{11}$$

These variables in first difference are seen to be stationary.

2.3 Derivation of estimating equations

In this subsection, we derive the estimating equations that relate the co-variability of GDP, GNP and consumption to empirical proxies of domestic financial development and international financial integration. To start, the three covariances among GDP_t and GNP_t, GNP_t and c_t, and GDP_t and c_t - all in first differences - can be obtained as follows,

$$Cov(GDP_t - GDP_{t-1}, GNP_t - GNP_{t-1}) = (1-\alpha_s)[\sigma_\eta^2 + (2 - \frac{r}{1+r}\alpha_c)\sigma_\varepsilon^2]$$

$$Cov(GNP_t - GNP_{t-1}, c_t - c_{t-1}) = (1-\alpha_s)^2[\sigma_\eta^2 + (2(1-\alpha_c) + \frac{r}{1+r}\alpha_c^2)\sigma_\varepsilon^2]$$

$$Cov(GDP_t - GDP_{t-1}, c_t - c_{t-1}) = (1-\alpha_s)[\sigma_\eta^2 + (2 - (\frac{2+r}{1+r})\alpha_c)\sigma_\varepsilon^2]$$

Next, we can derive the following theoretical least-squares regression equations:

$$GNP_t - GNP_{t-1} = b_1(GDP_t - GDP_{t-1}) \tag{12}$$

$$c_t - c_{t-1} = b_2(GNP_t - GNP_{t-1}) \tag{13}$$

$$c_t - c_{t-1} = b_3(GDP_t - GDP_{t-1}) \tag{14}$$

with the three coefficients b_1, b_2 and b_3 given by,

$$b_1 = \frac{Cov(GDP_t - GDP_{t-1}, GNP_t - GNP_{t-1})}{Var(GDP_t - GDP_{t-1})} = \frac{(1-\alpha_s)[\sigma_\eta^2 + (2 - \frac{r}{1+r}\alpha_c)\sigma_\varepsilon^2]}{\sigma_\eta^2 + 2\sigma_\varepsilon^2}$$

$$b_2 = \frac{Cov(GNP_t - GNP_{t-1}, c_t - c_{t-1})}{Var(GNP_t - GNP_{t-1})} = \frac{\sigma_\eta^2 + [2(1-\alpha_c) + \frac{r}{1+r}\alpha_c^2]\sigma_\varepsilon^2}{\sigma_\eta^2 + [1 + (1 - \frac{r}{1+r}\alpha_c)^2]\sigma_\varepsilon^2}$$

$$b_3 = \frac{Cov(GDP_t - GDP_{t-1}, c_t - c_{t-1})}{Var(GDP_t - GDP_{t-1})} = \frac{(1-\alpha_s)[\sigma_\eta^2 + (2 - \frac{2+r}{1+r}\alpha_c)\sigma_\varepsilon^2]}{\sigma_\eta^2 + 2\sigma_\varepsilon^2}$$

To interpret the coefficients, first note that b_1, b_2 and b_3 all depend on the interest rate r. To see why, note that a higher interest r increases the return to savings out of GNP_{t-1}, thereby making GNP_t more responsive to ε_{t-1}. This reduces the co-variation between differenced GNP and differenced GDP as well as b_1. At the same time, we see that lending L_t is negatively related to the interest rate r in (6) (as at a higher interest rate smaller savings are required to guarantee a higher level of consumption in the future). At a higher interest rate, actual lending thus becomes less responsive to the temporary output shock ε_t and at the same time consumption becomes more responsive to this shock. This increases the covariances between the differenced consumption and GNP, and between the differenced consumption and GDP - leading to higher coefficients b_2 and b_3. The role of the interest rate in this model, to wit, reflects its discrete-time nature, with only periodic adjustment of consumption to output shocks. With smaller periods, the relevant interest rate between periods would become smaller as well. If we let the interest rate go to zero, it can be seen that b_1 collapses to $1-\alpha$, that b_2 collapses to $1-\rho\alpha_c$, and that b_3 collapses to $(1-\rho\alpha_c)(1-\alpha_s)$ where $\rho = \frac{2\sigma_\varepsilon^2}{\sigma_\eta^2+2\sigma_\varepsilon^2}$. The parameter ρ is a measure of the importance of temporary shocks relative to permanent shocks. Note that in the absence of temporary shocks with $\rho = 0$, the credit market restriction parameter α_c becomes immaterial in consumption smoothing, as the representative agent only smooths his consumption through credit markets in response to temporary shocks.

Regardless of whether the interest rate is taken to be zero in the limit, the role of the restriction parameters α_s and α_c in determining b_1, b_2 and b_3 is now apparent. A less stringent equity market restriction - or higher α_s - reduces the "regression coefficient" b_1, while a less stringent debt market restriction - or higher α_c - reduces the "regression coefficient" b_2. Finally, higher values of α_s and α_c both reduce b_3 and we see that $\frac{\partial^2 b_3}{\partial\alpha_s\partial\alpha_c} = \rho\frac{2+r}{2+2r} > 0$, which means

that - with a higher level value of the equity market restriction parameter - the effect of a higher debt market restriction parameter in reducing the covariance between consumption and GDP is smaller (and vice versa).

Next, we note that the restriction parameters α_s and α_c are not directly observable. However, we can assume that they are related to observable measures for equity and credit market development, denoted S and C, by $\alpha_s = \beta_s S$ and $\alpha_c = \beta_c C$. The restriction parameters α_s and α_c can change over time, as S and C vary over time. Substituting period t values for α_c and α_s and suppressing the interest rate, we get

$$(GNP_t - GNP_{t-1}) - (GDP_t - GDP_{t-1}) = -\beta_s S_t (GDP_t - GDP_{t-1}) \quad (15)$$

$$(c_t - c_{t-1}) - (GNP_t - GNP_{t-1}) = -\beta_c^{'} C_t (GNP_t - GNP_{t-1}) \quad (16)$$

$$(c_t - c_{t-1}) - (GDP_t - GDP_{t-1}) = -\beta_c^{'} C_t (GDP_t - GDP_{t-1}) - \beta_s S_t (GDP_t - GDP_{t-1}) +$$

$$+\beta_c^{'} \beta_s C_t S_t (GDP_t - GDP_{t-1}) \quad (17)$$

where $\beta_c^{'} = \rho \beta_c$.

To interpret (15), note that the difference between a country's GNP and GDP is its net investment income from abroad. The left-hand-side of (15) hence is the first difference of a country's net investment income. There is no reason to assume that either a country's stock market development, as proxied by S_t, or the first difference of GDP, i.e. $GDP_t - GDP_{t-1}$, are endogenous to the change in a country's net investment income as given by $(GNP_t - GDP_t) - (GNP_{t-1} - GDP_{t-1})$. Hence, we can maintain the assumption of the exogeneity of the product variable $S_t(GDP_t - GDP_{t-1})$ on the right-hand-side of (15).[3] Equation (15), however, is somewhat restrictive in that the coefficient on $GDP_t - GDP_{t-1}$ is taken to be one. Relaxing this assumption and restating the equation in growth rates rather than first differences, we get

[3] Similarly, we maintain that the product variables on the right-hand-sides of (16) and (17) are exogenous to the differenced variables on the left-hand-sides of these two equations. In interpreting these left-hand-sides, note that GNP minus consumption equals savings, while GDP minus consumption equals savings minus the net investment income from abroad.

$$GNPg_t = \beta GDPg_t - \beta_s S_t GDPg_t \tag{15'}$$

where $GNPg_t$ and $GDPg_t$ are the growth rates of GNP and GDP and β is a coefficient generally different from one. Adding a constant and an error term yields us our final estimating equation. The estimated value of β_s provides information about the extent to which stock market development helps to smooth GNP relative to GDP. Equations (16) and (17) can be similarly transformed to yield equations with the growth rate of consumption cg_t on the left hand side as follows

$$cg_t = \beta GNPg_t - \beta_c^{'} C_t GNPg_t \tag{16'}$$

$$cg_t = \beta GDPg_t - \beta_c^{'} C_t GDPg_t - \beta_s S_t GDPg_t + \beta_c^{'} \beta_s C_t S_t GDPg_t \tag{17'}$$

Again adding constants and error terms yields us our estimating equations.

3 Data and empirical specifications

3.1 Data

The data on GDP, GNP, consumption and domestic financial development cover 210 countries from 1960 to 2001, while there are international financial variables for 67 countries during 1970-1998. This section briefly describes the data used in this study. Variable definitions and data sources are provided in the appendix.

3.2 Macroeconomic and domestic financial variables

GDPg, GNPg, cg are defined as the annual growth rates of per capita GDP, GNP, and final consumption expressed in terms of constant local currencies[4]. Domestic financial variables are proxies for domestic debt and equity market development. Two stock market development indicators are used as measures of domestic stock market size and efficiency. They are the market capitalization of listed companies as a percent of GDP *(MCap)* and stock market turnover relative to market capitalization *(Turn)*. There are four domestic credit market

[4]Local currencies are chosen since we are interested in countries' growth rates rather than international level comparisons.

development indicators: domestic credit to the private sector as a percent of GDP *(CredPriv)*, domestic credit provided by the banking sector as a percent of GDP *(CredBank)*, liquid liabilities as a percent of GDP *(M3)*, and the bank interest rate spread *(Spread)*. They characterize the size (*CredPriv, CredBank*), liquidity (*M3*) and efficiency (*Spread*) of the domestic credit market.

3.3 International financial variables

The international financial variables are indices of international equity and debt market integration. All of these variables are based on financial stock variables from the balance of payments. Stock variables summarize a country's past involvement in international financial markets and are taken to be indices of potential current international financial activity in pursuit of consumption smoothing as well. To represent international equity integration, there are three variables: the gross stock of foreign direct investment assets and liabilities as a percent of GDP (*FDI*), the gross stock of the portfolio equity assets and liabilities as a percent of GDP (*PortEq*), and the sum of the previous two, i.e. the gross international equity stock as a percent of GDP (*TotEq*). These variables are obtained from estimates by Lane and Milesi-Ferretti (2001).

To obtain variables to represent international debt market integration, we need to use data from several sources. Again represented as the sums of national assets and liabilities, i.e. as gross variables, we have one variable for rich countries: gross total debt as a percent of GDP (*TotDebt* for OECD countries). For poor countries, we can obtain two analogues of the rich-country *TotDebt* by taking the sum between one series of national debt liability[5] (from the OECD) and two alternative estimated series of debt assets (Lane and Milesi-Ferretti, 2001), leading to the *TotDebt* for non-OECD countries *TotDebt*$'$ for non-OECD countries. After combining with rich-country data, we obtain the *TotDebt* and *TotDebt*$'$ series for the world as a whole.

Gross stock variables are indices of total market activity. Higher gross stocks thus may give rise to volume-based, lower transaction costs in international financial markets, which would be a sign of higher financial market integration. Gross stock variables, by construction, give equal weight to national financial

[5] For debt liability data, we in fact have two measures avaliable, constructed differently. OECD data rely mainly on the creditor-reporting system and refers primarily to debt by a country's residents, regardless of the currency of denomination. World Bank data relies on a debtor-reporting system and focuses primarily on foreign-currency denominated debt. Not surprisingly, the World Bank numbers are smaller than OECD numbers. We use the broader OECD data as out debt liability measure.

assets and liabilities. However, it is reasonable to assume that countries with a positive net foreign asset position in, say, bank deposits can more easily smooth their consumption than countries with a negative net asset position, as it may be easier to draw down positive balances than to increase negative balances. To reflect this, we also construct analogous net stock variables, measured as national assets minus liabilities for the relevant financial instrument category. These net stock variables clearly are continuous variables. However, it may be important whether a country is a net asset or liability holder rather than how large these net assets or liabilities are. To reflect this, we also construct net stock dummy variables that take on a value of 1 if the country is a net asset holder in a particular instrument category and zero otherwise.

3.4 Summary statistics

Table 1 provides summary statistics for all the variables. Next, Table 2A gives the correlation coefficients among the *GDPg, GNPg, cg* variables. It is seen that the correlation coefficients between *GDPg* and *GNPg* are close to one. The correlation coefficients between *GDPg* and *GNPg* on the one hand and *cg* on the other are both shown to be a bit above 0.5. Table 2B gives the correlation coefficients among the financial variables, with the international financial variables measured in gross stock terms. The financial variables tend to be significantly correlated with the expected signs. Countries with large domestic debt markets (high *CredPriv* and *CredBank*), for instance, tend to have highly liquid financial markets (high *M3*) and a high efficiency (low *Spread*). Turning to the international equity variables, we see that countries with high gross FDI stocks also tend to have high gross portfolio equity stocks, which suggests that these modes of equity finance are complements rather than substitutes. Not surprisingly, the two total international debt measures (*TotDebt* and *TotDebt*$'$) are highly positively correlated with a correlation coefficient of 0.923. We see, however, that the *TotEq* and *TotDebt* variables display a weak negative correlation, while *TotEq* and *TotDebt'* display only a weak positive relation. Also note that the domestic debt variables tend to be positively correlated with the international debt variables and the same holds for the equity variables. Domestic and international financial development, not surprisingly, thus tend to move in tandem.

4 Empirical results

This section presents three sets of regression results. In subsection 4.1, we examine how equity market development affects the co-movement of GNP and GDP based on specification (15'). The impact of domestic and international financial variables is considered in turn given that these tend to be substantially positively correlated as seen in Table 2B. Subsection 4.2 considers how debt market development affects the co-movement of consumption and GNP based on specification (16'). Subsection 4.2 in addition considers the joint impact of domestic and international debt market development on the relationship between consumption and GNP to check whether in fact they can be shown to have distinct impacts. Next, subsection 4.3 examines the impact of equity and debt market development on the co-movement of consumption and GDP along the lines of specification (17'). Subsection 4, finally, assesses the quantitative impact of domestic and international finance on the co-movements of GDP, GNP and consumption as implied by the estimated regression coefficients.

Throughout, we correct for possible heteroscedasticity across country panels and autocorrelation over time within a panel. Specifically, we allow for AR(1) autocorrelation which is specific for each country in the panel data set, while between countries we assume heteroskedasticy[6]. Estimation is by feasible generalized least squares (FGLS).

4.1 Smoothing GNP relative to GDP

The regressions of GNP growth on GDP growth are based on specification (15'). Table 3 shows the results. Panel A is based on domestic equity market variables, while Panels B through D contain the international equity market variables in gross, net and dummy form, respectively. In Table 3A, stock market capitalization and turnover ratio enter the regressions separately with negative and significant coefficients, which suggests that both domestic stock market size and efficiency are conducive to smoothing GNP relative to GDP. Moreover, capitalization and stock market turnover jointly enter into a regression with negative signs as well, demonstrating to some extent that stock market size and

[6] We do not specify cross-sectional correlation because in order to cosider this possiblity we must have at least as many time periods as there are panels in the dataset, which is not the case. We altenatively applied robust standard error methods with clustering of countries, which specifies that error terms are independent across countries but correlated within a country with similar, unreported results.

efficiency actually play distinct roles. In Tables 3B through 3D, international equity market integration indicators - in gross, net, and dummy forms - appear to be unimportant for the smoothing of GNP relatively to GDP. These latter results suggest that in practice international equity investments are not chosen effectively to provide diversification benefits.

4.2 Smoothing consumption relative to GNP

In this subsection, we present regressions of consumption growth on GNP growth along the line of (16'). Table 4 presents the results. In Table 4A, the various domestic debt market development indicators enter into regressions of consumption growth on GNP growth with negative and significant coefficients, except for the interest rate spread which enters with a positive but not statistically significant coefficient. So larger domestic debt markets (measured by higher *CredPriv* and *CredBank*) and more liquid ones (higher *M3*) appear to contribute to smoothing consumption relatively to GNP. Turning to the international debt indicators *TotDebt and TotDebt*$'$, we see in Tables 4B through 4D that they enter negatively regardless of whether they are in gross, net or dummy form, with statistically significant coefficients (apart from the net *TotDebt* variable). Specifically, the negative and significant signs for the *TotDebt* and *TotDebt*$'$ variables in dummy form suggest that countries with positive net foreign debt assets can more easily smooth their consumption in the face of GNP shocks than countries with negative net foreign debt assets. This makes sense as it should be much easier to draw down a positive bank deposit balance or to liquidate a net position in bonds than to borrow money from banks or through the flotation of bonds in the international capital market.[7]

Finally, it is interesting to include both domestic and international debt variables in the regression to examine their relative importance in smoothing consumption relative to GNP. Analogously to (17'), we can assume that domestic agents consecutively have to overcome domestic and international credit market barriers to smooth consumption relative to GNP. Specifically, we can take the share of desired lending that can be carried out, i.e. α_c, to be equal to $\alpha_{cd} + \alpha_{ci} - \alpha_{cd}\alpha_{ci}$ where α_{cd} and α_{ci} are indices of the extent to which desired

[7] This could reflect that the liquidation of positive debt balances may be quicker and require lower transaction costs. Note that transaction costs may imply that the net-of-cost interets rate received on positive debt balances is less than the cost-inclusive interest rate to be paid on negative debt balances. This could lead to a more rapid liquidation of positive balances than build-up of negative balances, but the oppositve should be true as well.

lending can be carried out using domestic and international credit market channels. In this specification, it remains that $0 \leqq \alpha_c \leqq 1$, as long as $0 \leqq \alpha_{cd} \leqq 1$ and $0 \leqq \alpha_{ci} \leqq 1$ Further, we assume that $\alpha_{cd} = \beta_{cd} C_{d,t}$ and $\alpha_{ci} = \beta_{ci} C_{i,t}$ where $C_{d,t}$ and $C_{i,t}$ are domestic and international debt variables, respectively. Again for an interest rate of zero, instead of (16') we now get

$$cg_t = \beta GNPg_t - \beta^{'}_{cd} C_{d,t} GNPg_t - \beta^{'}_{ci} C_{i,t} GNPg_t + \beta^{'}_{di} C_{d,t} C_{i,t} GNPg_t \quad (18)$$

where $\beta^{'}_{cd} = \rho\beta_{cd}$ and $\beta^{'}_{ci} = \rho\beta_{ci}$and $\beta^{'}_{di} = \rho\beta_{cd}\beta_{ci}$. In (18), the interaction term of the domestic and international debt variables enters positively to reflect that more domestic debt market development reduces the marginal benefit of international debt market integration in consumption smoothing, and vice versa. To implement (18), we take the domestic debt variable to be either *CredPriv* or *CredBank* and the international debt variable to be either *TotDebt* or *TotDebt'*.

In Panel A of Table 5, we see that the international debt variables are significant in regressions (1), (2) and (4) at the 5 percent level, while the domestic debt variables are significant only at the 10 percent level in regression (1), but not so in regressions (2) through (4). Note that the interaction term of the domestic and international debt variables is significant at the 10 percent level only in regression (1). From this evidence, we conclude that international financial integration is more important in explaining consumption smoothing than domestic financial market development for the world sample.

Next, it is interesting to check whether this conclusion holds for countries at different levels of economic development. For this purpose, we split the overall worldwide sample into two subsamples consisting of the relatively rich OECD countries and the relatively poor non-OECD countries. The analogous regressions are represented in Panels B and C of Table 5. We see that (i) the domestic debt variables enter regressions (5) and (6) for the OECD sample with negative coefficients with significance levels of at least 10 percent, but not so in regressions (7) through (10) for the non-OECD sample, and (ii) the international debt variables obtain negative coefficients in regressions (7) through (10) for the non-OECD sample with significance levels of at least 10 percent, but not so in regressions (5) and (6) for the OECD sample. This suggests that domestic debt market development (international debt integration) is a relatively important bottleneck in improving the smoothing of consumption relative to GNP in OECD (non-OECD) countries. This may reflect that poor countries

still have rather weak links with the international debt market, and hence improving these links may be most important in achieving better consumption smoothing. For rich countries, links with the international debt market are generally well-established. In these countries, however, there are still many households that may not have sufficient financial wealth or may otherwise not be sufficiently "plugged into" the financial system to enable them to smooth their household consumption. In rich countries, further domestic financial development may serve to increase the share of households that can effectively smooth their household consumption and hence improve overall macroeconomic consumption smoothing. Finally, note that the debt variables interaction terms enter with positive coefficients in all regressions of Table 5B and 5C, even if the interaction term is only significant (at the 1 percent level) in regression 7. This provides some evidence that the (marginal) benefit of higher domestic debt market development in improving consumption smoothing decreases with the level of international debt market development, and vice versa, consistent with (18).

4.3 Smoothing consumption relative to GDP

Next we present the results of regressions relating consumption growth to GDP growth following (17') to see how equity and debt market development jointly affect the smoothing of consumption relative to GDP. For this purpose, we select *CredPriv* and *CredBank* to be two alternative domestic debt market variables, while *MCap* is the domestic equity market variable. At the same time, we select *TotDebt* and *TotDebt'* to be alternative international debt market variables and *TotEq* to be the international equity market variable.

Table 6 presents the results. The two domestic debt variables and the capitalization variable enter with negative and significant coefficients in the two regressions, which indicates that debt and equity market development have distinct roles in bringing about consumption smoothing as suggested by the theoretical model of section 2. Interestingly, the interaction terms of *CredPriv* or *CredBank* with *MCap* enter the two regressions positively and significantly at the 10 and 5 percent respectively, also consistent with the theoretical model. The (marginal) benefit of higher debt market development in improving consumption smoothing thus decreases with the level of equity market development, and vice versa. The marginal benefit of either type of development, however, remains positive (see the next subsection for an assessment of the implied quantitative effects),

which suggests that domestic debt and equity market are substitutes in that a relative lack of one can be made up by having more of the other. It would be going too far, however, to say that financial structure (or the relative development of debt and equity markets) does not matter, as the marginal effects of the two types of development are not the same (see again the next subsection for a quantitative assessment). For the international variables, we get qualitatively similar results for the gross, net, or net dummy measures of both the *TotDebt* and *TotDebt'* variables with several of the regression coefficients having the expected signs and being statistically significant. To summarize, we find strong empirical support for the theoretical predications that (i) both equity and debt market development are useful in reducing the co-movement of consumption and GDP and that (ii) the marginal benefit of having one type of financial market development decreases in the level of the other type.

4.4 Quantitative assessment

In this section, we examine the implication of our empirical results for the relationships between financial market development and integration on the one hand and the variabilities of GNP and consumption on the other hand. [8] Specifically we are interested in what our estimated coefficients can tell us about the variability of GNP and consumption relative to the variability of GDP. Before answering this question, we need to slightly extend the theoretical framework of section 2. To start, note that the ratio of the variance of (differenced) GNP to (differenced) GNP is related to the equity trading restriction parameter α_s as follows,

$$\frac{var(GNP_t - GNP_{t-1})}{var(GDP_t - GDP_{t-1})} = (1 - \alpha_s)^2 \tag{19}$$

where we take the interest rate r to be zero.

The elasticity of this relative variance w.r.t. the stock market restriction parameter α_s is now seen to be given by[9]

[8] Note that the quadratic utility specification implies that current utility declines with the variance of current consumption for a given mean value of consumption. It goes beyond the scope of this paper to assess how financial market development may affect the dynamic path of the variability of consumption.

[9] Alternatively, the elasticity of the standard deviation of differenced GNP relative to the standard deviation of differenced GDP w.r.t. α_s can be calculated as $\zeta_1' = \frac{\partial}{\partial \alpha_s}\left(\frac{\sigma_{(GNP_t - GNP_{t-1})}}{\sigma_{(GDP_t - GDP_{t-1})}}\right) \bullet \frac{\alpha_s}{\frac{\sigma_{(GNP_t - GNP_{t-1})}}{\sigma_{(GDP_t - GDP_{t-1})}}} = \frac{-\alpha_s}{1-\alpha_s}$, which is half of the elasticity of the analogous variance ratio in (19).

$$\zeta_1 = \frac{\partial}{\partial \alpha_s}\left(\frac{var(GNP_t - GNP_{t-1})}{var(GDP_t - GDP_{t-1})}\right) \bullet \frac{\alpha_s}{\frac{var(GNP_t - GNP_{t-1})}{var(GDP_t - GDP_{t-1})}} = \frac{-2\alpha_s}{1-\alpha_s} \qquad (20)$$

where it should be remembered that $\alpha_s = \beta_s S$ with S standing for overall (domestic or international) stock market development. To evaluate expression (20) we can take an estimated value for the coefficient β_s from one of the regression tables and find an associated value for S by taking the sample mean of the proxy for stock market development that is a variable in the relevant regression.

Before actually doing this, note that similarly we can write the variance of differenced consumption relative to differenced GNP as follows

$$\frac{var(c_t - c_{t-1})}{var(GNP_t - GNP_{t-1})} = 1 - \rho + \rho(1-\alpha_c)^2 \qquad (21)$$

Expression (21) reflects that representative agent only aims to smooth his consumption through the credit market if there are temporary shocks, i.e. with $\rho > 0$. Consistent with this, the variances of consumption and GNP are equal in the absence of temporary shocks with $\rho = 0$. The elasticity of the variance ratio in (21) to the debt market transaction parameter, α_c, is given by

$$\zeta_2 = \frac{\partial}{\partial \alpha_c}\left(\frac{var(c_t - c_{t-1})}{var(GNP_t - GNP_{t-1})}\right) \bullet \frac{\alpha_c}{\frac{var(c_t - c_{t-1})}{var(GNP_t - GNP_{t-1})}} = \frac{-2(1-\alpha_c)\alpha_c}{(1-\rho)/\rho + (1-\alpha_c)^2} \qquad (22)$$

where now $\alpha_c = \beta_c C$ with C standing for overall (domestic or international) debt market development.[10]

Finally, note that the ratio of the variance of differenced consumption to the variance of differenced GDP is given by

$$\frac{var(c_t - c_{t-1})}{var(GDP_t - GDP_t)} = (1-\alpha_s)^2[1 - \rho + \rho(1-\alpha_c)^2] \qquad (23)$$

This expression allows us to derive elasticities of this ratio of the variances of consumption and GNP with respect to the two financial market restriction

[10] Rememer that $\beta_c = \beta_c'/\rho$.To compute C, we use mean value of the relevant debt market variable.

parameters, α_s and α_c, as follows

$$\zeta_{3,\alpha_s} = \frac{\partial}{\partial \alpha_s}\left(\frac{var(c_t - c_{t-1})}{var(GDP_t - GDP_t)}\right) \bullet \frac{\alpha_s}{\frac{var(c_t - c_{t-1})}{var(GDP_t - GDP_t)}} = \frac{-2\alpha_s}{1-\alpha_s} \tag{24}$$

$$\zeta_{3,\alpha_c} = \frac{\partial}{\partial \alpha_c}\left(\frac{var(c_t - c_{t-1})}{var(GDP_t - GDP_{t-1})}\right) \bullet \frac{\alpha_c}{\frac{var(c_t - c_{t-1})}{var(GDP_t - GDP_{t-1})}} = \frac{-2(1-\alpha_c)\alpha_c}{(1-\rho)/\rho + (1-\alpha_c)^2} \tag{25}$$

To be able to evaluate expressions (22), (24) and (25), we need an estimate of ρ defined as $\frac{2\sigma_\varepsilon^2}{\sigma_\eta^2 + 2\sigma_\varepsilon^2}$. To find such as estimate, first note that the model implies that the variances of first-differenced GDP and second-differenced GDP are given by

$$Var(GDP_t - GDP_{t-1}) = \sigma_\eta^2 + 2\sigma_\varepsilon^2$$

$$Var(GDP_t - GDP_{t-2}) = 2\sigma_\eta^2 + 2\sigma_\varepsilon^2$$

which imply the following expression for ρ

$$\rho = 2 - \frac{var(GDP_t - GDP_{t-2})}{var(GDP_t - GDP_{t-1})}$$

This suggest that we can find an estimate of ρ by plugging estimates of first-differenced and second-differenced GDP in the above expression.[11]

Now we are ready to assess the implications of our estimated coefficients for the impact of financial market development on the variability of GNP and consumption (relative to GDP). Table 7A first presents the estimated elasticity of the relative variance of GNP and GDP with respect to proxies for equity market development. The estimates are based on the coefficients for *MCap* and *Turn* in regressions (1) and (2) in Table 3A. The figures can be interpreted to indicate how much the variance of GNP growth relative to GDP growth changes by having an increase in one of the domestic equity market variables of one percent. For example, a one percent increase in stock market capitalization relative to GDP evaluated at the mean value can reduce the relative variance of

[11] In practice, however, we use the variances of the one-year and two-year growth rates of GDP to estimate ρ. This procedure yields an estimated value of ρ of 0.81, which implies that the variance of the temporary shock is about twice the variance of the permanent shock or $\sigma_\varepsilon^2 \approx 2\sigma_\eta^2$.

GNP growth to GDP growth rate by 0.027 percent. We do not compute analogous elasticity estimates using international equity measures, as the underlying regression coefficients are statistically insignificant in Tables 3B, 3C, and 3D.

Table 7B provides the estimated elasticity of the variance of consumption growth (relative to GNP growth) with respect to both domestic and international indicators. These are based on regression coefficients taken from Tables 4. The estimated elasticity for *CredPriv*, for instance, is taken from the first regression in Table 4A. We see that the estimated elasticities in Table 7B tend to be larger than those reported in Table 7A. This suggests that credit market development is more effective in reducing the variance of consumption relative to GNP than equity market development is in reducing the variance of GNP relative to GDP.

Finally, Table 7C presents the estimated elasticity of the variance of consumption growth relative to GDP growth rate with respect to debt and equity market development jointly. The first two lines of Table 7C are based on regression (1) in Table 6A, while the third and fourth line of Table 7C are based on regression (2) in Table 6A. At the same time, the fifth and sixth line of Table 7C are based on regression (1) of Table 6B, while the last two lines are based on regression (2) of Table 6B. The elasticities reported in Table 7C range from -0.103 to -0.462 and hence are sizeable. For each of the four sets of two computed elastiticies, we further see that credit market development (integration) is more powerful in smoothing consumption relative to GDP than stock market development (integration). Overall we find that financial market development and integration are able to significantly smooth GNP and consumption relative to GDP.

5 Discussions and conclusions

In this paper we use a simple theoretical model to illustrate how a representative consumer smooths his consumption under a restricted availability of debt and equity market instruments due to imperfect domestic and international debt and equity markets. The model yields testable implications regarding the comovements of GDP, GDP and consumption for a given level of domestic or international debt and equity market development. These implications are explored using a variety of empirical proxies for domestic and international debt and equity market development that are familiar from the empirical literature

on the finance and growth nexus.

The empirical results confirm that the extent to which consumption smoothing is possible in the face of output or GDP shocks depends importantly on the level of financial development. The domestic and international aspects of financial development turn out to play distinct roles in reducing consumption variability. Specifically, we find that domestic debt market development is more relevant for reducing consumption variability relative to GNP for OECD member countries than for non-member countries, while international debt market development is relatively important for OECD non-member countries in reducing consumption variability. Similarly, we find that debt and equity market developments have independent roles in reducing the variability of consumption relative to GDP. They are to some extent substitutes in that more of one can make up for less of the other. Calculated elasticities suggest that credit market development is more potent than equity market development in reducing the variability of consumption relative to GNP.[12] Generally, the calculated elasticities suggest that financial market development can have economically relevant effects in reducing consumption variability relative to GNP. Consistent with the theoretical model, we also find empirical support for the hypothesis that a higher level of equity market development reduces the potential for debt market development to reduce the variability of consumption relative to GDP, and vice versa.

There are several avenues for further research. At a theoretical level, existing models of imperfections in international debt and equity markets can be extended to see how the determinants of these restrictions in the end determine the scope for international consumption smoothing. At the empirical level, similarly it may be possible to consider some of the determinants of domestic and financial development, such as the nature of legal systems, to see how these determinants impact on actual consumption smoothing.

At a policy level, the knowledge that financial sector development helps to smooth consumption should provide an impetus to take measures that promote such development. The results of this paper suggest that gross stock variables derived from the balance of payments help to explain a country's consumption smoothing possibilities. The gross financial stock variables of one coun-

[12] This study uses annual data. Instead, one could examine the co-movements of consumption and GDP or GNP taking three or five year intervals. Over longer periods, equity market development may be relatively important in smoothing consumption, as suggested by findings in Melitz and Zumer (1999).

try are likely to be directly affected by financial sector development in other countries. This reflects that international consumption smoothing requires the active involvement of at least two countries. Financial market development in one country thus is likely to increase the consumption smoothing options available to other countries. The potentially beneficial effects of national financial sector development on consumption smoothing possibilities and welfare abroad provides policy makers with an additional reason to aim for financial sector development.

Appendix: Variable definitions and data sources

- Growth rates

GDPg : Annual percentage growth rate of GDP per capita based on constant local currency. Per capita number is obtained by dividing total GDP by midyear population (Source: WDI).

GNPg : Annual percentage growth rate of GNP per capita based on constant local currency (Source: WDI).

cg : Annual percentage growth rate of per capita final consumption based on constant local currency. Final consumption is the sum of household final consumption expenditure and general government final consumption expenditure (Source: WDI).

- Domestic financial variables

MCap : Stock market capitalization as a percent of GDP. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year (Source: WDI).

Turn : Stock market turnover ratio computed as the total value of shares traded during the period divided by the average market capitalization for the period (Source: WDI).

CredPriv : Domestic debt to private sector as a percent of GDP. This domestic debt is financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include debt to public enterprises (Source: WDI).

CredBank : Domestic debt provided by banking sector as a percent of GDP. Debt is on a gross basis, with the exception of debt to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions, such as savings and mortgage loan institutions, building and loan associations (Source: WDI).

M3 : Liquid liabilities as a percent of GDP. Liquid liabilities are the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents (Source: WDI).

Spread : Interest rate spread. The spread is the interest rate charged by banks on loans to prime customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits (Source: WDI).

- International financial variables

FDI : Stock of foreign direct investment assets and liabilities as a percent of GDP. Estimated by Milesi-Ferretti using cumulative flow adjusted for relative price variations (Source: Lane and Milesi-Ferretti, 2001).

PortEq : Stock of portfolio equity assets and liabilities a percent of GDP. Estimated by Lane and Milesi-Ferretti using cumulative flow adjusted for relative price variations (Source: Lane and Milesi-Ferretti, 2001).

TotEq: Gross stock of international equity as a percent of GDP. Sum of *FDI* and *Portfolio-Equity* (Source: Lane and Milesi-Ferretti, 2001).

TotDebt for OECD countries: Gross stock of total debt assets and liabilities as a percent of GDP. Sum of *IntBank* and *Portfolio-debt*; For developed countries.

TotDebt for non-OECD countries and $TotDebt^{'}$ for non-OECD countries: Gross stock of portfolio debt and other investment (Mainly from Bank) as a percent of GDP. For developing countries (Source: OECD and Lane and Milesi-Ferretti, 2001). Alternative measures of the stock of total debt assets, namely ASSETS2 and CUMLOAN appearing in the Lane and Milesi-Ferretti (2001) original data set, are added respectively to OECD collected data on total debt liability, leading to *TotDebt* and $TotDebt^{'}$ correspondingly.

TotDebt for the world and $TotDebt^{'}$ for the world: These series combine *TotDebt* for OECD countries with two alternative measures, *TotDebt* for non-OECD countries and $TotDebt^{'}$ for non-OECD countries leading to two alternative worldwide measures of gross debt.

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Table 1. Summary statistics

Variables					
Growth rates					
	Obs.	Mean	S. D.	Min	Max
GDPg	5907	1.90	5.50	-19.73	42.99
GNPg	5633	1.95	5.91	-19.74	47.35
cg	4371	2.13	6.62	-19.54	47.56
Domestic Finance					
MCap	1142	40.64	54.37	0	549.88
Turn	778	42.23	53.00	0	475.46
CredPriv	5283	34.06	30.66	.56	203.17
CredBank	5150	47.00	39.14	.00	333.99
M3	5012	41.99	34.72	0	753.98
Spread	2869	7.16	7.78	-9.25	91.76
Int. Finance: Gross					
FDI	1858	16.01	17.94	0	127.22
PortEq	1724	4.42	16.00	0	343.32
TotEq	1671	21.32	30.28	0	438.11
TotDebt	976	80.36	68.29	10.54	606.55
TotDebt$'$	1078	93.94	85.09	10.54	606.55
Int. Finance: Net					
FDI	1858	-8.29	15.60	-110.90	34.74
PortEq	1724	-.81	9.05	-246.83	97.14
TotEq	1671	-9.67	18.21	-258.80	45.65
TotDebt	976	-45.66	39.08	-204.84	99.74
TotDebt$'$	1078	-24.40	70.63	-192.23	337.17

Note: The sample consists of yearly data for the period 1960-2001 for a worldwide set of countries. International financial variables (FDI, PortEq, TotEq, TotDebt, TotDebt$'$) are available only for the period 1970-1998. For variable definitions, see the appendix.

Table 2. Correlation coefficients

A. **Growth Rates**

	GDPg	GNPg	CONSg
GDPg	1		
GNPg	0.9136*	1	
CONSg	0.5448*	0.5452*	1

B. Financial Variables

	MCap	Turn	CredPriv	CredBank	M3	Spread
MCap	1					
Turn	0.1590*	1				
CredPriv	0.6237*	0.2787*	1			
CredBank	0.4875*	0.2591*	0.7647*	1		
M3	0.5656*	0.2067*	0.7284*	0.7592*	1	
Spread	-0.0612	-0.1986*	-0.0524*	-0.3080	-0.4450*	1
FDI	0.4850*	0.0373*	0.2949*	0.1515*	0.2452*	-0.0305
PortEq	0.5739*	0.2103*	0.4797*	0.3673*	0.3900*	-0.0314
TotEq	0.5866*	0.1309*	0.4258*	0.2701*	0.3513*	-0.0377
TotDebt	0.2195*	0.2662*	0.0430	0.2520*	0.2444*	-0.0317
TotDebt$'$	0.0089	0.0734	0.1115*	0.2915*	0.3381*	-0.0123

	FDI	PortEq	TotEq	TotDebt
MCap				
Turn				
CredPriv				
CredBank				
M3				
Spread				
FDI	1			
PortEq	0.5080*	1		
TotEq	0.7220*	0.6842	1	
TotDebt	0.0140	-0.1305*	-0.0350	1
TotDebt$'$	0.0450	-0.0048	0.0178	0.9238*

Note: The sample consists of yearly data for the period 1960-2001 for a worldwide set of countries. International financial variables (FDI, PortEq, TotEq, TotDebt, TotDebt$'$) are available only for the period 1970-1998. For variable definitions, see the appendix. * indicates significant at 5% level.

Table 3. Co-movements of GNP growth and GDP growth

A. Domestic measures

	(1)	(2)	(3)
GDPg	1.014** (0.002)	1.028**(0.005)	1.043**(0.005)
MCap	-0.032**(0.007)		-0.033**(0.011)
Turn		-0.012**(0.005)	-0.007**(0.002)
Const.	0.037**(0.014)	0.018**(0.012)	0.015**(0.004)
Obs.	1133	767	761

B. International measures: gross

	(1)	(2)	(3)	(4)
GDPg	1.017** (0.004)	1.014**(0.004)	1.016** (0.004)	1.017**(0.004)
FDI	0.021(0.026)			-0.003(0.036)
PortEq		0.068(0.045)		0.061(0.060)
TotEq			0.020 (0.018)	
Const.	-0.053**(0.015)	-0.036*(0.015)	-0.041**(0.015)	-0.042**(0.016)
Obs.	1772	1642	1589	1589

C. International measures: net

	(1)'	(2)'	(3)'	(4)'
GDPg	1.017**(0.004)	1.016**(0.004)	1.015**(0.004)	1.015**(0.004)
FDI	-0.029(0.037)			-0.050^{+}(0.038)
PortEq		0.071(0.103)		-0.094(0.101)
TotEq			-0.036(0.036)	
Const.	-0.056**(0.015)	-0.033**(0.015)	-0.042**(0.016)	-0.045**(0.016)
Obs.	1772	1642	1589	1589

D. International measures: dummy

	(1)"	(2)"	(3)"	(4)"
GDPg	1.023**(0.005)	1.015**(0.004)	1.024**(0.005)	1.024**(0.005)
FDI	-0.001(0.013)			-0.019^{+}(0.014)
PortEq		0.005(0.009)		-0.004(0.012)
TotEq			-0.023^{+}(0.014)	
Const.	-0.066**(0.019)	-0.034*(0.016)	-0.053**(0.020)	-0.052**(0.021)
Obs.	1772	1642	1589	1589

Note: Results of regressions of the growth rate of GNP on the growth rate of GDP and an interaction term of a financial market measure in the left column

with the growth rate of GDP. The sample consists of yearly data for the period 1960-2001 for a worldwide set of countries. International financial variables (FDI, PortEq, and TotEq) are available only for the period 1970-1998. Domestic financial measures are the relevant domestic financial variables as a percent of GDP. International gross financial measures are the relevant foreign assets plus liabilities as a percent of GDP. International net financial measures are the relevant foreign assets minus foreign liabilities as a percent of GDP. International dummy financial measures are dummy variables that take on a value of one if the relevant foreign assets exceed foreign liabilities and zero otherwise. Estimation by FGLS allows for within country autocorrelation and across countries heteroskedasticity. For variable definitions, see the appendix. $^{+}$,*, ** indicates statistical significance at the 10%, 5%, 1% confidence level; number in parentheses is standard error.

Table 4. Co-movements of consumption growth and GNP growth

A. Domestic measures

	(1)	(2)	(3)	(4)
GNPg	0.679**(0.016)	0.689**(0.017)	0.675**(0.019)	0.651**(0.013)
CredPriv	-0.087**(0.026)			
CredBank		-0.079**(0.023)		
M3			-0.060*(0.030)	
Spread				0.043(0.061)
Const.	0.739**(0.046)	0.732**(0.046)	0.682**(0.050)	0.638**(0.042)
Obs.	3968	3956	3707	2302

B. International measures: gross

	(1)	(2)
GNPg	0.829**(0.028)	0.891**(0.028)
TotDebt	-0.133**(0.028)	
TotDebt′		-0.207**(0.027)
Const.	0.317**(0.064)	0.262**(0.066)
Obs.	748	811

C. International measures: net

	(1)'	(2)'
GNPg	0.719**(0.029)	0.628**(0.021)
TotDebt	-0.034(0.050)	
TotDebt′		-0.200**(0.037)
Const.	0.315**(0.071)	0.401**(0.065)
Obs.	747	811

D. International measures: dummy

	(1)"	(2)"
GNPg	0.735**(0.019)	0.734**(0.019)
TotDebt	-0.290**(0.055)	
TotDebt′		-0.392**(0.052)
Const.	0.359**(0.063)	0.389**(0.067)
Obs.	747	811

Note: Results of regressions of the growth rate of consumption on the growth rate of GNP and an interaction term of a financial market measure in the left column with the growth rate of GNP. The sample consists of yearly data for the period 1960-2001 for a worldwide set of countries. International financial variables (TotDebt and TotDebt′) are available only for the period 1970-1998.

Domestic financial measures are the relevant domestic financial variables as a percent of GDP. International gross financial measures are the relevant foreign assets plus liabilities as a percent of GDP. International net financial measures are the relevant foreign assets minus foreign liabilities as a percent of GDP. International dummy financial measures are dummy variables that take on a value of one if the relevant foreign assets exceed foreign liabilities and zero otherwise. Estimation by FGLS allows for within country autocorrelation and across countries heteroskedasticity. For variable definitions, see the appendix. $^{+}$,*, ** indicates statistical significance at the 10%, 5%, 1% confidence level; number in parentheses is standard error.

Table 5. Co-movements of consumption growth and GNP growth: the roles of domestic and international debt variables

A. The world sample

Variables	(1)	(2)	(3)	(4)
GNPg	0.882**(0.058)	0.943**(0.059)	0.852**(0.059)	0.943**(0.061)
Domestic				
CredPriv	-0.081^{+}(0.053)	-0.104(0.071)		
CredBank			-0.032(0.063)	-0.062(0.066)
International				
TotDebt	-0.172*(0.071)		-0.089(0.075)	
TotDebt$'$		-0.199**(0.065)		-0.251**(0.070)
Interaction				
CredPriv*TotDebt$'$	0.062^{+}(0.041)	0.010(0.061)		
CredBank*TotDebt$'$			0.037(0.058)	0.023(0.057)
Const.	0.321**(0.068)	0.291**(0.068)	0.329**(0.067)	0.291**(0.068)
Obs.	743	806	743	806

B. OECD countries

Variables	(5)	(6)
GNPg	1.020**(0.123)	0.904**(0.114)
Domestic		
CredPriv	-0.389*(0.123)	
CredBank		-0.206^{+}(0.113)
International		
TotDebt	-0.161(0.099)	-0.074(0.089)
TotDebt$'$		
Interaction		
CredPriv $*$ TotDebt	0.105(0.086)	
CredBank $*$ TotDebt		0.002(0.057)
Const.	0.569**(0.062)	0.589**(0.065)
Obs.	278	278

C. Non-OECD countries

Variables	(7)	(8)	(9)	(10)
GNPg	1.055**(0.094)	0.828**(0.077)	0.931**(0.093)	0.776**(0.077)
Domestic				
CredPriv	-0.259(0.178)	-0.130(0.182)		
CredBank			-0.006(0.131)	0.058(0.129)
International				
TotDebt	-0.511**(0.140)		-0.303^{+}(0.165)	
TotDebt$'$		-0.257**(0.127)		-0.168^{+}(0.093)
Interaction				
CredPriv*TotDebt$^{(')}$	0.704**(0.265)	0.422(0.283)		
CredBank*TotDebt$^{(')}$			0.125(0.204)	0.068(0.218)
Const.	0.187(0.130)	0.582**(0.137)	0.161(0.129)	0.566**(0.137)
Obs.	416	666	416	666

Note: Results of regressions of the growth rate of consumption on the growth rate of GNP and interaction terms of the growth rate of GNP with (i) a domestic debt variable, (ii) an international debt variable, and (iii) the product of a domestic debt variable and an international debt variable, as stated in the left column. The sample consists of yearly data for the period 1960-2001 for OECD countries, non-OECD countries, and the world sample, respectively. International financial variables (TotDebt and TotDebt$'$) are available only for the period 1970-1998. Domestic financial measures are the relevant domestic financial variables as a percent of GDP. International financial variables are measured in gross terms, i.e. as the relevant foreign assets and liabilities as a percent of GDP. Estimation by FGLS allows for within country autocorrelation and across countries heteroskedasticity. For variable definitions, see the appendix. $^{+}$,*, ** indicates statistical significance at the 10%, 5%, 1% confidence level; number in parentheses is standard error.

Table 6. Co-movements of consumption growth and GDP growth

A. Domestic measures

	(1)	(2)
GDPg	0.906**(0.015)	0.955**(0.011)
CredPriv	-0.156**(0.034)	
CredBank		-0.195**(0.025)
MCap	-0.105*(0.058)	-0.140**(0.050)
CredPriv $*$ MCap	0.071^{+}(0.047)	
CredBank $*$ MCap		0.098*(0.041)
Const.	0.327**(0.062)	0.324**(0.061)
Obs.	901	904

B. International measures: gross

	(1)	(2)
GDPg	0.956**(0.041)	1.068**(0.043)
TotDebt	-0.093*(0.040)	
TotDebt$'$		-0.265**(0.048)
TotEq	-0.360**(0.120)	-0.374**(0.096)
TotDebt $*$ TotEq	0.125*(0.060)	
TotDebt $*$ TotEq		0.244**(0.066)
Const.	0.211**(0.070)	0.091(0.072)
Obs.	713	775

C. International measures: net

	(1)'	(2)'
GDPg	0.767**(0.030)	0.710**(0.025)
TotDebt	-0.067(0.053)	
TotDebt$'$		-0.189**(0.047)
TotEq	-0.466**(0.135)	-0.224**(0.104)
TotDebt $*$ TotEq	0.000(0.000)	
TotDebt$'$ $*$ TotEq		0.000*(0.000)
Const.	0.143^{+}(0.074)	0.246**(0.071)
Obs.	713	775

D. International measures: dummy

	(1)"	(2)"
GDPg	0.843**(0.020)	0.862**(0.022)
TotDebt	-0.334**(0.113)	
TotDebt$'$		-0.131*(0.071)
TotEq	-0.131**(0.022)	-0.145**(0.026)
TotDebt $*$ TotEq	0.151(0.124)	
TotDebt$'$ $*$ TotEq		0.301**(0.129)
Const.	0.212**(0.067)	0.162**(0.077)
Obs.	713	775

Note: Results of regressions of the growth rate of consumption on the growth rate of GDP and interaction terms of the growth rate of GDP with (i) a debt variable, (ii) an equity variable, and (iii) the product of a debt variable and an equity variable as stated in the left columns. The sample consists of yearly data for the period 1960-2001 for a worldwide set of countries. International financial variables (TotDebt TotDebt$'$, and TotEq) are available only for the period 1970-1998. Domestic financial measures are the relevant domestic financial variables as a percent of GDP. International gross financial measures are the relevant foreign assets and liabilities as a percent of GDP. International net financial measures are the relevant foreign assets minus foreign liabilities as a percent of GDP. International dummy financial measures are dummy variables that take on a value of one if the relevant foreign assets exceed foreign liabilities and zero otherwise. Estimation by FGLS allows for within country autocorrelation and across countries heteroskedasticity. For variable definitions, see the appendix. $^{+}$,*, ** indicates statistical significance at the 10%, 5%, 1% confidence level; number in parentheses is standard error.

Table 7. Estimated elasticities of relative variances w.r.t. financial variables

A. Elasticity of variance of GNP growth (relative to GDP growth) w.r.t. equity market variables

MCap	-0.027
Turn	-0.023

B. Elasticity of variance of consumption growth (relative to GNP growth) w.r.t. debt market variables

CredPriv	-0.061
CredBank	-0.084
M3	-0.096
TotDebt	-0.241
TotDebt′	-0.453[13]

C. Elasticity of variance of consumption growth (relative to GDP growth) w.r.t. debt and equity market variables

CredPriv	-0.198
MCap	-0.103
CredBank	-0.214
MCap	-0.121
TotDebt	-0.367
TotEq	-0.167
TotDebt′	-0.462
TotEq	-0.181

Note: Panel A presents the estimated elasticity of the relative variance of GNP and GDP with respect to proxies for equity market development. The estimates are partly based on the coefficients for MCap and Turn in regressions (1)

[13] The estimated regression coefficient is not significant at 10% percent level. See Table 6.

and (2) in Tables 3A. Panel B provides the estimated elasticity of the variance of consumption growth (relative to GNP growth) with respect to both domestic and international indicators. These are based on regression coefficients taken from Tables 4A and 4B. Table 7C presents the estimated elasticity of the variance of consumption growth relative to GDP growth rate with respect to debt and equity market development jointly. The first and second sets of two lines of Table 7C are based on the regressions (1) and (2) in Table 6A, respectively. The third and fourth sets of two lines of Table 7C are based on the regressions (1) and (2) of Table 6B, respectively. For variable definitions, see the appendix.