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Capital Markets and External Current Accounts: What to Expect from the Euro

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Capital Markets and External Current Accounts: What to Expect from the Euro

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Abstract

The paper compares the degree of capital market integration across euro-area countries with that across regions in Italy and provinces in Canada. Analyzing saving-investment correlations, and developing as well as fitting to the data a model of capital flows, reveal no compelling differences between the integration across countries before monetary union and that across the regions or provinces. The evidence does not suggest that EMU will prompt a major reallocation of net capital flows within the euro area that would entail sizable shifts in countries' equilibrium current accounts.

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I. Introduction

Factor market integration is important for the successful development of Economic and Monetary Union (EMU). Accordingly, the subject has drawn considerable attention in the literature on both labor and capital markets. This paper compares the degree of capital market integration among the euro-area countries with that among the regions in Italy and provinces (henceforth also referred to as regions) in Canada, two countries for which comprehensive regional data are available. Following EMU the euro-area countries resemble regions in one key respect: they share a common currency. If exchange rate risk and other barriers previously restrained cross-country net capital flows, then this should be evident in the degree of market integration across relative to within countries. The prior of this paper is that euro-area capital markets were already highly integrated before the onset of EMU, with cross-country real rates of return on capital broadly aligned. This hypothesis is tested by (i) assessing real interest rate differentials; (ii) investigating saving-investment correlations; and (iii) developing and fitting to the data a model of capital flows.

The issue of capital market integration has wider policy implications. If the null hypothesis finds support in the data, old estimates for countries' equilibrium current accounts, such as calculated by Isard and Faruqee (1998), may retain some validity following the introduction of the euro. The reason is that if cross-country returns were broadly on a par before EMU, no major reallocation of capital, on a net basis, should be expected afterward. Otherwise, new estimates for equilibrium balances may be necessary to judge whether the current account developments observed today in individual euro-area countries are sustainable.

Before proceeding, it is worthwhile to reflect briefly on why current account developments in individual euro-area countries remain interesting for policymakers. The current account sums up changes in the financial position of a country relative to the rest of the world: it can be considered sustainable if the society's choices about saving and investment balances are consistent with the intertemporal solvency constraint and any imbalance can continue to be financed through capital flows without requiring adjustment to consumption paths or policies in the future. The current account retains importance for assessing the performance of individual euro-area countries because: the countries differ in their production technologies, tastes, and institutions and thus will experience country-specific (asymmetric) shocks; such shocks will alter the financial positions of euro-area agents relative to each other because no supranational institutional mechanism has been introduced alongside the euro as a buffer; and the financial positions of countries are closely tied to those of agents, as there is limited labor mobility. In these respects, existing currency unions differ from the euro area. For the United States, for example, the evidence in the literature suggests that individual states form a more homogenous entity than the euro-area countries;[2] the

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[2]For example, Bayoumi and Eichengreen (1993) find that supply shocks are less correlated across European countries than across states in the United States; Decressin and Fatás (1995) focus on regions within Europe, arguing that these are more comparable to states, and conclude that a larger share of employment dynamics are region-specific in Europe, even after controlling for country-specifc dynamics. For similar conclusions see De Grauwe and Vanhaverbeke (1991).

federal government plays an important role in buffering state-specific economic shocks,[3] as does the federal deposit insurance scheme;[4] and economic agents are much more mobile.[5] Hence, it is not surprising that external balances and debts of states attract little attention, to the point that data on them are not collected.

The paper is organized as follows. Section II proceeds to standard tests of the degree of capital market integration between countries and within countries; Section III presents a theoretical model and Section IV new econometric tests for investigating the degree of capital market integration between and within countries; Section V summarizes the findings and concludes. The main contributions to the literature are the following. First, the high cross-country correlation between saving and investment among the euro-area countries, such as observed in Feldstein and Bacchetta (1991) and Bayoumi and others (1999) for the European Union (EU), appears largely related to cross-country net transfers. The transfers boost saving of the recipient countries; these countries are relatively capital scarce and thus exhibit higher investment. The observed correlation between saving and investment may thus reflect redistribution through the European Union's budget and not a low degree of capital mobility. Second, the paper extends the intertemporal model of the current account in Glick and Rogoff (1995) by introducing liquidity-constrained agents to capture capital market imperfections. And third, the extended model is fitted to regional and national data to draw new inferences for capital market integration within and across countries.

[3]The response of net fiscal transfers to shocks is typically called risk-sharing, while the continuous flow of net transfers from richer to poorer regions is termed redistribution. Research on the United States typically finds risk sharing and redistribution in the range of 10-15 percent of gross state product. Research on Canada or countries in Europe typically finds that the central government plays a much larger role (see Obstfeld and Peri (1998) for a brief survey of the literature).

[4]Sachs and Sala-i-Martin (1992) report that the negative net worth of thrift institutions in Texas stood at some 60 percent of Texas' GNP at the height of the savings and loans crisis in mid-1988: in the absence of intervention through the Federal Savings and Loan Insurance Corporation, they argue, the Texan economy might have suffered "a large decline in net wealth and perhaps a significant external debt crisis, to the extent that deposits in the failed institutions were from outside Texas."

[5]See Blanchard and Katz (1992) and Decressin and Fatás (1995). For a review of the literature see, for example, Faini (1999).

II. Capital Mobility: Countries and Regions

A number of standard tests for capital market integration build on real interest rate differentials and saving and investment correlations.[6] Here, capital is argued to be perfectly mobile if real interest rate parity prevails. The paper adopts this very stringent definition of perfect capital mobility as it also investigates whether countries' equilibrium current account balances may change as a result of EMU. Such changes could occur, for example, because exchange rate risk and other constraints on flows had left sizable arbitrage opportunities before the onset of monetary union. The basic idea is that following EMU, the countries may behave more like regions with respect to capital mobility; and the importance of such a change—and thus of equilibrium current account balances—can be gauged from the extent to which capital mobility is higher within rather than across countries.[7] This section briefly reviews evidence on ex post real interest rate differentials in money markets across euro-area countries; then it investigates real interest parity by analyzing both the short- and long-run relation between savings and investment in the countries and regions.

From the point of view of population size, the typical euro-area country is about 10 times as large as the typical region, which averages some 3 million inhabitants in both Canada and Italy; however, some of the larger regions have populations that are as large as those of the smaller countries. Turning to the distribution of productive capacity across countries and regions, Table 1 provides information on the shares of regions' and countries' real GDP in the respective country or euro-area aggregates. Notice that the distribution of capacity of the euro-area countries is about as balanced as that for the Canadian regions but considerably less balanced than that for the Italian regions.

A. Ex Post Real Interest Rates

Testing for capital market integration from the returns side requires data on the nominal rates of return on various types of capital as well as data on agents' inflationary expectations for various baskets of goods. This lies beyond the scope of the analysis pursued here. Rather than computing ex ante real interest rates with a model of agents' expectations, the paper uses ex post real interest rates. These rates are obtained as the difference between short-term money market rates and the annualized quarter-on-quarter rate of change of the personal consumption deflator.[8] Hence, this section focuses on the integration of money markets from the perspective of lenders. Subsequent tests better gauge real interest rate parity by analyzing saving, investment, and net exports.

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[6]For a different approach, see Sorensen and Yosha (1998).

[7]Note that capital market integration is always a matter of degree. There are numerous imperfections in credit and financial markets even within countries, relating, for example, to asymmetric information and regulatory constraints. The question is whether the costs of exchange rate volatility or hedging are high relative to the costs stemming from imperfections within countries (for example, costs stemming from the need for collateral or a credit rating).

[8]See Data Appendix for further details.

Choosing Germany's ex post real interest rate as a base, given the country's anchor role under the Exchange Rate Mechanism (ERM), Figure 1 shows the mean absolute deviation of euro-area countries' ex post real interest rates. Clearly ex post real interest rate differentials tend to widen in periods of crisis and exchange rate volatility (1973-75, 1979-80, and 1991-92). Average differentials were also somewhat larger during the 1970s than after 1980-85. A similar conclusion emerges if the differential between 10-year average real interest rates is computed, which captures integration over longer horizons. Interestingly, the onset of EMU has not lead to a noticeable reduction in the mean absolute differential relative to its typical value since 1993.

If markets were poorly integrated, there could be systematic and large ex ante real interest rate differentials. However, at least for ex post interest rates, such a hypothesis can be rejected at a 5 percent confidence level (10 percent for Portugal) for each country with unit root tests (Table 2); the half life of differentials typically amounts to less than 3 quarters.[9] Overall, the evidence presented here suggests that domestic money markets are linked fairly closely, notably since 1980-85.

B. Cross-Country Saving-Investment Relations

Real interest rate parity can be tested by analyzing the correlation between saving and investment.[10] The problems related to the saving-investment regressions and the implications of their results for capital mobility are well known: the most compelling argument against the approach is the endogeneity of saving and investment, implying that third factors can produce substantial correlations even in the presence of full capital mobility.[11] High correlations could also reflect that developed countries are sufficiently well-endowed with capital to be near their steady-state external debt or asset levels, implying that the intertemporal budget constraint of the economy does not allow for large differences in long averages of saving and investment.[12] Accordingly, a high correlation between saving and investment is a necessary but not sufficient condition for the absence of real interest rate parity and thus low capital mobility. As in Feldstein and Horioka (1980), long-run saving-investment relations are estimated as

$$\left(\frac{I}{Y}\right)_i = a + b\left(\frac{S}{Y}\right)_i + \varepsilon_i,$$

using time-averaged saving and investment rates for the euro-area countries (excluding Luxembourg) and the regions of Canada and Italy. The results are shown in Table 3. For the euro-area countries, the coefficient b on saving is found to be very high and significantly different from zero for the two sample periods; surprisingly, the estimate is higher for the later rather than the earlier period, contradicting the evidence from ex post real interest rates.[13] Notice, however,

[9]See Centeno and Mello (1999) for a similar conclusion.
[10]See Coakley and others (1998) which also provide a survey of the large literature spurred by Feldstein and Horioka (1980).
[11]See Obstfeld (1986, 1995), Tesar (1991), Baxter and Crucini (1993), Taylor (1994).
[12]See, for example, Obsfeld (1995), Obstfeld and Rogoff (1996), and Coakley (1998).
[13]Lemmen (1998) finds similar results.

that there is no systematic, positive relation for the regions of Canada and Italy.[14] This result is similar to others in the literature for different samples of regions.[15]

A key issue is the definition of saving. For the regions, saving is obtained as the difference between GDP and final consumption (C). By contrast, national saving is defined as the difference between GNP and net current transfers (NT) on the one hand, and final consumption on the other. Excluding current transfers from countries' saving, to obtain a concept which is closer to that used for the regions, drastically alters the result: for the period 1979-97, the countries now closely resemble the regions.[16] Moreover, this results, which is more acute for the later period, is not an artifact of the data but peculiar to the euro-area countries, as similar regressions for non-euro area OECD countries show. It is likely to reflect the redistribution of resources from richer to poorer EU countries, which was considerably higher over past two decades than earlier, through the EU budget. The poorer countries are also relatively capital scarce and thus have higher investment; hence the correlation between national saving and investment. For the question at hand, which deals with the integration of capital markets, it is thus arguably acceptable to remove net transfers from the definition of saving.[17] On the basis of saving so defined, the conclusion is that capital markets of euro-area countries have become more integrated over time, as suggested by the ex post real interest rate differentials, and now appear as integrated as those of regions within countries.

C. Time-Series Saving-Investment Relations

The intertemporal approach implies that in the steady state the current account, when suitably scaled (for example, by output), is constant so that saving and investment have a one-to-one relationship. It is therefore useful to analyze the short- to medium-run saving and

[14]This does not reflect a strong negative correlation between government saving and investment. While such a correlation is present in the data, private saving and investment rates, which could be obtained for 1961-98 for Canada and 1983-92 for Italy, were not significantly positively correlated either, with coefficient estimates amounting to around 0.3 for Canada and 0.1 for Italy.
[15]See, for example, Thomas (1993) for Canada and Dekle (1996) for Japan.
[16]Armstrong and others (1996) find similar evidence for the European countries upon defining saving as the difference between GDP and consumption but they do not investigate the reasons for the difference between their result and the others in the literature, including Feldstein and Bacchetta (1991) and Bayoumi and others (1999). They argue that public capital flows are still relatively minor and thus conjecture that these flows probably do not seriously affect their results.
[17]Host-Madsen (1979) argues that saving is a normative concept is. As an example, he raises the question whether it was meaningful to say that the aid under the Marshall plan for Europe increased savings in Europe pari passu. The answer given to this question by national income statistics was affirmative. Note that there are other instances in the literature were saving for countries is defined as the difference between GDP/GNP and final consumption (for example, Artis and Bayoumi (1992)).

investment relation by fitting the following error-correction model to the data:[18]

$$\Delta(\frac{I}{Y})_t = a + b\Delta(\frac{S}{Y})_t + c\left[(\frac{S}{Y})_{t-1} - (\frac{I}{Y})_{t-1}\right] + d(\frac{S}{Y})_{t-1} + \varepsilon_t. \quad (1)$$

The coefficient b captures the short-run Feldstein-Horioka relation: its size is fairly large and similar for the euro-area countries and Italian regions, but considerably lower for the Canadian ones (Tables 4a-c).[19] Its size probably does not relate to capital market integration: a regression of the percentage change in regional/country investment on, respectively, national/euro-area wide investment, reveals average R^2 values of 0.32, 0.49, and 0.50 across the regions of Canada, Italy, and the euro-area countries.[20] The regions in Italy and countries in the euro-area thus share half of the changes in investment, while the regions in Canada share only one third: movements that are shared should prompt smaller changes in the current account than movements that are idiosyncratic.

The test of c being significantly positive is equivalent to a test of investment and saving ratios moving together. Kremers and others (1992) show that the t-statistic associated with c follows the standard normal distribution in large samples. For small samples they recommend the Dickey-Fuller (DF) distribution. At a 5 percent significance level, the critical value under the DF distribution is about 2.9-3.0 for the sample sizes here: the t-statistics exceed these values for 3 countries (in the 1961-97 sample) as well as 5 Italian and 3 Canadian regions. The fact that the t-statistics are not higher for more countries and regions is probably related to the length of the sample—the intertemporal budget constraint binds only in the very long run—be that as it may, the result suggests a considerable degree of capital mobility across both regions and countries. Interestingly, the estimate for c has declined considerably over time for the euro-area countries—suggesting perhaps that current account imbalances have become much more sustainable because of increasing capital mobility—and is close to the average estimate for the regions.[21]

Jansen and Schulze (1996) show that the nature of the long-run equilibrium can be elicited from parameter tests: if $d = 0$ then the equilibrium current account is constant; furthermore, if $a = d = 0$, then this constant is zero. The results suggest that, for the entire sample from 1960 to 1997, the estimates in all cases except for Finland are consistent with an implied long-run equilibrium saving-investment relationship in which the steady state current account equals a constant (the restriction $d = 0$ holds); and in all those cases the constant is insignificantly different

[18]Banerjee and others (1986) argue that direct estimation of (1) constitutes a more powerful test for cointegration than the two-step Engle-Granger procedure.

[19]The measure of saving used in this part is inclusive of net transfers; excluding net transfers made little difference to the results, quite in contrast to the cross-country evidence.

[20]The sample periods are 1972-98 for the Canadian regions; 1971-95 for the Italian regions; and 1965-98 as well as 1981-91 for the euro-area countries.

[21]Note that throughout the discussion the paper sometimes focuses on the average values of the parameter estimates for a, b, c, and d, which should provide consistent estimates of the coefficients' means (see Zellner (1969) and Pesaran and Smith (1995)).

from zero (the restriction $a = 0$ also holds). The results for many of the regions differ somewhat in this last respect: the absolute values of the estimates for a are generally larger but significant only for some four regions in each Canada and Italy, where the equilibrium current accounts are thus not equal to zero.

At this point, it is instructive to again scrutinize the role of the government. The considerable role of the government in Canada and Italy has been underscored in the literature.[22] Comparing the resource gaps of countries with those of regions, the most striking differences lie in the cross-sectional standard deviations (Figure 2). Clearly, regions reach much larger gaps or surpluses, although since 1988, the cross section variability of euro-area country resource gaps has been approaching that of regions. In addition, the resource gaps for regions are more persistent. These results are consistent with a higher absolute value for the estimates for a of the regions than the countries and they could be taken to mean that capital moves powerfully across regions. But upon focusing on private sector saving-investment gaps for the regions, the difference relative to countries with respect to the cross sectional variances in resource gaps is much less pronounced.[23] For assessing capital market integration, these considerations suggest that not too much importance should be attached to observed differences in equilibrium resource gaps between countries and regions.

III. A Theoretical Framework

Saving-investment correlations may not provide much information on capital market integration, as the results from the time series regressions suggest. Accordingly, this section proposes an econometric specification that is grounded in intertemporal models of the current account. By tracing shocks to output and investment back to changes in labor productivity, the framework imposes more structure than the simple savings-investment regressions.

The theoretical model underlying the econometric framework builds on the model developed by Glick and Rogoff (1995) and introduces Campbell and Mankiw (1991)-type liquidity-constrained consumers. The economy is populated by two types of agents, constrained and unconstrained, accounting for a λ and $(1 - \lambda)$ share of the population respectively. Constrained consumers have no access to capital markets whatsoever and simply consume their current income. Unconstrained agents can borrow and lend freely in world capital markets at the riskless gross world real interest rate of r.

[22]Decressin (1999) estimates risk sharing and redistribution in Italy at some 30 percent of regional GDP. Evidence for Canada (for example, Bayoumi and Masson (1995), Mélitz and Zumer (1998)) suggests risk sharing between 10-20 percent of GDP and redistribution up to twice that amount.
[23]By raising government saving in booming regions and lowering it in declining regions, government redistribution increases the cross-sectional variance of regions' resource gaps.

A. Output and Investment

Output in the economy is assumed to follow

$$Y_t = A_t^c K_t^\alpha \left[1 - \frac{g}{2}\left(\frac{I_t^2}{K_t}\right)\right],$$

where K_t is the capital stock at time t,

$$I_t = K_{t+1} - K_t$$

is investment, and A_t^c is the time-t country-specific productivity shock which is assumed to follow an AR(1) process

$$A_t^c = \rho A_{t-1}^c + \varepsilon_t, \qquad 0 \leq \rho \leq 1. \tag{2}$$

The $\frac{I_t^2}{K_t}$ in the output function captures adjustment costs in changing capital stock.

The representative firm chooses the path of I_t to maximize the present discounted value of future profits. The solution to this problem is presented in Razin (1995) and is not repeated here. Taking a linear approximation to the first order conditions yields

$$Y_t \approx \alpha_I I_t + \alpha_K K_t + \alpha_A A_t^c \tag{3}$$

$$I_t \approx \beta_1 I_{t-1} + \eta \sum_{s=1}^{\infty} \phi^s \left(E_t A_{t+s}^c - E_{t-1} A_{t+s-1}^c\right) \tag{4}$$

where $\alpha_I < 0$, $\alpha_K > 0$, $\alpha_A > 0$ in (3), and $0 < \beta_1 < 1, \eta > 0$, and $0 < \phi < 1$. E_t is the expectations operator. The first term in (4) captures the effects on current investment of lagged productivity shocks, while the second term represents the impact of revisions in expectations about the future path of productivity.

B. Consumption and the Current Account

The representative unconstrained agent chooses a path of consumption, C_t^P, to maximize

$$E_t \sum_{s=0}^{\infty} \beta^s U\left(C_{t+s}^P\right)$$

subject to the intertemporal budget constraint

$$F_{t+1} = rF_t + y_t - C_t^P$$

where $y_t \equiv Y_t - I_t$ is non-financial income net of investment and F_t foreign assets of a representative individual entering period t. Assume, for simplicity, that $\beta = \dfrac{1}{r}$ and that utility is quadratic, $U = C - \dfrac{h}{2}C^2$. The solution to the maximization problem then yields the standard permanent income consumption function

$$C_t^P = \frac{r-1}{r}\left(rF_t + E_t \sum_{s=0}^{\infty} \frac{y_{t+s}}{r^s}\right). \tag{5}$$

Here, the *ex post* rate of change of consumption depends only on unanticipated movements in permanent net income

$$\Delta C_t^P = (E_t - E_{t-1})\frac{r-1}{r}\left(E_t \sum_{s=0}^{\infty} \frac{y_{t+s}}{r^s}\right) = \overline{y}_t - E_{t-1}\overline{y}_t$$

where $\Delta C_t^P \equiv C_t^P - C_{t-1}^P$ and $\overline{y}_t \equiv \left(\frac{r-1}{r}\right) E_t \sum_{s=0}^{\infty} \frac{y_{t+s}}{r^s}$. With unconstrained agents making up $(1-\lambda)$ proportion of the population, total consumption by them amounts to

$$C_t^u = (1-\lambda)\, C_t^P.$$

Since constrained agents neither save nor dissave, they do not contribute to the economy's assets and their income is, therefore, independent of these assets. Only unconstrained agents hold assets and these together amount to the economy's total stock of assets equal to $(1-\lambda)F_t$.[24] Total income of the economy is then given by

$$Y_t^{Total} = Y_t + (1-\lambda)(r-1)F_t,$$

while total net income of the constrained and unconstrained consumers are

$$Y_t^c = \lambda(Y_t - I_t)$$

and

$$Y_t^u = (1-\lambda)\left(Y_t + (r-1)F_t - I_t\right)$$

respectively.[25] Constrained consumers consume all of their current income, $C_t^c = Y_t^c$, and the economy's total consumption is

$$C_t = C_t^c + C_t^u = \lambda(Y_t - I_t) + (1-\lambda)\, C_t^P.$$

Saving is given by

$$S_t = Y_t^{Total} - C_t,$$

[24]Since each individual unconstrained agent's stock of asset is equal to F_t, the economy's total stock of assets is equal to $\int_0^{1-\lambda} F_t di = (1-\lambda)F_t$.

[25]The assumption that unconstrained agents consume their net income implies a one-to-one relationship between liquidity contraints and capital mobililty. Thus constrained consumers in this model are unable to participate in domestic *and* external capital markets. However, since the focus is on the current account and international capital mobility, the distinction between domestic liquidity contraint and external liquidity constraint is not crucial.

which, after substituting in for Y_t^{Total} and C_t, is equal to

$$S_t = (1-\lambda)\left(Y_t + (r-1)F_t - C_t^P\right) + \lambda I_t. \tag{6}$$

Subtracting investment from savings yields the current account,

$$CA_t = (1-\lambda)\left(Y_t + (r-1)F_t - I_t - C_t^P\right). \tag{7}$$

Note that the current account is also equal to the change in asset holdings of unconstrained agents, $CA_t = (1-\lambda)(F_{t+1} - F_t)$. Substituting for C_t^P in (7) yields the fundamental current account equation

$$CA_t = (1-\lambda)\left[\left(Y_t - E_t\overline{Y}_t\right) - \left(I_t - E_t\overline{I}_t\right)\right]$$

where $\overline{Y}_t \equiv \frac{r-1}{r}\sum_{s=t}^{\infty}\left(\frac{1}{r}\right)^{s-t} Y_s$ and $\overline{I}_t \equiv \frac{r-1}{r}\sum_{s=t}^{\infty}\left(\frac{1}{r}\right)^{s-t} I_s$ are the permanent level of output and investment respectively. A sizeable deterioration (improvement) in the current account balance can be justified only if current output is below (above) its permanent level or current investment needs are higher (lower) than their permanent ones as agents optimally utilize international capital markets to smooth consumption. This situation can occur, for example, in the face of an unexpected improvement (deterioration) in tradeables productivity. Another possibility is that low capital mobility and liquidity constraints, both related to exchange rate risks, prevented agents before the onset of EMU from pursuing their optimum consumption profile and capital from flowing to countries that offered the highest real returns. In this case, greater capital market integration and the easing of borrowing constraints (lower λ) associated with EMU would entail sizeable changes in countries' equilibrium current account balances which are optimal from the standpoint of the country as well as international lenders.

Equations (4) and (6) capture the motivation behind the Feldstein-Horioka regressions. If capital is perfectly mobile ($\lambda = 0$) saving and investment can diverge, even for protracted periods, as countries exploit their opportunities to gain from intertemporal trade by running unbalanced current accounts. With investment decisions being made to maximize the present discounted value of the country's output, evaluated at the world interest rate, investment itself is determined by elements that are *independent* of consumption preferences. The country's saving behavior is irrelevant. At the same time, savings is free to seek out the most productive investment opportunities worldwide. Taken together, this implies a low correlation between saving and investment. However, when all agents are assumed to be constrained ($\lambda = 1$), savings equals investment and the current account is zero. Any observed increase in national saving will automatically be accompanied by an equal rise in domestic investment and the two will be perfectly correlated.

C. Productivity Shocks and Capital Mobility

Although the model is simpler to solve when productivity follows a random walk ($\rho = 1$), the actual data exhibit mean-reversion, especially for the regions. The estimating equations presented below are therefore derived from solving the model with the more general specification of shocks (which encompasses the special case of $\rho = 1$).

Equations (2) and (4) together yield

$$I_t = \beta_1 I_{t-1} + \beta_2 \Delta A_t^c \tag{8}$$

where $\beta_2 \equiv \eta\rho\left(\frac{\phi}{1-\phi\rho}\right) > 0$. Subtracting I_{t-1} from both sides yields our estimating equation for investment

$$\Delta I_t = (\beta_1 - 1) I_{t-1} + \beta_2 \Delta A_t^c. \tag{9}$$

Note that $\frac{\partial\beta_2}{\partial\rho} > 0$ reflecting the fact that more persistent productivity shocks have larger effects on investment. Following an analogous derivation to Glick and Rogoff, one obtains the reduced-form equation for the current account of

$$\Delta CA_t = (r-1)CA_{t-1} + \gamma_1 I_{t-1} + \gamma_2 A_t^c + \gamma_3 A_{t-1}^c \tag{10}$$

where $\gamma_1 \equiv (1-\lambda)(\beta_1 - 1)(\alpha_I - 1) + \alpha_k$, $\gamma_2 \equiv (1-\lambda)\left[(\alpha_I - 1)\beta_2 + \alpha_A - \delta\right]$, and $\gamma_3 \equiv (1-\lambda)\left[(\rho-1)\delta - \gamma_2\right]$ with $\delta \equiv \frac{r-1}{r-\rho}\left[\beta_2 \frac{(\alpha_I-1)(r-1)+\alpha_K}{r-\beta_1} + \alpha_A\right] > 0$. Of interest is the effect of a country-specific productivity shock on the current account, given by

$$\gamma_2 = (1-\lambda)\left[\alpha_A \frac{1-\rho}{r-\rho} + \beta_2(\alpha_I - 1) - \frac{r-1}{r-\rho}\beta_2 \frac{(\alpha_I - 1(r-1) + \alpha_K)}{r-\beta_1}\right].$$

It is straightforward to verify that $\frac{\partial\gamma_2}{\partial\rho} < 0$ so that a positive productivity disturbance leads to a larger deterioration in the current account (larger deficit or smaller surplus), the more persistent it is.[26] For shocks that are temporary enough, γ_2 becomes positive and the current account moves into surplus. Indeed when $\rho = 0$, there is no investment response since future productivity is unchanged and with current income rising by more than permanent income, saving increases as agents smooth over time the benefits of temporarily higher output.

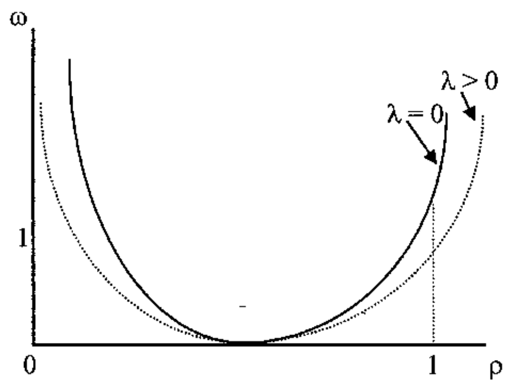
The focus will be on the relative responses of the current account and investment to a country-specific productivity shock,

$$\frac{\left|\frac{\partial\Delta CA_t}{\partial A_t^c}\right|}{\frac{\partial\Delta I_t}{\partial\Delta A_t^c}} = \frac{|\gamma_2|}{\beta_2} \equiv \omega.$$

Glick and Rogoff show that with perfect capital mobility ($\lambda = 0$) and random walk productivity ($\rho = 1$) the model predicts that $|\gamma_2| > \beta_2$, or $\omega > 1$. The intuition is that a permanent rise in productivity induces investment which leads to higher future capital stock and causing permanent income to rise by more than current income. Thus saving falls while investment increases, worsening the current account by more than the rise in investment. For a sample of G-7 countries, Glick and Rogoff find that the current account response to a productivity shock tends to be less than the investment response, $\omega < 1$, despite the fact that productivity closely approximates a random walk, a puzzle which they explain by showing that the predictions of the model are very

[26]Note that $(\alpha_I - 1) + \alpha_K/(r-1) > 0$ which states that the adjustment costs to marginal investment do not exceed the present discounted value of the corresponding output gain.

Figure A. Persistence and Liquidity Constraints



sensitive to the actual degree of persistence.

The interesting result in this modified model is that the observation of $\omega < 1$ can now also be explained by differing degrees of capital mobility. The introduction of liquidity constrained agents provides a framework for understanding how ω can vary independently of the process for productivity. The model predicts that the higher the proportion of agents that are liquidity constrained, the smaller will be the current account response relative to investment. That is, $\frac{\partial \omega}{\partial \lambda} < 0$ for any given ρ. Thus for the same process of productivity, countries with lower values of ω are identified as having a smaller degree of capital mobility. Note that in the extreme case of a closed economy, $\omega = 0$ and there is no current account response at all.

Figure (A) illustrates the relationship between ω and ρ. As discussed above, for $\rho = 1$, $\omega > 1$ because agents' consumption rise by more than the increase in current income. As the degree of persistence of the shock declines, the decline in savings and the increase in investment gets smaller, and for shocks that are temporary enough, the current account begins to improve. For $\rho = 0$, the consumption effect is negligible as agents save most of the shock and there is no investment response at all since future productivity is unchanged, and in this case, $\omega = \infty$. Figure (A) also shows that a higher proportion of liquidity constrained consumers (higher λ) flattens out the curve so that for any given value of ρ, economies with less capital mobility will exhibit smaller values of ω.

The framework can be applied naturally to compare the degree of capital market integration for regions and for countries. If the regression results suggest that ω is greater for regions within a country compared to the euro-area countries and the productivity shocks have a similar degree of persistence, then it can be argued, based on the model, that capital is more mobile and financial markets more integrated for the regions. In the case where shocks are persistent enough to bring about a worsening of the current account, the implication is that regions are financing relatively less of the increase in investment from their own savings and more from foreign borrowing. For the case in which ρ is low enough to generate a current account surplus, it implies that regions can export relatively more of their savings abroad than can countries. In either case, more capital mobility means that the current account acts more like a buffer against shocks.

D. Global and Specific Shocks

The theoretical analysis above implicitly treated all productivity shocks as being country-specific. For a sensible empirical implementation of the model, however, it is important to distinguish between global and country-specific productivity shocks. The current account effect of a positive global shock will be smaller than that of a country-specific one since the world interest rate will be pushed up if all countries try to dissave at once. Investment will still be affected, but to a lower degree than if the shock were country-specific because of the higher interest rates. If the productivity shock is predominantly global, then, the finding that the investment response is greater than that of the current account would still be consistent with the theoretical model even in the case of a random walk in productivity. The distinction is therefore critical for a clear interpretation of the results.

Since the paper looks at regions and the euro-area countries, it also investigates shocks which are common to the regions and euro-area countries but not the world. Shocks which are common to regions should typically not trigger large interest rate movements—since it is possible for an individual country as a whole to borrow/lend to the rest of the world—and thus prompt a sizeable current account/investment response; the same holds for shocks which are common to euro-area countries, although to a lesser extent, given the weight of the euro area in world capital markets.

Finally, since regional data for current accounts are not readily available, the estimation will instead be done using net exports, defined as

$$NE_t = CA_t - (1-\lambda)(r-1)F_t. \tag{11}$$

Allowing for country-specific and euro-specific shocks gives reduced-form estimating equations for investment and net export as[27]

$$\Delta I_t = (\beta_1 - 1)\, I_{t-1} + \beta_2 \Delta A_t^r + \beta_3 \Delta A_t^c + \beta_4 \Delta A_t^n + \beta_5 \Delta A_t^w, \tag{12}$$

$$\Delta NE_t = \gamma_1 I_{t-1} + \gamma_2 A_t^r + \gamma_3 A_{t-1}^r + \gamma_4 A_t^c + \gamma_5 A_{t-1}^c + \gamma_6 A_t^n + \gamma_7 A_{t-1}^n + \gamma_8 \Delta A_t^w, \tag{13}$$

where A_t^r represents the region-specific shock (for the euro-area countries, this shock is not present in the regression), A_t^c represents the country-specific shock, A_t^n the euro-area shock (for the Canadian regions, this shock is not present in the regression), and A_t^w the global productivity shock. Assuming a similar degree of persistence for the various types of shocks, the investment and current account responses should be larger for the region- and country-specific shocks because they have a smaller effect on interest rates.

[27]Equation (13) is derived by taking the first difference of (11), plugging into (10), and using the fact that $CA_{t-1} = (1-\lambda)\,(F_t - F_{t-1})$.

IV. Empirical Results

A. Modeling Global and Specific Productivity Shocks

Productivity, A, is measured as the natural logarithm of labor productivity. The euro-area-specific productivity series A^n is constructed as the residual from a regression of $(A - A^*)$ on a time trend, where A is the labor productivity for the euro area and A^* for the world (G-7). The country/region-specific productivity series, A^c and A^r, are constructed analogously, with A standing for country or regional productivity and A^* for euro-area or country productivity, respectively. The prior adopted here is that productivity shocks are trend stationary, with the trend capturing the well-documented income convergence across industrial countries. This convergence has been argued to be consistent with a one-sector neoclassical growth model that allows for technological diffusion.[28] In addition, detrending with first differences has the drawback of throwing away a considerable amount of information.

The paper nonetheless tests the hypothesis of nonstationary productivity shocks. The results from a standard Dickey-Fuller regression with a time trend are in Table 5. Global productivity shocks are clearly nonstationary, while specific shocks are not. For the latter, the estimates for b are generally lower for the regions than the countries, suggesting that technology shocks may travel faster within rather than across countries. The Im, Pesaran, and Shin (1997) test-statistics for unit roots in heterogenous panels amount to -2.49, -2.61, and -1.98 for the regions in Italy, Canada, and euro-area countries, respectively. Accordingly, even upon adopting nonstationarity of productivity as a prior, the tests would lead to a rejection of the prior for the regions of Italy and Canada at a 5 percent significance level. For the group of euro-area countries, however, this is not so. Thus the paper checks the results obtained for the euro-area countries under the assumption of stationarity against the alternative of nonstationarity.

B. Productivity, Investment, and Net Exports: Fitting the Model

The results from estimating (12) and (13), both individually and as a panel, are presented in Tables (6a-c). For comparability, the productivity shocks are scaled across regions and countries by the average of regions' or countries' real GDP over the sample period.

Focusing first on the investment equations, for the euro-area countries the country-specific shocks in most cases have a small, positive effect on investment (except for Ireland and Spain). Interestingly, it is in the large countries (Germany, France, and Italy) that the shocks have a sizeable and significantly positive effect. Euro-area-specific shocks raise investment significantly and sizably for all countries, while the global productivity shocks move investment in the expected direction but to a lesser extent than the euro-area shocks, with the difference smaller for the small countries. For the Italian regions, the results compare to those for the smaller countries of the euro area: region-specific shocks have a small effect while country- and euro-area-specific shocks have a sizeable and significant effect on regions' investment, although this is less so with respect to the

[28] See Sala-i-Martin (1994).

Table A. Relative Current Account/Investment Response

Ratio	Euro	Italy	Canada
Region/Country - Specific			
Panel	0.43	1.78	1.80
Average	0.73	0.87	...

euro-area shocks in the southern regions (the regions shown below Lazio in Table 6b). For the Canadian regions, the fit of the investment equations is not as good. The coefficient estimates for the productivity shocks are generally positive but not significant for any type of shock and they are largest for the global shocks, followed by the country-specific ones.

Turning to net exports, considering that the specific productivity shocks are stationary, the estimates for the respective coefficients could be either negative or positive, depending on whether the investment or consumption-smoothing effect of the shock dominates. For the euro-area countries, the country-specific shocks reduce net exports upon impact in five countries: these include the G-7 countries (France, Germany, and Italy) for which the reduction in net exports is the largest. The euro-area-wide shock has a negative effect for 7 out of 10 countries.[29] For the regions in Italy, the region-specific shock generally has a positive effect on net exports upon impact; by contrast, the country- and euro-area-specific shocks affect net exports negatively in almost all regions; the results are thus again comparable to those for the smaller countries. The evidence for the Canadian regions is rather different: net exports tend to respond positively to all types of productivity shocks.

Overall, in response to region/country-specific shocks, the finding of a larger impact on investment as well as a deterioration in net exports for countries, as opposed to an improvement in net exports in regions, suggests that productivity shocks in countries may be more persistent than in regions, consistent with the evidence from the unit root regressions. However, here the contrasting results for large and small countries need to be underscored: the latter behave similarly to the regions, although this could not necessarily be expected from the degree of persistence of productivity shocks evident in the unit root regressions.

The ω ratios for the region/country-specific shocks are presented in Table A at the top of this page. The results from the panel regression could suggest a large consumption smoothing effect for the regions ($\omega_{\text{euro}} = 0.43 < \omega_{\text{italy}} = 1.78 < \omega_{\text{canada}} = 1.80$), whereby the regions lend to

[29]The net export regressions for the euro-area countries that assume country- or euro-area specific productivity follow a nonstationary process yield very similar results. The estimates for h, i, and j in the panel (standard errors in parentheses) amount to -0.10 (0.07), -0.07 (0.13), and -0.07 (0.20). Note that the equation which is estimated features country- and euro-area specific productivity in first differences and without lags. In the individual regressions, the estimates for h and i have the same signs, except for the Netherlands for h and for Spain for i.

the rest of the country as they experience temporary increases in their income. Without pushing the argument too far, the same may not be borne out for the euro-area countries because of lower capital mobility. However, since the response of net exports is positive for the regions and negative for the euro-countries, an alternative interpretation is that agents in the euro countries simply consume more of their increase in income because the productivity shocks are more persistent. The differing degree of persistence of the shocks makes it difficult to draw firm conclusions about capital mobility from the panel regressions.

A more fruitful way is to compare the GDP-weighted averages of the ω ratios across regions and countries for which the investment response is positive and net exports decline.[30] These regions at least all lie in the range for ρ which is to the right of the minimum of the curve in Figure A. Given that the productivity shocks in the euro-area countries tend to be, if anything, slightly more persistent than those of the regions, one would expect the ω ratio to be larger for the countries if the degree of capital mobility was similar. However, as shown in Table A, $\omega_{\text{euro}} = 0.73 < \omega_{\text{italy}} = 0.87$. In other words, per unit of extra investment induced by the region/country-specific productivity shock, the amount of foreign borrowing undertaken to finance the new investment by Italian regions appears to be slightly higher than that of the euro-area countries although the difference is not substantial enough to make a compelling case for higher capital mobility across Italian regions.

Perhaps the most striking result for both countries and regions is the finding that investment responds at least as strongly, if not more so, to productivity shocks which are shared among the members of the monetary union—that is, productivity shocks that are euro-area-wide, Canada-wide, and Italy-wide—than to the country- or region-specific shocks, respectively. This is less so for the largest countries (France, Germany, and Italy).[31] A possible explanation lies in the openness of the smaller countries and regions: with trade, country- and region-specific technological shocks diffuse rather quickly and thus are very transitory in nature. Such an interpretation would also be consistent with the finding that the euro-area-specific shocks have a smaller effect on the southern regions in Italy: while these regions account for roughly one quarter of Italy's GDP, the produce only about one tenth of the country's exports.[32] Alternatively, it may only pay to invest if a sufficiently large part of the monetary union experiences a boom.

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[30]This is the case for five euro-area countries and four Italian regions; together, the countries account for 82 percent of euro-area real GDP and the regions for 31 percent of Italian GDP, on average over the sample. Since the results for Canada are very mixed and the fit of the equations poorer, they are not discussed further.

[31]For these countries, the results obtained are close to those of Glick and Rogoff (1995) although both the sample and data differ (see Data Appendix).

[32]The results obtained here are generally in line with those of Gregory and Head (1999) who used dynamic factor analysis and Kalman filtering to study the effects of common and country-specific productivity fluctuations on investment and the current account for the G-7 countries. They find that common productivity fluctuations have substantial impact on investment while country-specific productivity movements have little effect on the current account. Estimates of the latter also varied substantially across countries in both sign and magnitude. In addition, the degree of persistence of country-specific productivity shocks generally varied widely across their

V. CONCLUSION

Capital market integration is important for a successful monetary union in Europe. Using historical data, the paper compares the degree of capital market integration among the euro-area countries to that among regions within Canada and Italy. It investigates the hypothesis that capital markets in the euro-area were already well integrated before the onset of EMU by analyzing the standard saving-investment relations and by developing and fitting to the data a model of capital flows.

The results are somewhat surprising in that the differences between regions and countries are not very pronounced. Upon adopting a comparable definition of saving and investment, there appears to be no large and significantly positive correlation in more recent data across both regions and countries. The evidence on the time-series relation between saving and investment yields similar conclusions: it suggests no systematic differences between countries or regions both with respect to short-run fluctuations and the sustainability of deviations from longer-run equilibria. The theoretical model highlights the importance of region- or country-specific productivity shocks in influencing net capital flows. However, only the largest euro-area countries experience a sizeable response of investment to country-specific productivity shocks. In the smaller countries, as in the regions within countries, investment is largely driven by common shocks to productivity. Moreover, to the extent that there are country- or region-specific productivity changes, they appear temporary in nature. Interpreting the joint behavior of investment and net exports in the context of the model reveals no compelling evidence for higher capital mobility across the regions than the countries.

Overall, these results are thus good news for EMU: they suggest that the euro-area capital markets are well integrated; also, it is not clear that asymmetric productivity shocks in the tradeables sector should *per se* raise more important concerns for the euro-area than for existing currency unions.

The findings on capital market integration can be harnessed to reflect on current account developments in individual euro-area countries. The definition of perfect capital market integration underlying the statistical tests is real interest rate parity. It follows that in the absence of any compelling difference in integration between and within countries, real rates of return on capital were as aligned across the euro-area countries as across regions within countries (exemplified here by Canada and Italy) before the onset of EMU. The paper finds no compelling evidence that the adoption of a single currency *in and of itself* should prompt a major reallocation of capital, on a net basis, across the euro-area countries that would entail sizeable shifts in countries' equilibrium current account balances, a result that finds support in post-EMU data on ex post real interest rate differentials. This suggests that pre-EMU estimates of equilibrium current account balances should retain some usefulness as benchmarks against which to assess external sector developments in individual euro-area countries. Of course, what has changed with the removal of the exchange

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sample but was lower in all cases than that embodied in the common component of productivity fluctuations.

rate as a policy instrument is that a crucial element in the propagation of self-fulfilling balance of payment crises is no longer present; and second, that adjustment to imbalances can no longer be achieved quickly through movements in the currency value but will now have to come mainly from expenditure restraint, wages, and prices.

DATA APPENDIX

The data come from the OECD; the IMF; the *Associazione Per Lo Sviluppo Dell'Industria Nel Mezzogiorno (*SVIMEZ*);* the *Instituto Nazionale di Statistica (*ISTAT*); and* CANSIM.

For the countries, data on savings and investment are taken from the OECD Annual National Accounts Database. Data are in national currency and the sample goes form 1960 to 1997. Saving is obtained as the difference between GNP and net transfers on the one hand and final consumption on the other. Alternatively, net transfers are excluded. The data on countries' net exports and investment, both in real terms, are taken from the OECD's Economic Outlook database; and the quarterly data on short-term interest rates and the personal consumption deflator are from the OECD's Analytical Database. For manufacturing productivity, the data are from the IMF's World Economic Outlook (WEO) database (see Appendix Table),[33] except for Italy, where the source is SVIMEZ, and Canada, where it is from CANSIM (to ensure consistency with the regional data). Relative to other studies, such as Glick and Rogoff (1995), Gregory and Head (1999), and Iscan (1999), the data used here differ in three respects: (i) except for the provinces of Canada, data on real net exports and investment are used; for Canada's provinces, nominal data on net exports (which also include the statistical discrepancy) and investment are deflated by the personal consumption deflator, the only broad deflator available for the provinces; accordingly, in all but the Canadian provinces, the data are purged from terms of trade effects; by contrast, other studies have used data on the current account and deflated it with the GDP or GNP deflator (Glick and Rogoff also used nominal investment deflated by the GDP deflator); (ii) the paper uses WEO data for manufacturing labor productivity; these data differ from the data published by the United States Bureau of Labor Statistics (BLS) that have been used in the other studies; the same holds for the national data from SVIMEZ (which come from ISTAT) and CANSIM: all are less volatile than the BLS data (the Appendix Table includes the results from a regression of WEO on BLS data for manufacturing labor productivity); and (iii) the sample period stretches through 1998, while it stops in 1990 for the other studies.

For the regions of Italy, the data on real GDP, consumption, net exports, and manufacturing output and employment come from SVIMEZ (2000), *I Conti Economici Delle Regioni Italiane dal 1970 al 1998,* Il Mulino, Bologna. We are very grateful to Luca Bianchi for providing us these data in electronic form. We have also used this source of data, rather than the WEO, for national manufacturing productivity. Data on regional public saving-investment balances come from ISTAT (1996), *Conti Economici Regionali delle Amministrazioni Pubbliche e delle Famiglie.* Public saving is given by the difference between current revenue and expenditure. For Canada, regional data were purchased from CANSIM.

Regarding manufacturing productivity, Glick and Rogoff obtain labor productivity as the residual from a Cobb-Douglas production function for manufacturing, $\ln Y - \pi \ln L - (1-\pi) * time$, where π is the share of labor in manufacturing output, and the time trend captures the evolution

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[33]For the group of industrial countries, the productivity series starts a decade later; thus the paper uses G-7 productivity for the global shock.

of capital (upon taking first differences to obtain shocks it drops out). Iscan (1999) extends the framework of Glick and Rogoff to incorporate a distinction between traded and non-traded goods and finds that global traded and nontraded productivity have no impact on the current account but the former does affect investment: consumption smoothing of nontradables across borders is not possible since all of them are produced and consumed domestically. It is for this reason that this paper uses manufacturing output and employment to construct the productivity series, as this reflects more the traded component of productivity shocks. Moreover, productivity can be measured much more accurately for manufacturing, particularly in a cross-country/regional context; and data on regional capital stocks are not available, precluding the computation of total factor productivity in manufacturing. Lastly, Iscan's model shows that terms of trade matter for investment and the current account. However, his estimates suggest that they have no significant effects for the sample of G-7 countries. For this reason, and because terms of trade data are not available for regions, the terms of trade do not appear in the estimated equations in this paper.

Appendix Table: Data on Manufacturing Labor Productivity, 1960–98.

Year	Austria	Belgium	Finland	France	Germany	Ireland	Italy	Netherlands	Portugal	Spain	Euro area	G-7
1960	NA	NA	18.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	NA	22.9	19.6	20.3	NA	NA	NA	22.0	21.8	NA	NA	NA
1962	NA	24.1	20.1	21.5	NA	NA	NA	22.7	23.0	NA	NA	NA
1963	NA	25.1	21.3	22.5	NA	NA	NA	23.4	23.9	NA	NA	NA
1964	NA	26.7	22.4	24.2	NA	NA	NA	25.6	25.4	NA	NA	NA
1965	19.5	28.2	23.4	25.9	NA	17.1	28.4	27.2	26.4	20.5	NA	NA
1966	20.6	30.1	24.7	27.9	NA	17.3	29.7	28.8	27.9	23.7	NA	NA
1967	22.0	31.9	26.0	29.6	NA	17.6	31.0	30.5	29.2	25.4	NA	NA
1968	23.7	34.8	27.6	32.8	NA	18.1	31.7	34.0	31.8	27.3	31.6	39.6
1969	25.8	37.9	29.6	34.6	NA	18.5	34.8	33.5	34.4	31.5	34.1	41.7
1970	28.0	41.7	31.0	36.6	NA	19.5	36.5	36.6	36.8	34.2	35.9	43.2
1971	29.6	44.0	31.5	38.4	NA	20.4	36.5	38.6	38.2	35.3	37.6	45.5
1972	32.0	49.2	33.8	40.2	NA	21.2	39.3	41.9	41.8	41.8	40.8	48.3
1973	33.2	54.2	35.2	42.8	NA	23.1	43.0	46.4	44.9	47.1	44.1	51.4
1974	35.0	57.1	36.4	44.2	NA	23.8	44.3	50.2	46.1	50.6	45.8	52.0
1975	36.2	55.9	35.3	43.6	NA	23.8	42.0	49.1	45.9	48.7	45.7	53.1
1976	38.9	59.4	36.7	47.4	NA	26.0	47.4	54.5	51.6	50.0	48.9	56.2
1977	40.5	60.1	38.3	50.1	NA	26.8	48.0	57.0	54.2	51.6	50.7	58.7
1978	43.2	62.1	41.1	51.9	53.3	28.3	50.6	60.7	57.6	53.3	52.7	60.2
1979	46.3	62.4	43.9	55.1	55.7	29.2	54.8	64.9	60.9	55.1	55.6	61.7
1980	51.6	67.9	45.7	56.6	56.2	29.7	56.9	65.0	61.4	58.9	57.3	62.2
1981	51.3	73.5	47.4	58.0	57.2	32.2	57.8	66.9	64.0	61.4	59.5	63.2
1982	52.9	77.1	50.0	60.4	57.9	33.5	58.4	68.5	69.7	64.2	61.3	65.6
1983	55.7	79.3	52.6	62.4	60.8	38.7	61.3	72.6	73.4	66.8	64.2	68.2
1984	58.4	81.5	53.6	64.8	62.9	43.5	66.8	77.8	76.5	69.5	66.5	71.1
1985	60.6	81.9	56.6	67.4	65.2	47.8	69.8	81.6	79.3	73.1	69.0	73.7
1986	61.8	83.2	59.6	69.9	66.0	49.5	72.0	80.4	85.9	75.9	70.9	75.8
1987	65.2	84.6	63.1	72.5	67.2	54.7	75.7	79.5	86.5	77.4	73.0	78.3
1988	70.9	87.7	68.2	77.8	70.1	61.2	79.7	82.4	88.5	79.6	76.7	81.5
1989	75.0	90.3	72.1	82.0	72.4	66.8	82.1	85.9	91.7	80.1	79.4	83.3
1990	79.6	91.8	74.0	83.2	74.8	68.6	83.3	87.1	91.6	79.1	80.7	85.3
1991	81.9	93.5	74.2	84.2	82.1	70.5	84.4	87.3	91.4	80.9	83.9	87.7
1992	83.9	95.4	82.3	88.0	85.6	76.7	87.8	87.0	90.8	82.2	87.0	90.6
1993	87.5	95.3	89.2	88.3	88.0	80.6	89.3	88.3	90.8	88.3	89.0	92.2
1994	95.3	98.2	97.8	96.2	95.7	88.2	94.5	96.4	92.6	97.2	96.1	96.4
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	104.6	100.3	103.1	102.9	105.4	104.3	99.5	102.9	104.0	100.0	102.7	103.3
1997	111.5	103.3	111.5	109.5	112.8	114.3	102.3	107.9	107.9	100.9	107.8	108.0
1998	116.5	105.7	117.0	113.8	117.9	113.2	104.1	109.9	109.7	102.3	110.8	110.5
Correlation with BLS data, 1970/71-98												
log-levels (b, s.e., R2)	NA	0.69,0.01,0.99	NA	1.08,0.01,0.99	1.58,0.05,0.98	NA	0.93,0.02,0.99	0.88,0.01,0.99	NA	NA	NA	NA
log-differences (b, s.e., R2)	NA	0.73,0.14,0.51	NA	0.72,0.14,0.50	0.57,0.16,0.40	NA	0.92, 0.09, 0.79	0.94,0.08,0.99	NA	NA	NA	NA

Source: World Economic Outlook Database (August 2000), except for Italy where data from 1970 onward are from SVIMEZ. Bureau of Labor Statistics (BLS) data were downloaded from the BLS website in May 2000. Correlations are from a regression of WEO data on BLS data (for Germany and G-7 the sample is 1978/79-98).

Table 1. Sample Characteristics

Country/Region	Percent Share in GDP	Country/Region	Percent Share in GDP
Italy		**Canada**	
Piemonte	8.5	Newfoundland	1.3
Valle d'Aosta	0.3	Prince Edward Island	0.3
Lombardia	20.0	Nova Scotia	2.3
Trentino Alto Adige	2.1	New Brunswick	1.9
Veneto	9.5	Quebec	21.7
Friuli Venezia Giulia	2.5	Ontario	41.7
Liguria	3.4	Manitoba	3.4
Emilia Romagna	8.8	Saskatchewan	3.2
Toscana	6.6	Alberta	11.8
Umbria	1.4	Bristish-Columbia	12.4
Marche	2.6		
Lazio	10.2	**Euro area**	
Abruzzo	2.0	Austria	3.2
Molise	0.4	Belgium	3.8
Campania	6.4	Finland	2
Puglia	4.8	France	22.1
Basilicata	0.7	Germany	32.8
Calabria	2.1	Ireland	1.3
Sicilia	5.8	Italy	18.1
Sardegna	2.1	Netherlands	5.9
		Portugal	1.6
		Spain	8.9

Sources: OECD; CANSIM; and SVIMEZ.

Table 2. Unit Root Tests of Real Interest Rate Differentials
$\Delta[r_t(\text{country})-r_t(\text{Germany})] = b[r_{t-1}(\text{country})-r_{t-1}(\text{Germany})]$

Country	b	Std. Error	*t*-Statistic	*R*-squared
Austria	-0.45	0.08	-5.89	0.23
Belgium	-0.17	0.05	-3.30	0.08
Finland	-0.37	0.07	-5.17	0.18
France	-0.26	0.06	-4.16	0.13
Ireland	-0.15	0.05	-3.10	0.08
Italy	-0.10	0.04	-2.54	0.05
Netherlands	-0.27	0.06	-4.27	0.13
Portugal	-0.06	0.03	-1.93	0.03
Spain	-0.20	0.05	-3.65	0.10

Source: OECD.

Table 3. Cross-Country Saving-Investment Regression

Sample	b	S.E.	*R*-squared
Euro Area (S=GNP+NT-C)			
1960-78	0.58	0.15	0.65
1979-97	0.82	0.36	0.40
Canadian Provinces			
1961-78	-0.12	0.09	0.17
1979-98	0.02	0.08	0.01
Italian Regions			
1970-79	-0.47	0.17	0.30
1980-95	-0.21	0.09	0.24
Euro Area (S=GNP-C)			
1960-78	0.27	0.14	0.33
1979-97	-0.13	0.26	0.03
Non-Euro OECD (S=GNP+NT-C)			
1960-78	0.83	0.14	0.77
1979-97	0.60	0.09	0.81
Non-Euro OECD (S=GNP-C)			
1960-78	0.67	0.18	0.59
1979-97	0.50	0.12	0.64

Sources: OECD; CANSIM; and SVIMEZ.

Table 4a. Time-Series Saving-Investment Relations: Euro Area, 1961–97

$$\Delta[I_t/Y_t(i)] = a + b\Delta[S_t/Y_t(i)] + c[S_{t-1}/Y_{t-1}(i)-I_{t-1}/Y_{t-1}(i)]+d[S_{t-1}/Y_{t-1}(i)]$$

Country		a	b	c	d	R^2
Austria	1961-1978	**0.06**	**0.80**	**0.67**	**-0.22**	**0.70**
		(0.05)	(0.21)	(0.26)	(0.19)	
	1961-1997	**0.02**	**0.92**	**0.49**	**-0.06**	**0.65**
		(0.02)	(0.14)	(0.15)	(0.06)	
Belgium	1961-1978	**0.09**	**0.56**	**0.65**	**-0.40**	**0.79**
		(0.03)	(0.13)	(0.24)	(0.15)	
	1961-1997	**-0.01**	**0.70**	**0.05**	**0.04**	**0.61**
		(0.01)	(0.11)	(0.10)	(0.06)	
Finland	1961-1978	**-0.06**	**0.43**	**0.79**	**0.28**	**0.62**
		(0.07)	(0.37)	(0.27)	(0.26)	
	1961-1997	**-0.03**	**0.61**	**0.50**	**0.17**	**0.62**
		(0.02)	(0.17)	(0.15)	(0.08)	
France	1961-1978	**-0.01**	**1.01**	**0.69**	**0.03**	**0.68**
		(0.05)	(0.27)	(0.23)	(0.21)	
	1961-1997	**-0.01**	**0.84**	**0.39**	**0.03**	**0.60**
		(0.01)	(0.16)	(0.16)	(0.05)	
Germany	1961-1978	**-0.03**	**1.03**	**0.58**	**0.09**	**0.75**
		(0.03)	(0.17)	(0.24)	(0.10)	
	1961-1997	**0.00**	**0.66**	**0.26**	**0.00**	**0.46**
		(0.02)	(0.16)	(0.11)	(0.07)	
Ireland	1961-1978	**-0.02**	**0.09**	**0.68**	**0.30**	**0.55**
		(0.04)	(0.29)	(0.18)	(0.22)	
	1961-1997	**0.00**	**0.10**	**0.16**	**0.06**	**0.14**
		(0.04)	(0.22)	(0.09)	(0.18)	
Italy	1961-1978	**0.01**	**1.10**	**0.43**	**-0.03**	**0.47**
		(0.08)	(0.50)	(0.24)	(0.32)	
	1961-1997	**0.00**	**0.55**	**0.42**	**-0.01**	**0.35**
		(0.02)	(0.29)	(0.15)	(0.08)	
Netherlands	1961-1978	**0.05**	**0.75**	**0.21**	**-0.20**	**0.43**
		(0.05)	(0.28)	(0.19)	(0.21)	
	1961-1997	**-0.01**	**0.61**	**0.09**	**0.04**	**0.32**
		(0.02)	(0.17)	(0.08)	(0.09)	
Portugal	1961-1978	**0.11**	**0.41**	**0.59**	**-0.42**	**0.46**
		(0.07)	(0.21)	(0.29)	(0.27)	
	1961-1997	**0.03**	**0.39**	**0.32**	**-0.11**	**0.34**
		(0.04)	(0.16)	(0.13)	(0.15)	
Spain	1961-1978	**0.06**	**0.15**	**0.63**	**-0.21**	**0.49**
		(0.07)	(0.38)	(0.21)	(0.28)	
	1961-1997	**-0.01**	**0.35**	**0.44**	**0.05**	**0.43**
		(0.02)	(0.19)	(0.11)	(0.08)	
Averages	1961-1978	**0.03**	**0.63**	**0.59**	**-0.08**	
	1961-1997	**0.00**	**0.57**	**0.31**	**0.02**	

Sources: OECD; and authors' calculations. Standard errors appear in parentheses.

Table 4b. Time-Series Saving-Investment Relations: Italy, 1971–98

$\Delta[I_t/Y_t(i)] = a + b\Delta[S_t/Y_t(i)] + c[S_{t-1}/Y_{t-1}(i)-I_{t-1}/Y_{t-1}(i)]+d[S_{t-1}/Y_{t-1}(i)]$

Region	a	b	c	d	R^2
Piemonte	**0.04**	**0.50**	**0.87**	**-0.37**	**0.56**
	(0.05)	(0.33)	(0.28)	(0.22)	
Valle d'Aosta	**0.21**	**0.21**	**0.65**	**-0.60**	**0.33**
	(0.07)	(0.35)	(0.20)	(0.21)	
Lombardia	**-0.03**	**0.98**	**0.59**	**-0.13**	**0.52**
	(0.04)	(0.40)	(0.23)	(0.15)	
Trentino Alto Adige	**0.03**	**0.65**	**0.33**	**0.02**	**0.29**
	(0.06)	(0.45)	(0.17)	(0.30)	
Veneto	**-0.08**	**0.72**	**0.11**	**0.29**	**0.20**
	(0.11)	(0.48)	(0.17)	(0.45)	
Friuli Venezia Giulia	**-0.05**	**1.28**	**-0.10**	**0.18**	**0.50**
	(0.07)	(0.33)	(0.13)	(0.32)	
Liguria	**-0.07**	**1.24**	**0.18**	**0.34**	**0.39**
	(0.04)	(0.40)	(0.14)	(0.21)	
Emilia Romagna	**-0.06**	**1.12**	**0.51**	**0.07**	**0.62**
	(0.04)	(0.29)	(0.21)	(0.15)	
Toscana	**-0.05**	**1.22**	**0.76**	**0.11**	**0.60**
	(0.04)	(0.28)	(0.21)	(0.15)	
Umbria	**0.03**	**0.90**	**0.19**	**-0.08**	**0.23**
	(0.05)	(0.49)	(0.13)	(0.28)	
Marche	**0.04**	**1.18**	**0.32**	**-0.14**	**0.54**
	(0.03)	(0.28)	(0.12)	(0.15)	
Lazio	**0.16**	**0.06**	**0.82**	**-0.76**	**0.40**
	(0.06)	(0.34)	(0.22)	(0.27)	
Abruzzo	**-0.10**	**0.58**	**-0.08**	**0.64**	**0.11**
	(0.07)	(0.41)	(0.10)	(0.47)	
Molise	**0.09**	**1.02**	**0.24**	**-0.46**	**0.34**
	(0.05)	(0.48)	(0.14)	(0.28)	
Campania	**0.00**	**1.10**	**0.13**	**0.39**	**0.35**
	(0.03)	(0.35)	(0.15)	(0.28)	
Puglia	**-0.01**	**-0.30**	**0.14**	**0.26**	**0.25**
	(0.02)	(0.31)	(0.15)	(0.21)	
Basilicata	**0.08**	**0.27**	**0.28**	**0.11**	**0.13**
	(0.05)	(0.34)	(0.17)	(0.19)	
Calabria	**0.22**	**-0.06**	**0.67**	**-0.25**	**0.39**
	(0.07)	(0.24)	(0.20)	(0.14)	
Sicilia	**0.00**	**-0.01**	**0.01**	**0.07**	**0.02**
	(0.02)	(0.15)	(0.06)	(0.15)	
Sardegna	**0.01**	**0.05**	**0.07**	**0.03**	**0.01**
	(0.03)	(0.35)	(0.17)	(0.15)	
Average	**0.02**	**0.63**	**0.34**	**-0.01**	

Sources: SVIMEZ; and authors' calculations. Standard errors appear in parentheses.

Table 4c. Time-Series Saving-Investment Relations: Canada, 1962–98

$\Delta[I_t/Y_t(i)] = a + b\Delta[S_t/Y_t(i)] + c[S_{t-1}/Y_{t-1}(i) - I_{t-1}/Y_{t-1}(i)] + d[S_{t-1}/Y_{t-1}(i)]$

Province	a	b	c	d	R^2
Alberta	**0.04**	**0.05**	**0.18**	**-0.16**	**0.09**
	(0.03)	(0.14)	(0.10)	(0.10)	
British Columbia	**0.03**	**0.67**	**0.27**	**-0.09**	**0.39**
	(0.02)	(0.18)	(0.12)	(0.10)	
Manitoba	**0.02**	**0.88**	**0.53**	**0.04**	**0.39**
	(0.02)	(0.22)	(0.17)	(0.11)	
New Brunswick	**0.01**	**-0.12**	**0.08**	**0.25**	**0.24**
	(0.03)	(0.18)	(0.11)	(0.27)	
Newfoundland	**0.06**	**0.36**	**0.20**	**0.63**	**0.22**
	(0.03)	(0.27)	(0.09)	(0.35)	
Nova Scotia	**0.03**	**0.11**	**0.12**	**-0.12**	**0.09**
	(0.02)	(0.13)	(0.09)	(0.15)	
Ontario	**-0.07**	**0.81**	**0.53**	**0.13**	**0.68**
	(0.02)	(0.12)	(0.13)	(0.09)	
Prince Edward Island	**0.07**	**0.03**	**0.42**	**-0.57**	**0.22**
	(0.03)	(0.16)	(0.16)	(0.24)	
Quebec	**0.03**	**0.49**	**0.29**	**-0.15**	**0.26**
	(0.02)	(0.20)	(0.12)	(0.11)	
Saskatchewan	**0.08**	**0.55**	**0.58**	**-0.29**	**0.48**
	(0.05)	(0.20)	(0.16)	(0.18)	
Averages	**0.03**	**0.38**	**0.32**	**-0.03**	

Sources: CANSIM; and authors' calculations. Standard errors appear in parentheses.

Table 5. Labor Productivity: Permanent or Transitory Productivity Shocks
Unit root tests for global and region/country-specific labor productivity in manufacturing,
$\Delta A_t = a + b A_{t-1} + cT$

Country/Region	Sample Period	b	b: *t*-statistic	c: *t*-statistic
Italy				
Piemonte	1971-98	-0.23	-2.34	1.00
Valle d'Aosta	1971-98	-0.26	-1.90	-0.59
Lombardia	1971-98	-0.17	-2.20	1.70
Trentino Alto Adige	1971-98	-0.34	-2.08	1.68
Veneto	1971-98	-0.21	-2.23	0.25
Friuli Venezia Giulia	1971-98	-0.38	-2.51	1.78
Liguria	1971-98	-0.26	-2.00	1.10
Emilia Romagna	1971-98	-0.18	-2.23	-1.39
Toscana	1971-98	-0.26	-2.55	-2.50
Umbria	1971-98	-0.36	-2.59	-1.69
Marche	1971-98	-0.29	-2.06	-1.24
Lazio	1971-98	-0.45	-2.88	1.68
Abruzzo	1971-98	-0.18	-1.61	-0.08
Molise	1971-98	-0.40	-3.96	-2.53
Campania	1971-98	-0.40	-2.87	0.82
Puglia	1971-98	-0.32	-2.25	-1.44
Basilicata	1971-98	-0.38	-2.37	1.92
Calabria	1971-98	-0.59	-3.30	1.69
Sicilia	1971-98	-0.37	-2.53	0.41
Sardegna	1971-98	-0.59	-3.37	-1.17
Average		-0.33	-2.49	
Canada				
Newfoundland	1972-98	-0.71	-3.34	-3.15
Prince Edward Island	1972-98	-0.80	-3.93	-1.30
Nova Scotia	1972-98	-0.61	-3.63	-3.35
New Brunswick	1972-98	-0.63	-3.40	-2.96
Quebec	1972-98	-0.13	-1.03	-1.21
Ontario	1972-98	-0.12	-1.01	1.98
Manitoba	1972-98	-0.47	-2.77	-1.93
Saskatchewan	1972-98	-0.42	-2.39	-1.57
Alberta	1972-98	-0.31	-2.08	-0.53
Bristish-Columbia	1972-98	-0.46	-2.56	-2.65
Average		-0.47	-2.61	
Euro area				
Austria	1969-98	-0.52	-3.10	3.12
Belgium	1969-98	-0.11	-1.57	-3.51
Finland	1969-98	-0.12	-1.85	3.52
France	1969-98	-0.28	-2.64	2.35
Germany	1979-98	-0.09	-1.10	4.11
Ireland	1969-98	-0.17	-2.78	3.61
Italy	1971-98	-0.29	-1.86	-1.82
Netherlands	1969-98	-0.12	-1.23	-1.06
Portugal	1969-98	-0.06	-0.77	-1.43
Spain	1969-98	-0.27	-2.91	-2.75
Average		-0.20	-1.98	
Italy relative to Euro area	1971-98	-0.29	-1.86	-1.82
Canada relative to G7	1972-98	-0.33	-2.22	-1.71
Euro area relative to G7	1971-98	-0.34	-2.73	2.27
Euro area (not specific)	1969-98	0.01	0.19	0.12
G7 (not specific)	1969-98	0.03	0.41	-0.11

Sources: SVIMEZ; CANSIM; IMF, *WEO*; and authors' calculations.

Table 6a. Euro Area: Productivity, Investment, and Net Exports

(1) $\Delta I_t = a + b\ \Delta(\text{country/euro}) + c\Delta(\text{euro/G7}) + d\Delta(\text{G7}) + eI_{t-1} + f^{*}\text{TREND}$

(2) $\Delta NE_t = g + h(L)(\text{country/euro}) + i(L)(\text{euro/G7}) + j\Delta(\text{G7}) + kI_{t-1}$

Country/Region	Sample	b	c	d	R^2 (1)	h1	h2	i1	i2	j	R^2 (2)
Euro area											
Austria	1969-98	**0.19**	**0.54**	**0.50**	**0.59**	**-0.07**	**0.17**	**-0.16**	**0.12**	**-0.41**	**0.34**
		(0.11)	(0.16)	(0.17)		(0.08)	(0.08)	(0.13)	(0.12)	(0.14)	
Belgium	1969-98	**0.13**	**0.29**	**0.28**	**0.34**	**0.06**	**-0.08**	**0.34**	**0.09**	**0.18**	**0.90**
		(0.11)	(0.12)	(0.13)		(0.09)	(0.07)	(0.15)	(0.15)	(0.14)	
Finland	1969-98	**0.08**	**0.16**	**-0.21**	**0.21**	**0.15**	**-0.20**	**-0.22**	**-0.13**	**0.08**	**0.13**
		(0.28)	(0.29)	(0.28)		(0.20)	(0.17)	(0.38)	(0.36)	(0.34)	
France	1969-98	**0.46**	**0.53**	**0.29**	**0.59**	**-0.11**	**0.08**	**-0.07**	**0.06**	**-0.03**	**0.15**
		(0.12)	(0.12)	(0.10)		(0.12)	(0.11)	(0.13)	(0.13)	(0.12)	
Germany	1979-99	**0.65**	**0.60**	**0.02**	**0.79**	**-0.81**	**0.75**	**-0.09**	**0.41**	**0.17**	**0.57**
		(0.09)	(0.11)	(0.12)		(0.25)	(0.25)	(0.38)	(0.31)	(0.34)	
Ireland	1969-98	**-0.20**	**0.08**	**0.60**	**0.43**	**0.21**	**-0.10**	**-0.24**	**0.77**	**-0.37**	**0.50**
		(0.11)	(0.18)	(0.21)		(0.12)	(0.12)	(0.36)	(0.36)	(0.30)	
Italy	1969-98	**0.25**	**0.37**	**0.13**	**0.53**	**-0.12**	**0.04**	**-0.10**	**0.05**	**-0.10**	**0.07**
		(0.07)	(0.14)	(0.09)		(0.14)	(0.15)	(0.29)	(0.26)	(0.27)	
Netherlands	1969-98	**0.09**	**0.19**	**0.41**	**0.37**	**-0.06**	**0.01**	**0.38**	**0.01**	**0.00**	**0.32**
		(0.05)	(0.12)	(0.14)		(0.07)	(0.07)	(0.17)	(0.15)	(0.17)	
Portugal	1969-98	**0.05**	**0.83**	**0.58**	**0.40**	**0.11**	**-0.13**	**0.05**	**0.48**	**-0.01**	**0.21**
		(0.14)	(0.37)	(0.29)		(0.25)	(0.24)	(0.46)	(0.48)	(0.43)	
Spain	1969-98	**-0.02**	**0.23**	**0.28**	**0.29**	**0.07**	**-0.18**	**-0.06**	**0.41**	**0.08**	**0.19**
		(0.18)	(0.19)	(0.16)		(0.12)	(0.10)	(0.25)	(0.24)	(0.21)	
Panel regressions		**0.28**	**0.42**	**0.15**	**0.56**	**-0.12**	**0.04**	**-0.10**	**0.03**	**-0.10**	**0.07**
		(0.08)	(0.14)	(0.16)		(0.07)	(0.10)	(0.20)	(0.15)	(0.25)	

Sources: OECD; IMF, *WEO;* and authors' calculations. Standard errors appear in parentheses.

Table 6b. Italy: Productivity, Investment, and Net Exports

(1) $\Delta I_t = a + b\,\Delta(\text{province/Italy}) + c\Delta(\text{Italy/Euro}) + d\Delta(\text{Euro/ G7}) + e\Delta(G7) + fI_{t-1} + e{*}TREND$

(2) $\Delta NF_t = g + h(L)\,(\text{province/Italy}) + i(L)(\text{Italy/Euro}) + j(L)(\text{Euro/ G7}) + k\Delta(G7) + iI_{t-1}$

Country/Region	Sample	b	c	d	e	R^2 (1)	h1	h2	i1	i2	j1	j2	k	R^2 (2)
Piemonte	1971-95	**-0.07**	**0.49**	**0.41**	**0.05**	**0.57**	**0.36**	**-0.12**	**-0.29**	**-0.26**	**0.33**	**-0.09**	**0.26**	**0.40**
		(0.21)	(0.11)	(0.28)	(0.20)		(0.24)	(0.23)	(0.17)	(0.23)	(0.33)	(0.27)	(0.36)	
Valle d'Aosta	1971-95	**-0.14**	**0.16**	**1.10**	**0.76**	**0.41**	**0.28**	**-0.30**	**-0.76**	**0.11**	-1.08	**0.66**	**-0.84**	**0.53**
		(0.08)	(0.24)	(0.53)	(0.32)		(0.13)	(0.11)	(0.36)	(0.37)	(0.59)	(0.61)	(0.65)	
Lombardia	1971-95	**0.10**	**0.41**	**0.56**	**0.30**	**0.65**	**-0.08**	-0.64	**-0.13**	**0.12**	**-0.16**	**0.16**	**-0.07**	**0.36**
		(0.12)	(0.06)	(0.11)	(0.13)		(0.40)	(0.38)	(0.12)	(0.17)	(0.24)	(0.22)	(0.24)	
Trentino Alto Adige	1971-95	**0.11**	**0.19**	**0.63**	**-0.24**	**0.74**	**-0.17**	**-0.07**	**-0.24**	**-0.04**	**-0.01**	**0.27**	**-0.13**	**0.33**
		(0.07)	(0.08)	(0.15)	(0.21)		(0.15)	(0.17)	(0.18)	(0.20)	(0.35)	(0.31)	(0.36)	
Veneto	1971-95	**-0.20**	**0.25**	**0.37**	**0.19**	**0.51**	**0.05**	**0.02**	**-0.04**	**-0.23**	**-0.10**	-0.04	**0.10**	**0.37**
		(0.19)	(0.08)	(0.11)	(0.17)		(0.33)	(0.30)	(0.16)	(0.18)	(0.28)	(0.27)	(0.28)	
Friuli Venezia Giulia	1971-95	**-0.14**	**0.18**	**0.87**	**-0.16**	**0.55**	**0.21**	-0.19	**0.09**	**-0.25**	**-0.64**	**0.40**	**-0.27**	**0.31**
		(0.13)	(0.08)	(0.22)	(0.21)		(0.16)	(0.16)	(0.16)	(0.18)	(0.32)	(0.32)	(0.37)	
Liguria	1971-95	**-0.04**	**0.10**	**0.39**	**-0.26**	**0.34**	**0.04**	**-0.27**	**0.09**	**-0.09**	**-0.11**	**-0.33**	**0.29**	**0.27**
		(0.12)	(0.10)	(0.38)	(0.35)		(0.20)	(0.20)	(0.32)	(0.26)	(0.57)	(0.47)	(0.52)	
Emilia Romagna	1971-95	**0.28**	**0.42**	**0.45**	**0.07**	**0.69**	**0.06**	-0.14	**-0.08**	**-0.20**	-0.12	**-0.09**	**-0.29**	**0.21**
		(0.09)	(0.06)	(0.10)	(0.17)		(0.19)	(0.17)	(0.12)	(0.18)	(0.23)	(0.24)	(0.29)	
Toscana	1971-95	**0.05**	**0.30**	**0.45**	**0.04**	**0.65**	**0.31**	**-0.43**	**-0.05**	**-0.26**	**-0.04**	**-0.29**	**-0.05**	**0.45**
		(0.17)	(0.07)	(0.19)	(0.21)		(0.21)	(0.20)	(0.16)	(0.20)	(0.25)	(0.27)	(0.27)	
Umbria	1971-95	**-0.01**	**0.41**	**0.82**	**0.42**	**0.62**	**0.30**	**-0.04**	**-0.19**	**-0.29**	**-0.29**	**0.26**	**-0.31**	**0.73**
		(0.09)	(0.18)	(0.20)	(0.19)		(0.13)	(0.12)	(0.22)	(0.26)	(0.34)	(0.31)	(0.34)	
Marche	1971-95	**0.20**	**0.43**	**0.40**	**-0.20**	**0.63**	**-0.07**	**-0.10**	**-0.33**	**-0.01**	**-0.04**	**-0.09**	**-0.03**	**0.31**
		(0.11)	(0.19)	(0.20)	(0.22)		(0.13)	(0.13)	(0.15)	(0.18)	(0.23)	(0.23)	(0.25)	
Lazio	1971-95	**-0.16**	**0.09**	**-0.16**	**0.20**	**0.35**	**0.36**	-0.04	**-0.26**	**-0.21**	**0.00**	**-0.30**	**-0.30**	**0.41**
		(0.11)	(0.09)	(0.21)	(0.20)		(0.19)	(0.25)	(0.18)	(0.21)	(0.36)	(0.34)	(0.31)	
Abruzzo	1971-95	**-0.10**	**0.25**	**-0.12**	**-0.06**	**0.35**	**0.16**	**-0.13**	**-0.21**	**0.06**	**0.25**	**-0.51**	**0.06**	**0.21**
		(0.11)	(0.10)	(0.29)	(0.18)		(0.18)	(0.18)	(0.22)	(0.21)	(0.39)	(0.38)	(0.34)	
Molise	1971-95	**-0.05**	**1.01**	**-0.21**	**-0.66**	**0.45**	**0.42**	**-0.31**	**-0.59**	**0.41**	**-0.26**	-1.15	**0.02**	**0.46**
		(0.18)	(0.32)	(0.37)	(0.44)		(0.26)	(0.21)	(0.42)	(0.43)	(0.69)	(0.81)	(0.64)	
Campania	1971-95	**0.25**	**0.20**	**-0.03**	**0.24**	**0.31**	**0.02**	-0.17	**-0.44**	**0.03**	**0.24**	**-0.56**	**0.05**	**0.20**
		(0.09)	(0.09)	(0.22)	(0.28)		(0.20)	(0.24)	(0.27)	(0.27)	(0.43)	(0.43)	(0.43)	
Puglia	1971-95	**-0.10**	**0.20**	**0.33**	**0.36**	**0.53**	**0.23**	**-0.20**	**-0.34**	**0.09**	**-0.06**	**0.15**	**-0.36**	**0.40**
		(0.09)	(0.09)	(0.13)	(0.14)		(0.16)	(0.15)	(0.18)	(0.19)	(0.36)	(0.37)	(0.42)	
Basilicata	1971-95	**0.02**	**0.08**	**0.39**	**0.54**	**0.36**	**0.49**	**-0.34**	**0.38**	**-0.23**	-1.75	**0.85**	-1.04	**0.46**
		(0.24)	(0.41)	(0.66)	(0.93)		(0.24)	(0.23)	(0.41)	(0.53)	(0.98)	(0.77)	(0.95)	
Calabria	1971-95	**0.01**	**0.12**	**0.34**	**-0.67**	**0.41**	**0.07**	**0.22**	**-0.72**	**0.01**	**0.01**	**-0.91**	**0.25**	**0.32**
		(0.07)	(0.16)	(0.43)	(0.42)		(0.22)	(0.21)	(0.43)	(0.47)	(0.97)	(0.97)	(0.78)	
Sicilia	1971-95	**0.18**	**0.00**	**0.26**	**-0.10**	**0.36**	**-0.18**	**-0.19**	**0.39**	**-0.54**	**-0.80**	**0.42**	**-0.46**	**0.47**
		(0.04)	(0.07)	(0.11)	(0.14)		(0.13)	(0.12)	(0.21)	(0.19)	(0.34)	(0.33)	(0.29)	
Sardegna	1971-95	**-0.08**	**0.03**	**-0.17**	**0.30**	**0.31**	**0.25**	**-0.12**	**-0.06**	**0.19**	**0.12**	**0.51**	**0.20**	**0.73**
		(0.03)	(0.17)	(0.22)	(0.18)		(0.07)	(0.07)	(0.17)	(0.16)	(0.27)	(0.32)	(0.30)	
Panel regression	1971-95	**0.07**	**0.30**	**0.36**	**0.12**	**0.49**	**0.13**	**-0.14**	**-0.18**	**-0.05**	**-0.13**	**-0.01**	**-0.08**	0.22
		(0.04)	(0.03)	(0.07)	(0.08)		(0.05)	(0.04)	(0.04)	(0.05)	(0.09)	(0.08)	(0.10)	

Sources: OECD; IMF, *WEO*; SVIMEZ; and authors' calculations. Standard errors appear in parentheses.

Table 6c. Canada: Productivity, Investment, and Net Exports

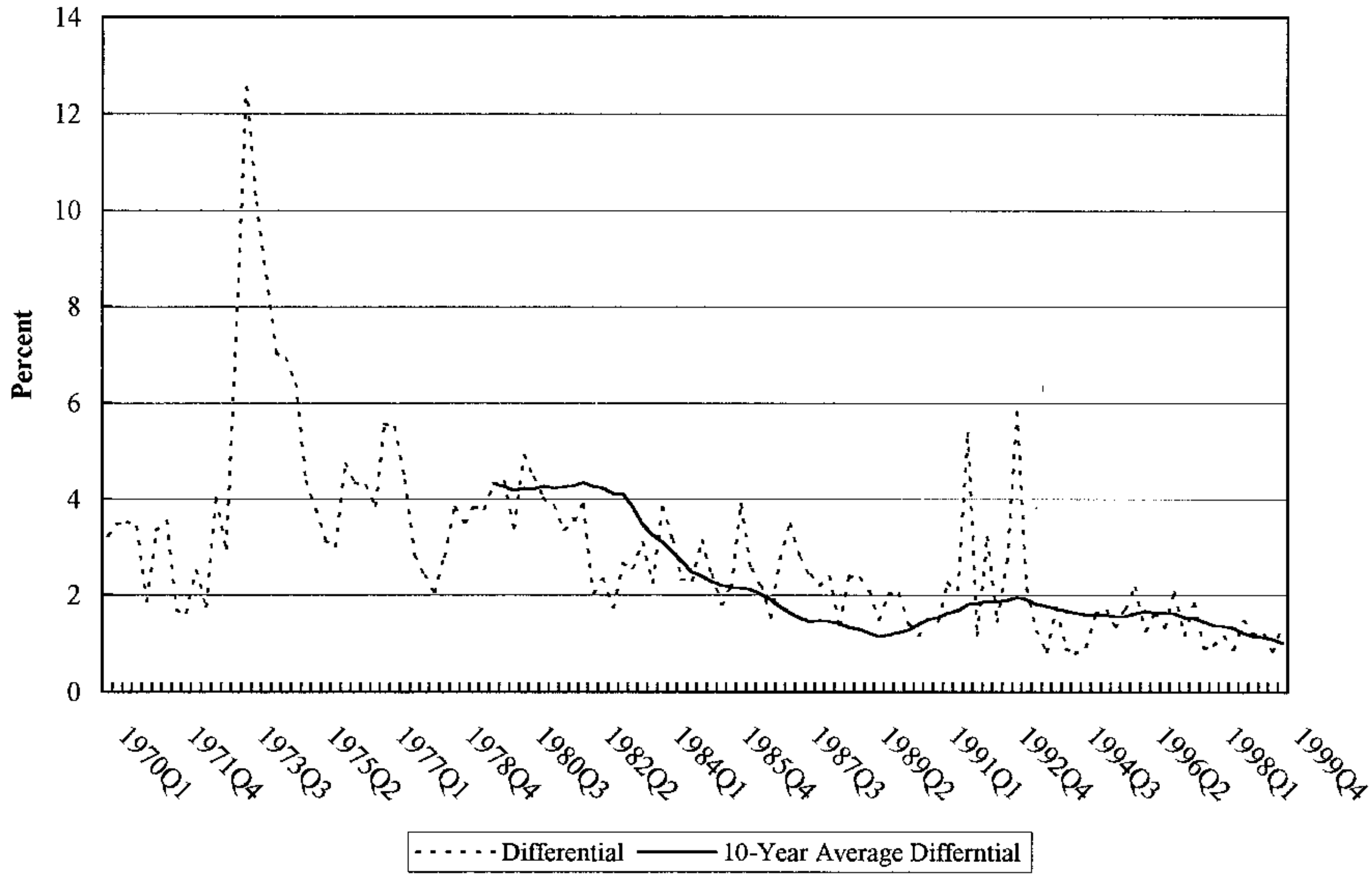
(1) $\Delta I_t = a + b\Delta(\text{province/Can}) + c\Delta(\text{Can/G7}) + d\Delta(\text{ G7}) + eI_{t-1} + f^*\text{TREND}$

(2) $\Delta NE_t = g + h(L)(\text{province/Can}) + I(L)(\text{Can/G7}) + j(L)\Delta(\text{ G7}) + kI_{t-1}$

Province	Sample	b	c	d	R^2 (1)	h1	h2	i1	i2	j	R^2 (2)
Newfoundland	1972-98	**0.06**	**0.03**	**0.22**	**0.40**	**-0.13**	**0.01**	**0.23**	**-0.11**	**-0.06**	**0.21**
		(0.05)	(0.14)	(0.42)		(0.09)	(0.10)	(0.25)	(0.23)	(0.55)	
Prince Edward Island	1972-98	**0.06**	**-0.12**	**0.59**	**0.36**	**-0.13**	**0.09**	**-0.03**	**-0.42**	**-0.27**	**0.29**
		(0.07)	(0.16)	(0.50)		(0.12)	(0.13)	(0.34)	(0.32)	(0.80)	
Nova Scotia	1972-98	**-0.05**	**-0.04**	**0.14**	**0.14**	**0.12**	**-0.06**	**-0.18**	**-0.08**	**0.64**	**0.15**
		(0.06)	(0.14)	(0.20)		(0.13)	(0.12)	(0.22)	(0.22)	(0.54)	
New Brunswick	1972-98	**0.02**	**-0.01**	**-1.08**	**0.41**	**-0.45**	**0.15**	**-0.07**	**0.24**	**1.16**	**0.19**
		(0.08)	(0.17)	(0.43)		(0.34)	(0.24)	(0.46)	(0.56)	(1.01)	
Quebec	1972-98	**0.11**	**0.15**	**0.00**	**0.28**	**0.28**	**0.01**	**-0.07**	**0.35**	**0.63**	**0.45**
		(0.10)	(0.16)	(0.20)		(0.15)	(0.13)	(0.11)	(0.12)	(0.26)	
Ontario	1972-98	**-0.16**	**0.10**	**0.31**	**0.19**	**-0.01**	**-0.20**	**0.05**	**0.14**	**0.29**	**0.18**
		(0.22)	(0.20)	(0.30)		(0.26)	(0.25)	(0.11)	(0.10)	(0.26)	
Manitoba	1972-98	**0.25**	**0.48**	**0.41**	**0.58**	**0.03**	**0.03**	**-0.22**	**0.19**	**0.10**	**0.21**
		(0.11)	(0.19)	(0.18)		(0.15)	(0.15)	(0.19)	(0.19)	(0.38)	
Saskatchewan	1972-98	**0.11**	**0.25**	**-0.99**	**0.38**	**0.03**	**0.07**	**0.13**	**-0.04**	**-0.18**	**0.04**
		(0.06)	(0.34)	(0.77)		(0.19)	(0.18)	(0.43)	(0.41)	(0.86)	
Alberta	1972-98	**0.33**	**-0.12**	**-0.09**	**0.22**	**0.49**	**-0.01**	**0.16**	**-0.65**	**-0.48**	**0.21**
		(0.15)	(0.20)	(0.62)		(0.32)	(0.31)	(0.40)	(0.39)	(0.84)	
Bristish-Columbia	1972-98	**-0.04**	**0.18**	**-0.43**	**0.28**	**0.10**	**0.01**	**0.14**	**0.06**	**0.25**	**0.17**
		(0.08)	(0.15)	(0.46)		(0.14)	(0.14)	(0.17)	(0.16)	(0.40)	
Panel regression	1972-98	**0.07**	**0.10**	**0.11**	**0.20**	**0.13**	**-0.09**	**0.00**	**0.08**	**0.20**	**0.09**
		(0.06)	(0.14)	(0.18)		(0.09)	(0.08)	(0.07)	(0.06)	(0.16)	

Sources: OECD; IMF, *WEO*; CANSIM; and authors' calculations. Standard errors appear in parentheses.

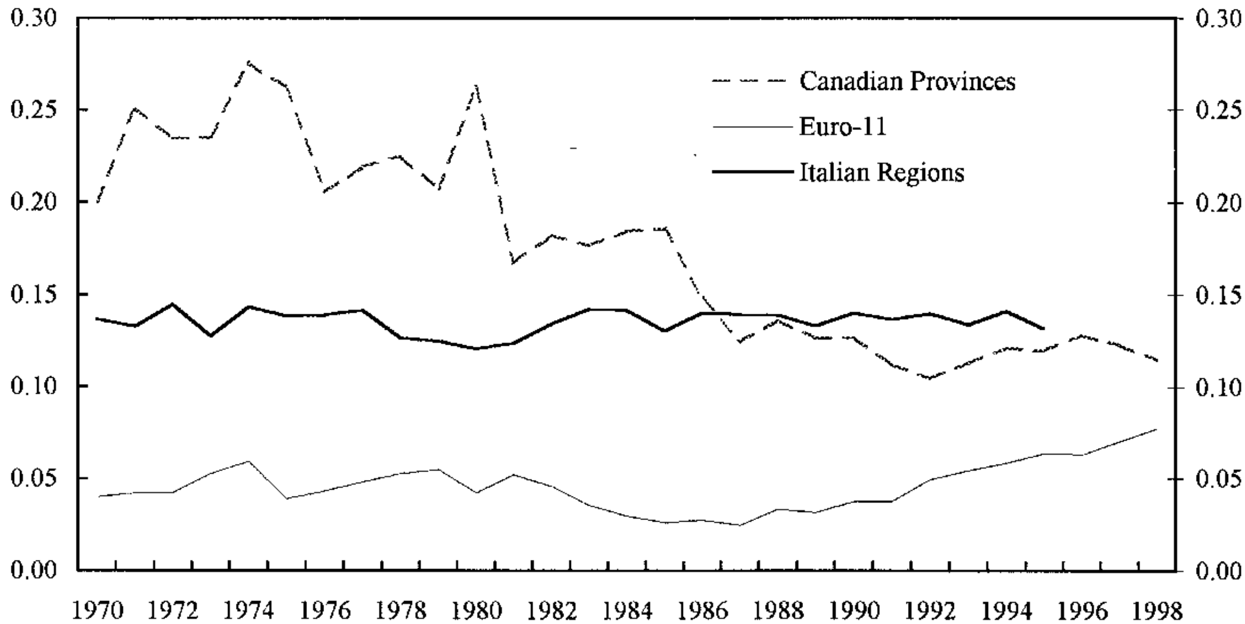
Figure 1. Real Interest Rates: Average Absolute Deviation, 1970-99



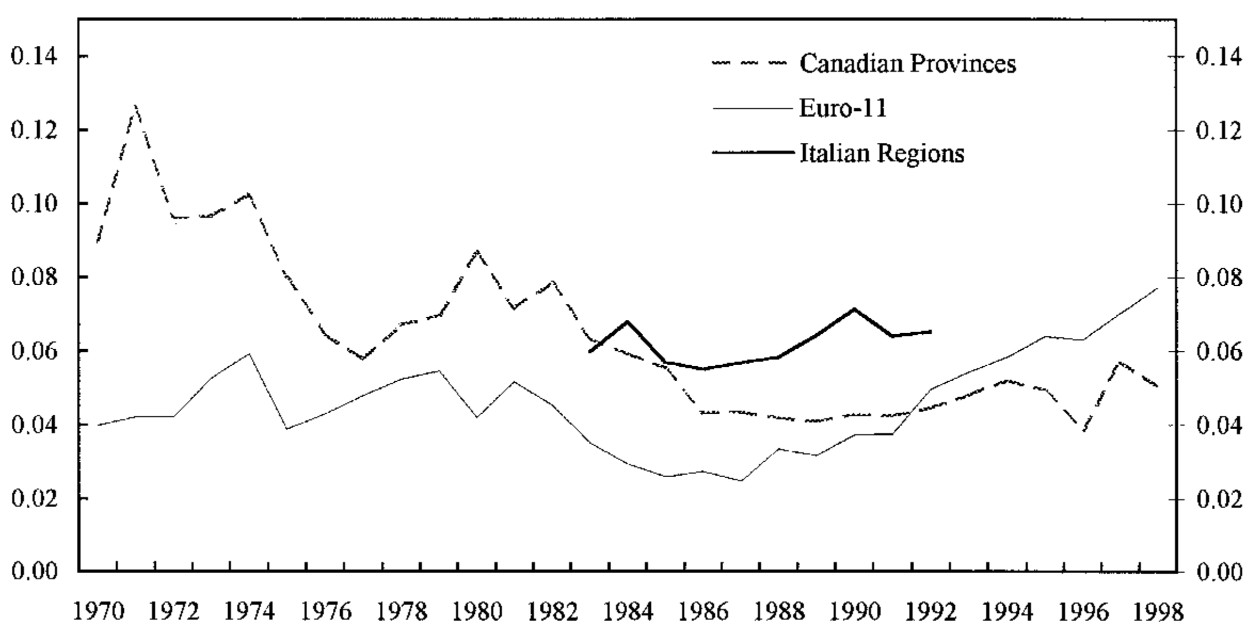
Sources: OECD; and authors' calculations.

Figure 2. Net Exports, 1970-98

Cross-Section Standard Deviation of NE/Y Over Time



Cross-Section Standard Deviation of Private NE/Y Over Time



Sources: OECD; CANSIM; SVIMEZ; and authors' calculations.

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