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COMPARING CAPITAL MOBILITY ACROSS PROVINCIAL AND NATIONAL BORDERS

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ABSTRACT

The persistence of high savings-investment correlations and home-country bias in portfolio construction at the national level is contrasted with new evidence of savings behaviour in Canadian provinces. We confirm that national borders clearly divert flows of capital to domestic investments, but provincial borders have no such effect. In particular, while there is a significant correlation between national savings and investment, among provinces that effect disappears. We discuss the implications for interpreting the distinction between provincial and national borders.

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1. Introduction.

If capital were perfectly mobile, national savings could be used to fund investment anywhere in the world. Domestic capital expenditures could likewise be financed by savings from anywhere in the world. Savings and investment decisions are made separately. Consequently, there is no reason to suppose, in a world of perfect capital mobility, that countries with high savings rates (national savings as a proportion of national income) will necessarily have high investment rates, and vice versa. Thus, the discovery by Feldstein and Horioka (1980) of high correlations between national savings rates and domestic investment rates among OECD countries in the 1960's and early 1970's was surprising. That the national "savings retention coefficient", as they called it, approached unity rather than zero, indicated substantially more global capital market segmentation than had previously been suspected. Subsequent estimates of the same form have shown a small reduction in the savings retention rate over time, but it remains significantly different from zero, often two-thirds or more.[1] By controlling for cross-country heterogeneity, Fujiki and Kitamura (1995) show that the savings retention rate typically falls below 0.5, but remains statistically significant.

This paper contrasts the savings retention rate among OECD countries with that among Canadian provinces. We confirm that national borders clearly divert flows of capital to domestic investments, but provincial borders have no such effect: the provincial savings retention rate is statistically indistinguishable from zero. Several conclusions can be drawn, the first of which is that the Feldstein-Horioka result cannot be dismissed as a mere artifact of econometric misspecification, as has sometimes been suggested (on which see Frankel 1992, Feldstein 1994).

The second conclusion is that goods and capital market linkages among Canadian provinces remain far stronger than those among OECD countries. This result corresponds to similar, and equally

[1] A recent survey is in Feldstein (1994).

striking, demonstrations of the role of the Canada-US border in generating a within-country preference in provincial trade flows (McCallum 1995) and in reducing the covariance of goods prices (Engle and Rogers 1996). The results shown here also support earlier results in Bayoumi and Klein (1997) who show that Canadian provinces draw on a national capital market to smooth consumption with respect to income, but the nation as a whole engages in only partial consumption smoothing, as inferred from a model linking movements in the provincial trade balance to changes in wealth. These four independent lines of inquiry collectively make a formidable case that, in economic terms, provincial borders are almost invisible compared to the national border. Whereas a relatively seamless fabric of economic activity exists across the Canadian economic union, the national border constitutes a persistent and influential demarcation of trade and capital movements. It is open to debate whether this difference reflects a way point along a process of globalization that has far to go, or if there are good reasons for supposing that international economic linkages will always remain far less dense than those within a national economy. It is clear, however, that there are still widespread impressions, probably based on the growth of international trade and investment, that national borders have no more economic importance than provincial ones. The evidence of this paper is that such impressions are far off the mark.

The Feldstein-Horioka result attracted considerable attention because it stood in such sharp contrast to the conventional wisdom (and circumstantial evidence) on globalization, and because it has such significant implications for the design of fiscal policy.[2] The simple linear relationship between savings and investment which Feldstein and Horioka reported has been found to hold under numerous alternative specifications. Additionally, recent evidence has shown that the high level of aggregate national savings retention is matched by a high degree of "home-bias" in portfolio choice[3]. Feldstein

[2] For instance, if the world capital supply function is perfectly elastic, the public budget must be financed mostly out of taxes on labour earnings and consumption, rather than on earnings of capital, in order to minimize the excess burden. Alternatively, as argued by Rodrik (1997, p. 81), high international mobility requires international agreement about rates of taxation on capital income to maintain balanced tax systems. In addition, an elastic capital supply function would imply that public deficits have little effect on the domestic real interest rate, and that domestic savings incentives would have no effect on domestic investment.

[3] French and Poterba (1991), for instance, found that 94 per cent of U.S. portfolios were invested in American securities, and 98 per cent of Japanese portfolios were invested in Japanese securities. Feldstein (1994) cites an American study which estimated that the minimum variance bond portfolio for a U.S. investor would be 90 per cent

(1994, 10) remarks: "Capital is mobile, but its owners generally prefer to keep it at home. Evidence that capital *can* move and that *some* capital does move is not the same as evidence that capital is allocated globally without regard to national boundaries."

We have ample evidence, then, that capital markets are segmented by national borders. What factors account for this, and do we expect them to apply between provinces? Feldstein (1994) argues that hedging against currency risk through forward currency contracts is a significant cause of the apparent segmentation of capital markets, even in a world where much international investment occurs. When a foreign bond purchase is coupled with the sale of a forward contract, the two transactions are mutually offsetting in the foreign exchange market, so the net effect becomes a reallocation of assets within each country. Presumably this effect would be absent within a currency union. Another form of *de facto* segmentation suggested by Feldstein is the observation that foreign direct investment is often locally financed, to take advantage of the better terms offered by a lender who is able to monitor the enterprise. Where labour mobility, information gathering and trustworthy contracts are easier and cheaper to provide, then capital mobility would be correspondingly higher.

Many of the differences in the density of networks, the costs of gathering information, and the costs of making and maintaining contacts and contracts, that are likely to be important in explaining the separation of national capital markets have similar effects in making national goods markets tighter than international ones. However, the link between capital and goods mobility is even greater than would be suggested by their mutual dependence on differences in transactions and information costs. It has long been well understood that if goods made in different countries are not perfect substitutes for each other, then it does not follow that a transfer of savings or assets from one country to another can be easily translated into a matching current account balance.[4] Thus without perfect international substitutability of

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in U.S. bonds. Baxter and Jermann (1997) argue that the lack of international diversification is even more striking when one considers that the correlation between returns to capital and returns to human capital makes a case for a short position in domestic equities.

[4] The so-called 'transfer problem' was first raised, most significantly by Keynes (1929) and Ohlin (1929), in the analysis of reparations payments by Germany after World War I, and later in a more general context of balance-of-payments theory (Samuelson 1952 and 1954, Johnson 1956).

goods, there is no assured mechanism whereby incremental savings in one country will be seamlessly spread among investments in many countries. Hence the absence of full integration of goods markets is a sufficient reason for expecting some correlation between national savings and domestic investment rates. Since we already know that goods markets are much more tightly linked within than between national economies, we might suppose that provincial borders are qualitatively less influential in segmenting capital markets than are national borders. We will see in the next section that this is indeed the case.

2. Comparing Border Effects for Countries and Provinces.

We explore the role of provincial borders in savings retention by looking at three related models. First we estimate a simple savings-investment function for the Canadian provinces, and show that the slope coefficient is not significantly different from zero. Then we examine the provincial data within a panel of savings and investment rates across the OECD. We estimate two types of savings-investment functions in which interprovincial savings retention is nested within an international model. We show that while the Feldstein-Horioka (1980) and Fujiki-Kitamura (1995) results are replicated at the national level, the presence of a provincial border almost exactly offsets the role of the national border.

The basic Feldstein-Horioka model is the linear regression across $i=1, ,n$ countries:

$$(1) \qquad \bar{I}_i = a + b\bar{S}_i$$

where

$$\bar{I}_i = \frac{1}{T}\sum_{t=1}^{T} \frac{I_{it}}{Y_{it}},$$

$$\bar{S}_i = \frac{1}{T}\sum_{t=1}^{T} \frac{S_{it}}{Y_{it}}$$

I_{it} is investment in country i at time t, S_{it} and Y_{it} are respectively savings and income similarly subscripted, e_i is an error term and a, b are parameters. In the case of perfect capital mobility, b should be close to zero, but Feldstein and Horioka (1980) report values close to unity. Recent estimates of b are in Fujiki and Kitamura (1995), who report values between 0.8 and 0.95 for most 10-year panels from 1961 to 1989. Controlling for cross-country heterogeneity by allowing a separate intercept for each country they find the savings-retention rate falls to the range of about 0.5-0.6 for the period up to 1975 and 0.2-0.5 for the period 1976-1989, but nevertheless remains statistically significant.

In examining the movements of provincial savings an important question is the treatment of net intergovernmental transfer payments, since in some cases these are very large relative to domestic savings. The question of whether such transfers should be treated as part of savings or not is taken up in Brown (1992). For our purposes we present results both with and without net transfers. While their inclusion changes the signs and magnitudes of some of the coefficient estimates slightly, none of the quantitative results are affected.

In each regression below we find Newfoundland to be an influential outlier, with a high investment rate (over 35 per cent) but with a very low savings rate. Inclusion of this observation tends to produce an apparently negative correlation between savings and investment at the provincial level, especially in the earlier period of the sample. While retaining this observation does not detract from our main results, its inclusion typically raises the magnitude of provincial slope coefficients by a factor of two or more. The results reported below all include Newfoundland, but for comparison purposes the tables are repeated in the appendix with Newfoundland excluded.

Estimating equation (1) on Canadian provincial data for 1961 through 1993 yields parameters as shown in Table One.[5] We report only the slope parameters, but the intercepts are available on request from the authors (see Appendix). The contrast between the cross-country results reported above and the cross-provincial results is quite sharp: when run on both pooled (public plus private) and private sector-

[5] Details on the construction of the data set are in the Appendix.

only data, the estimate of b is close to zero and statistically insignificant. These results are invariant to inclusion or exclusion of transfers. There is some variation over time, with the negative correlation in the pooled data being somewhat stronger in the early years and the positive correlation in the private sector data being somewhat stronger in the later years, although in no case is the slope parameter significant at either the five or ten per cent level.

Since the estimates in Table One are based on only seven degrees of freedom we might suspect that they are due to a lack of statistical power. This can be ruled out by re-establishing the provincial results within an OECD panel study. We gathered savings-investment data for 17 OECD countries (other than Canada), and included the provinces (excluding Newfoundland), for a total of 26 regions. We then estimated several alternative versions of equation (1) to examine whether the intercept and slope were significantly affected by a region being a province within Canada rather than a country. The results are shown in Table Two.

The first results are from the equation

$$(2) \qquad I_{it} = \alpha_{1f} + r(i) + \beta_{1f} S_{it} + \gamma_1 DPROV + \delta_1 (DPROV \times S_{it}) + e_{it}$$

where $r(i)$ is a country-specific dummy variable which controls for cross-country heterogeneity,[6] and $DPROV$ is a dummy which takes the value 1 if the observation is a Canadian province and 0 otherwise. The subscript $1f$ denotes that the coefficient is a one-way fixed effects estimator, following the terminology of Fujiki and Kitamura (1995), who found that it was consistently preferred to the estimator in equation (1), which they refer to as a 'between' estimator. (We also estimate results using a between estimator below.) We do not report the $r(i)$ values in Table Two, but details on how to obtain them from the authors are in the Appendix.

Equation (2) yields two separate models for national and provincial savings retention. The coefficient β_{1f} is the estimate of the savings retention rate for countries in the OECD, while $(\beta_{1f}+\delta_1)$ is the

estimated savings retention rate for provinces. In the sample without transfer payments we find a statistically significant national savings retention rate across the OECD of 0.30, in line with the estimates in Fujiki and Kitamura, but an insignificant rate of 0.04 for Canadian provinces (0.05 if transfers are added in). We test the hypothesis (β_{1f}=-δ_1): does the fact that a region is a province within a country 'cancel out' the savings retention rate? The calculated *t* statistic on the sum of β_{1f}+δ_1 shows that the hypothesis cannot be rejected, and the fact that the coefficients are individually significant suggests that the result is not simply due to a lack of power. That β_{1f} and δ_1 are of such similar magnitude and opposite signs is striking confirmation of the integration of capital markets within the country.

We estimated a two-way fixed effects version of equation (2), to control for intertemporal heterogeneity. The estimating equation was:

$$(3) \qquad I_{it} = \alpha_{2f} + r(i,t) + \beta_{2f} S_{it} + \gamma_2 DPROV + \delta_2 (DPROV \times S_{it}) + e_{it}$$

where the variables are as defined below equation (2), and the subscript *2f* denotes a two-way fixed effects estimator. The term *r(i,t)* denotes country and year-specific dummies. The results are reported in Table Two. As expected, controlling for intertemporal heterogeneity reduces the national savings retention rate (β_{2f}) somewhat, to 0.27 in the case without transfers, but the offsetting effect of the provincial border remains, and the sum of β_{2f} and δ_2 is identical to that in the one-way estimator case and is likewise statistically insignificant.

To carry out the same test in a standard Feldstein-Horioka framework we also estimated an expanded version of equation (1):

$$(4) \qquad \bar{I}_i = a + b_{betw} \bar{S}_i + gDPROV + d(DPROV \times \bar{S}_i) + e_i$$

[6] The US was the omitted reference dummy.

where the variables are as defined above and the subscript $_{betw}$ denotes that b is a 'between' estimator in the terminology of Fujiki and Kitamura (1995). We estimate (4) taking the average over the whole sample, and over the first and last ten years of the sample respectively. The results are also shown in Table Two, and closely mirror the results for equations (2) and (3). The full-sample national savings retention rate is about 0.8, and is higher in the early years than in more recent years. The province dummy offsets the slope almost exactly. In the full-period estimation (without transfers), the provincial savings retention rate falls to a magnitude not significantly different from zero.[7] The clearest pattern of interprovincial capital market integration, in a context of international capital market segmentation, is in the last decade of the sample. Here the national savings retention rate is 0.6 or 0.7 (depending on the definition of savings) but the provincial savings retention rate is effectively zero.

3. Conclusions.

The argument underlying the Feldstein-Horioka paradox is that, in a world of perfect capital mobility, national savings and national investment should be uncorrelated, but the data show a consistently significant correlation under numerous alternative specifications. We show that such savings retention disappears if the region of study is a province within Canada rather than the nation as a whole. Consequently, provincial borders are not barriers to capital mobility in the way that a national border is.

This result strengthens and extends recent evidence on the role of the national border in segmenting economic activity. The Canada-US border has been the subject of particular focus in this literature (see Helliwell 1996, 1997, 1998, McCallum 1995, Engel and Rogers 1996 and Bayoumi and Klein 1997), and the results in every case show a manifest and surprising contrast between the nature of interprovincial borders and the international border. This contrast can be interpreted in various ways: as testimony to the ability of the Canadian economic union to generate trade and allocate capital efficiently, as consequences of persistent barriers to trade and investment posed by cross-border regulations, or as evidence that economic networks are denser and less costly to access within national communities.

[7] Moreover, what correlation there is falls by half when Newfoundland is removed.

Whatever the preferred mix of explanations, and whatever one's conclusion about the likely persistence of the border effects into the future, what is clear is that a national border functions in a very different way than does a provincial border. National borders continue to mark sharp divisions between markets for capital, as well as for goods and services. Provincial borders apparently do not.

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Appendix: Construction of the Data Base and Availability of Additional Computations

For each province, we obtained data from Statistics Canada's Provincial Economic Accounts for total and private sector gross fixed capital formation and inventory investment, gross domestic product, exports and imports, and total government savings, from 1961 through 1993. Savings was defined as investment plus exports minus imports. Private sector figures were obtained by subtracting government investment and savings. Both investment and savings were divided by gross domestic product and all regressions were done in rates rather than levels.

Government net transfers by province were computed as follows. Total tax revenue by province was calculated as total government revenue minus government investment income. Each province's contribution to total (national) tax revenues was calculated (denote by s_i). Transfers payments by province were calculated as total expenditures minus current spending on goods and services minus interest on the public debt. The sum of these figures across provinces is total national transfers. Each province's proportionate 'contribution' to this fund was estimated as s_i. The net transfers were then taken to be gross transfers minus total national transfers times s_i. The 'with transfers' case treats net transfer receipts as income and savings in the recipient provinces.

OECD data were obtained from the International Monetary Fund data base *International Financial Statistics*, available on magnetic tape through the University of British Columbia's Data Library. National savings was defined as national investment plus net exports. The time series of US domestic investment was missing from the IMF data base and so was obtained from the 1997 *Economic Report of the President* Table B.30.

All the regressions and data manipulations were done in Shazam (White 1978). An output file containing details of the data construction (including Cansim series numbers) and the complete regression results is available on the World Wide Web at: http://biff.econ.uoguelph.ca/~rmckit/si/borders.out.

Table One
Savings Retention Rates for Canadian Provinces, 1961-1993

Dependent Variable: National Investment

	Savings Measure:	Public and Private		
		Without Transfers	With Transfers	Private Only*
1961-1993	*b*	-0.069	-0.061	0.047
	t statistic	(0.82)	(1.21)	(0.34)
	R^2	0.08	0.16	0.01
1961-1971	*b*	-0.112	-0.092	0.058
	t statistic	(1.08)	(1.38)	(0.42)
	R^2	0.13	0.19	0.02
1983-1993	*b*	-0.011	-0.008	0.181
	t statistic	(0.15)	(0.23)	(1.39)
	R^2	0.00	0.01	0.19

*Private investment regressed on private savings. Absolute t-statistics in parentheses (8 degrees of freedom).

Table Two
Savings-Investment Correlations for OECD Countries and Canadian Provinces, 1961-1993

Dependent Variable: National Investment

Savings Measure:	Without Transfers				With Transfers			
	Ntl. Savings	(DPROV × Ntl. Savings)	Sum	R^2	Ntl. Savings	(DPROV × Savings	Sum	R^2
ONE-WAY FIXED EFFECTS MODEL (EQUATION 2)								
1961-1993	0.301	-0.262	0.039	0.47	0.301	-0.250	0.051	0.47
	(4.55)	(3.36)	(0.94)		(4.55)	(3.48)	(1.78)	
TWO-WAY FIXED EFFECTS MODEL (EQUATION 3)								
1961-1993	0.268	-0.229	0.039	0.47	0.268	-0.218	0.051	0.47
	(3.83)	(2.81)	(0.93)		(3.83)	(2.87)	(1.75)	
FELDSTEIN-HORIOKA MODEL (EQUATION 4)								
1961-1993	0.780	-0.850	-0.070	0.53	0.780	-0.842	-0.061	0.57
	(4.32)	(4.51)	(1.29)		(4.50)	(4.77)	(1.91)	
1961-1971	0.718	-0.830	-0.112	0.51	0.718	-0.818	-0.101	0.55
	(3.49)	(3.85)	(1.71)		(3.66)	(4.08)	(2.32)	
1983-1993	0.670	-0.691	-0.021	0.53	0.577	-0.587	-0.010	0.46
	(4.93)	(4.94)	(0.64)		(4.28)	(4.24)	(0.32)	

Absolute t-statistics in parentheses

Table A1
Savings Retention Rates for Canadian Provinces, 1961-1993
Newfoundland Omitted

Dependent Variable: National Investment

Savings Measure:		Public and Private		
		Without Transfers	With Transfers	Private Only*
1961-1993	*b*	-0.027	-0.026	0.014
	t statistic	(0.40)	(0.60)	(0.12)
	R^2	0.02	0.05	0.00
1961-1971	*b*	-0.068	-0.040	0.058
	t statistic	(0.94)	(0.79)	(0.60)
	R^2	0.11	0.08	0.05
1983-1993	*b*	0.047	0.018	0.108
	t statistic	(0.89)	(0.72)	(0.89)
	R^2	0.10	0.07	0.10

*Private investment regressed on private savings. [a]Absolute t-statistics in parentheses.

Table A2
Savings-Investment Correlations for OECD Countries, 1961-1993 and Canadian Provinces; Newfoundland Omitted

Dependent Variable: National Investment

Savings Measure:	Without Transfers				With Transfers			
	Ntl. Savings	(DPROV × Ntl. Savings)	Sum	R^2	Ntl. Savings	(DPROV × Savings	Sum	R^2
ONE-WAY FIXED EFFECTS MODEL (EQUATION 2)								
1961-1993	0.301	-0.278	0.023	0.43	0.301	-0.290	0.011	0.43
	(4.93)	(3.84)	(0.61)		(4.92)	(4.33)	(0.41)	
TWO-WAY FIXED EFFECTS MODEL (EQUATION 3)								
1961-1993	0.268	-0.245	0.023	0.43	0.268	-0.257	0.011	0.43
	(4.15)	(3.23)	(0.59)		(4.14)	(3.65)	(0.41)	
FELDSTEIN-HORIOKA MODEL (EQUATION 4)								
1961-1993	0.780	-0.807	-0.027	0.62	0.780	-0.806	-0.026	0.63
	(5.64)	(5.58)	(0.64)		(5.71)	(5.78)	(0.95)	
1961-1971	0.718	-0.786	-0.068	0.61	0.718	-0.776	-0.059	0.63
	(4.97)	(5.18)	(1.45)		(5.10)	(5.38)	(1.81)	
1983-1993	0.670	-0.646	-0.024	0.61	0.577	-0.567	-0.010	0.53
	(5.70)	(5.30)	(0.75)		(4.81)	(4.61)	(0.38)	

Absolute t-statistics in parentheses