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Dissertation

The Impact of Capital Account Openness on International Risk-Sharing

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Abstract

This dissertation studies the impact of capital account openness on the level of consumption and investment international risk-sharing. It does so by analyzing a panel consisting of 100 advanced and developing economies for the annual periods between 1995 and 2016. The econometric results indicate that economies with completely open capital accounts have approximately between 20% and 50% less dependence on domestic income growth to finance their consumption growth whilst their investment growth is up to one half less sensitive on domestic output growth. The findings for the degree of consumption risk-sharing at the mean level of capital controls are roughly comparable with those previously found in the literature, but the novelty of this exercise is to document the sensitivity of consumption risk-sharing to measures of capital controls across distinct country groups and using a more up-to-date sample. The approach for measuring investment risk-sharing is an addition to what has been done in usual studies of international risk-sharing assessments. To the extent that excessive sensitivity of consumption and investment to domestic income shocks detract from societal welfare, the empirical findings of this thesis highlight some of the overall benefits of capital account openness.

Keywords: international risk-sharing, long-run efficiency, capital mobility, capital account liberalization.

JEL codes: E02, F02, F21, F38.

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1. Introduction

Recent decades have witnessed a heated discussion on the potential benefits of capital account liberalization and its symmetrical criticisms, which highlight the eventual need for capital controls enforcement. While some arguments in favor of liberalization typically focus on the potential wider availability of resources for investment through capital inflows, or the possibility for individuals and firms to diversify risk through consumption and income smoothing, many macro-financial crises in both advanced and developing countries – including the European debt crises of 2009-2012 lend support to the suspicion that fully open capital accounts also come at the cost of greater macroeconomic and financial vulnerability.

The Great Recession of 2008-2009 has spurred renewed interest on the possible benefits of capital controls, with several countries across the entire spectrum of development considering its introduction, and some actually implementing them. Among developing countries, for instance, Brazil responded to the crisis by implementing controls on inflows in order to fight currency appreciation (Garcia & Chamon, 2013). Among developed countries, Iceland opted for introducing controls facing capital outflows when facing currency depreciation pressures in the wake of a banking crisis (Fernandéz, Klein, Rebucci, Schindler & Uribe, 2016) and so did Greece in 2015 in an effort to restrict capital outflows and build reserves to honor external debt commitments.

Studies on the various implications of capital account openness extend from its direct impact – on the cost of capital, market discipline and national savings – all the way to more indirect and proven hard to show impacts on output growth or income inequality. While the former examples of potential benefits have been the topic of some interesting literature (e.g. Chari & Henry (2004) and Harrison, Love & McMillan (2004) on the cost of capital; Garrett and Mitchel (2000) on market discipline improvements of public spending), the latter, especially in regard to liberalization's impact on economic growth

suffer from inconsistent evidence, with the most prominent literature on this field reaching either mixed results (Edwards, 2001) or no conclusion whatsoever (Rodrik, 1998).

This thesis focuses on a subset of all these possible effects, namely, on the effects of capital account openness on international risk-sharing through the channels of consumption and investment. Similarly to Kose, Prasad and Torrones (2009), we would expect greater levels of capital mobility to come as a major benefit for agents wishing to smooth consumption growth, insuring against country-wide shocks through international pooling of such risk and, in turn, enhancing efficiency. As Fernandéz et. al (2016) point out the same should apply to investment, as openness to financial flows, which allows agents to borrow and lend abroad, should also promote efficiency and spur growth altogether by allowing domestic investment to differ from domestic savings.

We intend to assess this by extending Kose, Prasad and Torrones's (2009) approach regarding consumption risk-sharing to investment flows, supporting this analysis on Fernandéz et. al (2016) new dataset of capital controls, which builds on previous measures and adds financial asset categories for a large sample of 100 countries and a timeframe of 22 periods. This dataset includes 31 Advanced Economies and 69 Emerging Markets & Developing Economies, and classifies them through Klein's (2012) labels of either Open, Gate or Wall, depending on the level of capital controls each country has in place each year, with Open economies being those with virtually no restrictions on capital flows, Wall economies with substantial controls on most or even all asset categories, and Gate economies being those which have only sporadically put in place significant controls.

This work shall be divided into four sections: the first of which focusing on a review of the most important literature developments on this topic; the second section extends and clarifies the aspects related to the methodology which is to be employed, along with the data we use for this analysis; in the third section we analyze the results which were reached with the methodology described in the second section, with this analysis then

dividing into two sub-parts: one regarding the baseline model and the second addressing due robustness tests. Finally, for the fourth section, we conclude by summarizing our findings and provide recommendations for future research.

2. International risk-sharing

2.1. On the concept of long-run efficiency

The theoretical underpinnings for understanding the concept of long-run efficiency are taken from Heathcote and Perri (2014). The authors note the importance of preferences, technologies and frictions specification for establishing a sound definition of efficiency which serves as a baseline scenario which one may compare with actual observed allocations in order to assess the level of observed (in)efficiency. When a typical literature set-up is used, one assumes a representative agent economy (where there are similar utility functions to depict consumer preferences). Building on this, Heathcote and Perri (2014) consider two alternative ways through which information on the consumption, investment and output growth rate (which should equate the productivity growth rate) are disclosed: one in which agents are perfectly informed about future productivity (named “perfect foresight”), and another in which agents assume productivity grows at the same rate as world (aggregate) productivity (i.e. they do not take into consideration eventual economy-idiosyncratic shocks), being informed at the end of each period about the actual realized productivity growth on the previous period (this hypothesis is named “repeated surprises”). Of course, frictions may exist, and to deal with that, traditionally three possible states of the world are introduced: financial autarky (no asset trade between countries), bond economy (where agents can borrow and lend from the world economy by trading an international one period bond), and complete markets (where people trade a full set of state-contingent claims at each date). For each of these three scenarios, there’s a different efficient allocation. When concerning international risk-sharing, the usual baseline term of comparison is a complete market economy, or, in other words, the absence of financial frictions. Assuming common preferences across countries, baseline efficient allocations may be determined.

Under complete markets and considering small countries relative to the world economy (Heathcote and Perri, 2014), both consumption and investment should grow at the each respective world (aggregate) growth rates, since all countries invest to equate their own marginal product of capital to the world interest rate, and financial trade allows the marginal utility of consumption growth rate to equate that of the world economy. Concerning investment long-run efficient allocations specifically, Lucas (1990) explains, through the example of two economies which face the same technology conditions (constant returns to scale) and freely trade a single good, that the Law of Diminishing Returns suggests that any initial difference in production between economies (given by differences in the level of capital per worker) should disappear because for the poorer country would face a higher marginal product of capital and, henceforth, attract capital flows coming from the richer country.

2.2. On the concept of international risk-sharing

Traditional theory on capital account liberalization suggests that, after the removal of capital controls, there should be a significant increase in international capital transactions, increasing the levels of risk-sharing associated with each country's idiosyncratic consumption (Kose, Prasad and Torrones, 2009). As Mace (1991) asserts, the chief implication of risk-sharing is that individual consumption varies not based on idiosyncratic factors such as individual income, but is rather influenced (positively) by aggregate consumption.

Theoretical welfare gains from international risk-sharing have been widely presented and celebrated in literature, based on the premise that allowing for consumption smoothing between nations may help reduce a country's dependence of its national income variations, insuring against eventual slumps in output growth or temporary increases in domestic investment (Brennan and Solnik, 1989). A similar logic has been presented

regarding the gains retrieved from international risk-sharing for investment flows – should complete markets be in place, countries expecting to grow faster would benefit from using international financial markets to fund higher investment rates (Heathcote and Perri, 2014). Skepticism on these results has been fed by some evidence that gains from international risk-sharing, despite real, may be small (Cole and Obstfeld, 1991) and too easily offset by increased volatility which enlarges country-specific risk (Tobin, 1978).

The argument in favor of international consumption risk-sharing follows from the Permanent Income Hypothesis (PIH), the theory which suggests an absence of correlation between the transitory component of income and consumption, so that consumers decide to smooth their consumption based on their expectations for their "permanent income", or the invariant component of an individual's income. As stated by Mace (1991), risk sharing would imply that individual consumption responded only to aggregate risk, and not to individual-specific risk, making it an "extreme version" of the PIH.

2.3. Review of the empirical literature

Empirical studies on the matter of international risk-sharing have been incomparably more abundant for consumption than for investment risk-sharing. Thus, for a brief review, the scarce investment-related literature is presented first, followed by a more complete overview of the works on consumption risk-sharing.

An important contribution to the understanding of international allocation of capital was obtained from Caselli and Fryer (2007), where the authors calculate the marginal product of capital for a wide panel of developed and developing countries between the period 1960-2003 and conclude that there must be an efficient allocation of capital, given the negligible differences in the marginal product of capital across countries.

On a particularly circumscribed approach to the evolution of private investment for the post-2008 crisis, the IMF (2015) looks for different explanatory factors, one of which being the potential influence of financial constraints and policy uncertainty. Considering a sample of over 27 thousand firms from 32 advanced economies, they find that the reduced credit availability played a role in the private investment slump, with most credit-dependent firms being the most affected. We would hope to extend this analysis and find that the existence of capital controls, as a direct constraint on credit availability, produces a similarly significant negative effect on national investment growth.

Heathcote and Perri (2014) take on data comprised of 112 countries for the period of 1960 to 2010, during which there's an evolution from what financial autarky was a reasonable approximation, in the first half of this period, towards a world economy with increasing openness, during its second half. Allocations are seen as not efficient for any of the two halves of the period regardless of the openness setting: results suggest that, while faster-growing economies were expected to use international financial markets to increase their own consumption and investment based on future expected higher income, they were exporting savings and accumulating positive net foreign asset positions over time. For their assessment on the impact of capital account openness on risk-sharing, they find that countries which were more open seemed to enjoy less risk-sharing.

In a seminal paper focusing on the first strand of risk-sharing – Cole and Obstfeld (1991) – attempts to shed light on the welfare gains derived from international capital mobility by analyzing different allocations of consumption across countries, accounting for different states of the world, taking as given the distribution of output and ends up concluding there's but a small loss from prohibiting international diversification. Brennan and Solnik (1989) follow a similar approach and compare real per capita consumption allocation across countries with that which would have prevailed if capital mobility had been prohibited, confirming the hypothesis that international financial flows may serve to

smooth national consumption. Both studies attempt to quantify the welfare loss (gain) which would arise from fully restricting (enhancing) capital mobility and, while the former state that this welfare loss wouldn't be expected to exceed 0.15 percent of average national output per year, the latter determine a loss of 4-8 percent loss in the level of consumption of the period they consider. Cole and Obstfeld (1991) depict as a fragility of their study the fact that they did not extend their approach to international investment flows, while Brennan and Solnik (1989) recognize that their assumption of invariant domestic investment regarding the capital flow regime was "clearly a simplifying one", noting the importance of the existence of international capital flows for investors to direct their wealth towards less risky production processes. As a direct reply, Obstfeld (1992) criticizes Brennan and Solnik's (1989) work warning that the results the authors reach are faulty, especially in the measure employed of welfare loss. According to Obstfeld (1992), regarding this measurement, it mustn't make much sense to assume that the full burden of capital account restrictions would fall on consumption alone, leaving investment constant. In this review, the author warns it would have been better to compute compensating or equivalent variations to compute the welfare loss from prohibiting financial trade, concluding, through the same methodology settings as Brennan and Solnik (1989) that total loss would amount, instead, to no more than 0,2% of output, accusing the former of overestimation of the welfare loss from enforcing capital restrictions.

More recent work such as that developed by Kose, Prasad and Torrones (2009), builds on this equation to assess risk-sharing. In their work, they perform cross-section, time series and panel regressions on a sample which features 69 countries facing different stages of development (21 of which are advanced economies, while the remaining 48 developing economies are subdivided into 21 emerging market economies and 27 other developing economies), over the time period spanning from 1960 to 2004. Their findings are coherent across all estimation methods employed and suggest that risk-sharing of

idiosyncratic consumption risk is higher for advanced economies than for developing ones. They find that advanced economies share between 30% and 50% of their consumption risk internationally, while developing economies share only 10% to 30% of that same risk. Once they try to assess the impact that financial integration and liberalization pose on risk-sharing, they find limited evidence that it has helped to increase consumption risk-sharing for advanced economies and no evidence suggesting it had done so for developing economies.

Gardberg (2019) follows an identical baseline approach to Kose, Prasad and Torrones (2009), regressing the same equation for an unbalanced panel of 120 countries (30 of which advanced economies and the remaining 90 developing economies) over the period 1970-2014. In order to reconsider the conclusion obtained by Kose, Prasad and Torrones (2009) regarding the (modest to null) impact of capital account liberalization on consumption risk-sharing, Gardberg (2019) adds several measures of financial liberalization and integration, such as an index of financial reform, the Chinn & Ito (2006) index for financial liberalization, and the total foreign liabilities to GDP ratio as a measure of *de facto* financial integration measure. For the baseline model, he reaches degrees of risk-sharing compatible with those found on previous works (around 33% for the full sample, and between 25% and 71% when subdividing for different income groups of countries, with varying results depending on the estimation method employed). However, Gardberg's (2019) results contrast with Kose, Prasad and Torrones (2009) as he finds the significant impact of the financial sector policies extend to less developed countries, while it had been previously suggested that these liberalization policies should only reach a significant effect on risk-sharing once countries reached a certain level of institutional development (Kose, Prasad and Torrones, 2009).

The apparent lack of international risk-sharing has motivated some interesting contributions as well. Lewis (1996) addresses this issue by testing for two possible explanations: the existence of non-separable utility of tradeables with leisure, non-traded

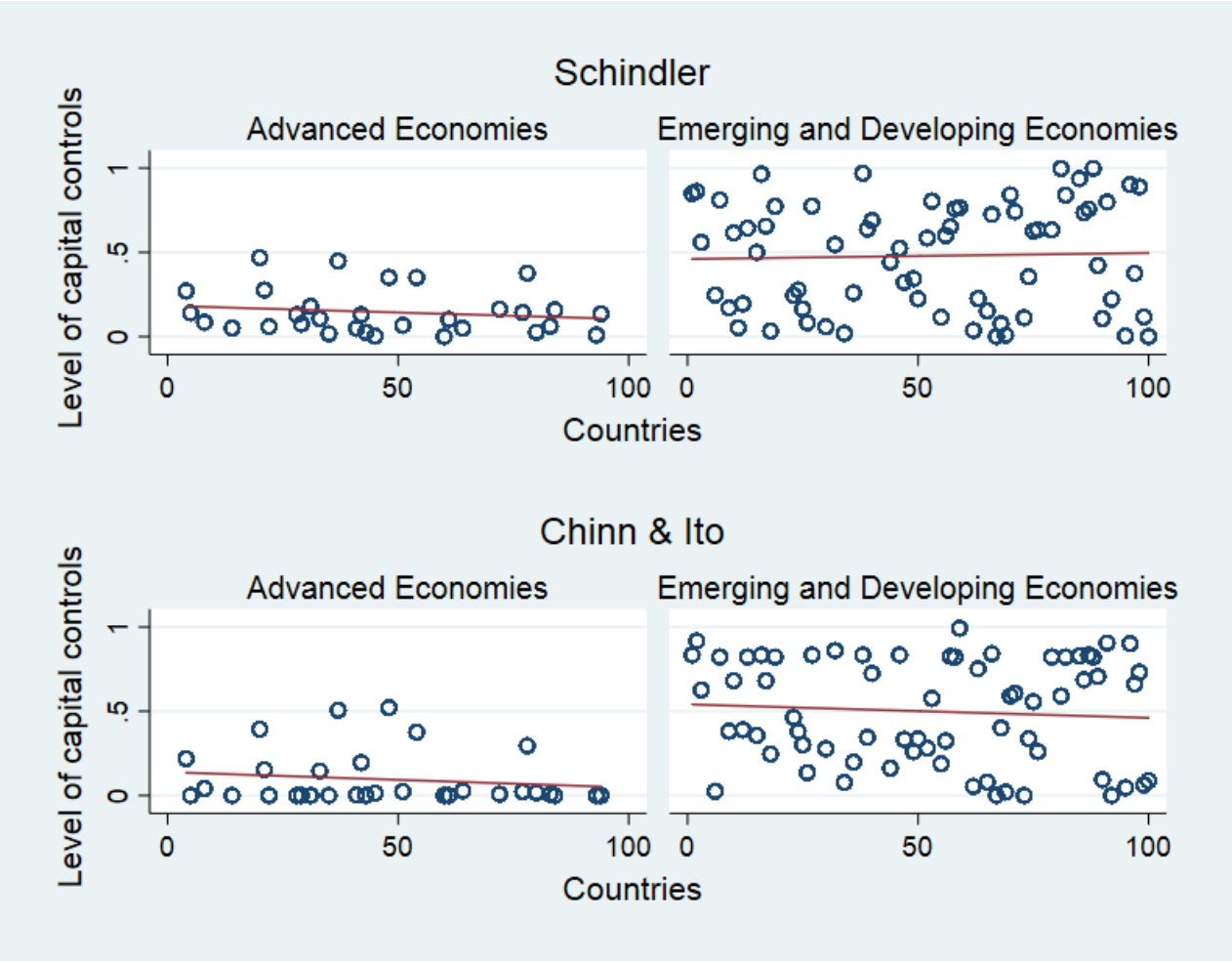
goods and durable goods; the existence of capital market restrictions which limit or prohibit the ownership of foreign assets. In order to test the first possible explanation, the author uses two panel data sets, one with aggregate and the other with disaggregate consumption into groups of tradeable and non-tradeable, durable and non-durable goods, the first of which for 72 countries between 1950 and 1992, and the second one covering 48 countries measured in 5-year intervals between 1970 and 1985. To test the second hypothesis, Lewis (1996) asks whether countries with capital restrictions displayed a greater covariation between consumption growth and domestic output. While neither of the hypothesis explained the lack of international risk-sharing by itself, when the two were jointly considered – the existence of non-separable preferences as well as capital market restrictions – the hypothesis of risk-sharing was not rejected. Finally, Kraay (1998) has also weighed in on this issue: by first reasserting empirically how small or unidentifiable the gains from financial openness are to macroeconomic outcomes such as output, investment growth or lower inflation, the author sets off to evaluate whether two of the most common hypothetical explanations for this result may hold. The first of these hypotheses is that uncertainty brought about by increased volatility in capital flows might offset benefits from capital account liberalization, and the second one is that capital account liberalization requires a supportive policy and institutional framework in order to provide macroeconomic benefits. The author found little evidence to support either one of these hypotheses, allowing to redirect the discussion to issues directly related to capital account openness itself – namely, whether current measures of openness are sufficiently accurate and whether capital account liberalization simply does not provide significant macroeconomic benefits.

3. Methodology and data

3.1. Data

The analysis introduced above is applied to the whole sample of Fernandéz, et. al (2016). This consists of a total of 100 countries, 31 of which are classified according to the IMF World Economic Outlook (2016) as Advanced Economies and 69 of which are considered Emerging Markets & Developing Economies.

Figure 1: Level of capital controls in country averages (1995-2016)



The sample covers the groups displayed in Table 3.1 for 21 periods, from 1995 to 2016. All data for consumption, investment, output, population and the relative price of investment is taken from Penn World Tables 9.1 under the national accounts-based variables. Real consumption and output are directly taken as the variables in constant national 2011 prices, while real investment is deduced from the difference between real domestic absorption (defined in Feenstra, Inklaar and Timmer (2015) as the sum of domestic consumption and domestic investment) and real consumption. All three are turned into per capita variables and the annual values for the relative price of investment variable is calculated according to IMF (2019) and Karabarbounis and Neiman (2013) from the same Penn World Tables dataset.

The data for the measures of capital controls is taken from Fernandéz, et. al (2016), yet to serve as comparison and robustness checks a complementary measure is also introduced: the well-known Chinn & Ito (2006) measure of capital openness, which measures a country's level of capital account openness on a scale from 0 to 1, where 1 depicts an economy with a completely open capital account, i.e. it is symmetric to the measure from Fernandéz, et. al (2016). To deal with this and allow for easier comparison, we transform the Chinn & Ito index to become a measure of capital controls, where a value of 1 depicts an economy with high capital controls. In order to simplify, when these indices are mentioned, the Fernandéz, et. al (2016) shall be named as Schindler index, and the Chinn & Ito (2006) index will be named Chinn & Ito index. An overview of the level of capital controls in country averages as measured by both indices can be found in Figure 1, labelled as either Open, Gate or Wall economies, under the Klein (2012) nomenclature mentioned in the Introduction section .

The main difference between these two indices is that Chinn & Ito takes into account current account transactions, while Schindler doesn't. Regarding the dataset coverage, the Chinn & Ito index covers the whole sample of countries for the chosen time period, with the exception of Brunei (for the entire dataset period), Czech Republic, Georgia,

Kazakhstan, Latvia, Moldova, Russia, Slovenia, Switzerland, Ukraine and Uzbekistan (on 1995), Kirgizstan (on 1995 and 1996), and Yemen (on 2011).

Table 3.1 – Country classifications according to World Economic Outlook 2016

Advanced Economies (31)		Emerging Markets (50)				Developing Economies (19)	
Australia	Gate	Algeria	Wall	Panama	Open	Bangladesh	Gate
Austria	Open	Angola	Wall	Paraguay	Open	Bolivia	Gate
Belgium	Open	Argentina	Gate	Peru	Open	Burkina Faso	Gate
Canada	Open	Bahrain	Gate	Philippines	Wall	Côte D'Ivoire	Wall
Cyprus	Gate	Brazil	Gate	Poland	Gate	Ethiopia	Gate
Czech Republic	Gate	Brunei	Open	Qatar	Open	Ghana	Gate
Denmark	Open	Bulgaria	Gate	Romania	Gate	Kenya	Gate
Finland	Open	Chile	Gate	Russia	Gate	Kirgizstan	Gate
France	Open	China	Wall	Saudi Arabia	Gate	Moldova	Gate
Germany	Gate	Colombia	Gate	South Africa	Gate	Myanmar	Gate
Greece	Open	Costa Rica	Open	Sri Lanka	Wall	Nicaragua	Open
Hong Kong	Open	Dominican Republic	Gate	Swaziland	Wall	Nigeria	Gate
Iceland	Gate	Ecuador	Gate	Thailand	Gate	Tanzania	Wall
Ireland	Open	Egypt	Open	Tunisia	Wall	Togo	Wall
Israel	Gate	El Salvador	Open	Turkey	Gate	Uganda	Gate
Italy	Open	Georgia	Open	Ukraine	Wall	Uzbekistan	Wall
Japan	Open	Guatemala	Open	United Arab Emirates	Gate	Vietnam	Gate
Korea	Gate	Hungary	Gate	Uruguay	Open	Yemen	Open
Latvia	Open	India	Wall	Venezuela	Gate	Zambia	Open
Malta	Gate	Indonesia	Gate				
Netherlands	Open	Iran	Gate				
New Zealand	Open	Jamaica	Gate				
Norway	Open	Kazakhstan	Gate				
Portugal	Gate	Kuwait	Gate				
Singapore	Open	Lebanon	Gate				
Slovenia	Gate	Malaysia	Wall				
Spain	Open	Mauritius	Open				
Sweden	Open	Mexico	Gate				
Switzerland	Gate	Morocco	Wall				
United Kingdom	Open	Oman	Open				
United States	Open	Pakistan	Wall				
Open (36) / Gate (48) / Wall (16)							
20 / 11 / 0		13 / 25 / 12				3 / 12 / 4	

3.2. Baseline Models

Important developments in risk-sharing assessment were obtained through Obstfeld (1994) and Lewis (1996). Both observe that, should international risk-sharing be complete, then consumption growth in a given country should be uncorrelated with the country-specific shocks it faces. Lewis (1996) suggested the use of the difference between lagged national output and lagged world (aggregate) output as a measure for these country-specific shocks, which should hold a coefficient of zero should there be perfect risk-sharing. Obstfeld (1994) suggested first-differencing national and world consumption levels, due to concerns about stochastic trends. Taking both contributions together would result in the currently widely employed (see Kose, Prasad and Torrones, 2009; Baxter, 2012; Gardberg, 2019) regression form of the difference between national and world (aggregate) consumption growth rates on the difference between national and world (aggregate) output growth rates:

$$\Delta \ln C_{it} - \Delta \ln C_t^* = \beta_i + \beta_t(\Delta \ln Y_{it} - \Delta \ln Y_t^*) + \varepsilon_{it} \quad (1)$$

In the above equation where *i* denotes the *i*th country and *t* denotes the *t*th year, $\Delta \ln c_{it}$ is the change in (log) real per capita domestic consumption, and $\Delta \ln Y_{it}$ the change in (log) real per capita domestic output; $\Delta \ln C_t^*$ is the change in (log) real per capita world consumption, and $\Delta \ln Y_t^*$ the change in (log) real per capita world output; θ is a linear time trend variable. The fixed effect β_i allows domestic consumption growth to diverge from world consumption growth. The residual term ε_{it} captures non-systematic influences on consumption risk sharing, some of which could in principle be correlated across time.

Once we take equation (1) and add an interaction term to assess how the level of capital controls influences the level of international risk-sharing, we get

$$\Delta \ln C_{it} - \Delta \ln C_t^* = \beta_i + \beta_t(\Delta \ln Y_{it} - \Delta \ln Y_t^*) + \delta_t Kcon_{it} * (\Delta \ln Y_{it} - \Delta \ln Y_t^*) + \varepsilon_{it} \quad (2)$$

where $Kcon$ is the chosen index of capital controls, which varies from 0 (in the absence of capital controls) to 1 (when the capital account is fully closed). Following the standard consumption risk-sharing literature, the level of IRS is obtained through 1–β_t from (1). By adding an interaction variable as in (2), the same procedure (1–β_t) provides the value for the level of IRS of fully open economies (for which $Kcon$ has a value of 0).

Following this same logic, but lacking a similarly accessible interpretation of β_t to allow us to use equation (1) to assess investment risk-sharing, we bear in mind the aforementioned principles of risk-sharing, which basically imply that the higher the level of risk-sharing, the lower the dependence upon idiosyncratic shocks. Similarly to the analysis in IMF (2015) to assess the impact of output on private investment growth, we check the impact of the level of openness on investment growth through an adaptation of the traditional accelerator investment model:

$$\Delta \ln I_{it} = \beta_i + \beta_t \Delta \ln Y_{it} + \delta_t Kcon_{it} * \Delta \ln Y_{it} + \gamma \Delta \ln RPI_{it} + \varepsilon_{it} \quad (3)$$

In the above equation where *i* denotes the *i*th country and *t* denotes the *t*th year, $\Delta \ln I_{it}$ is the change in (log) real per capita domestic investment, and $\Delta \ln Y_{it}$ the change in (log) real per capita domestic output; $Kcon$ is the chosen index of capital controls, which varies from 0 (in the absence of capital controls) to 1 (when the capital account is fully closed); $\Delta \ln RPI_{it}$ is the change in (log) price of investment goods relative to consumption. As in the consumption equation, the residual term ε_{it} captures non-systematic influences on consumption risk sharing, some of which could in principle be correlated across time.

Preliminary considerations are made for each model, namely by performing the Wooldridge test for autocorrelation (which finds no first order autocorrelation), and two unit root tests (which reject the presence of a unit root in every panel), while the errors in the model are also clustered on country in order to take into consideration unobserved correlation and heteroskedasticity. The results for these preliminary tests can be found in Appendix B.

4. Empirical Analysis

4.1. Baseline Model

4.1.1. Consumption risk-sharing

Table 4.1 – Consumption risk-sharing results for selected estimations

	Pooled OLS		*Fixed Effects*		*Fixed Country and Time Effects*	
	CI	SCH	CI	SCH	CI	SCH
Full Sample						
Δlog(Y)-Δlog(Y)*	.6011***	.6328***	.5534***	.5988***	.5630***	.6030***
	(.0663)	(.0768)	(.0664)	(.0802)	(.0674)	(.0806)
Kcon	.0072***	.0058**	-.0001	-.0055	.0041	-.0025
	(.0020)	(.0022)	(.0038)	(.0068)	(.0041)	(.0069)
Kcon(Δlog(Y)-Δlog(Y*))*	.2590**	.1923	.3204**	.2181	.2949**	.2050
	(.1181)	(.1515)	(.1407)	(.1862)	(.1400)	(.1861)
R^2	0.2796	0.2738	0.2181	0.2128	0.2336	0.2297
Advanced Economies						
Δlog(Y)-Δlog(Y)*	.5774***	.5697***	.5690***	.5661***	.5808***	.5822***
	(.0982)	(.1073)	(.0980)	(.1057)	(.1207)	(.1263)
Kcon	.0023	.0050	.0025	.0062	.0033	.0065
	(.0048)	(.0049)	(.0074)	(.0063)	(.0080)	(.0064)
Kcon(Δlog(Y)-Δlog(Y*))*	.5024***	.3839*	.5338***	.3921*	.5349***	.3921*
	(.1775)	(.1953)	(.1882)	(.1989)	(.1793)	(.1945)
R^2	0.5762	0.5683	0.5532	0.5434	0.5800	0.5703
Emerging Markets & Developing Economies						
Δlog(Y)-Δlog(Y)*	.6010***	.6424***	.5340***	.6008***	.5205***	.5736***
	(.0862)	(.0981)	(.0841)	(.1035)	(.0856)	(.1013)
Kcon	.0061**	.0037	-.0026	-.0133	.0031	-.0090
	(.0028)	(.0030)	(.0033)	(.0094)	(.0038)	(.0094)
Kcon(Δlog(Y)-Δlog(Y*))*	.2484*	.1729	.3301**	.202296	.3186**	.2206
	(.1391)	(.1775)	(.1603)	(.2152)	(.1580)	(.2132)
R^2	0.2523	0.2474	0.1944	0.1899	0.2183	0.2155

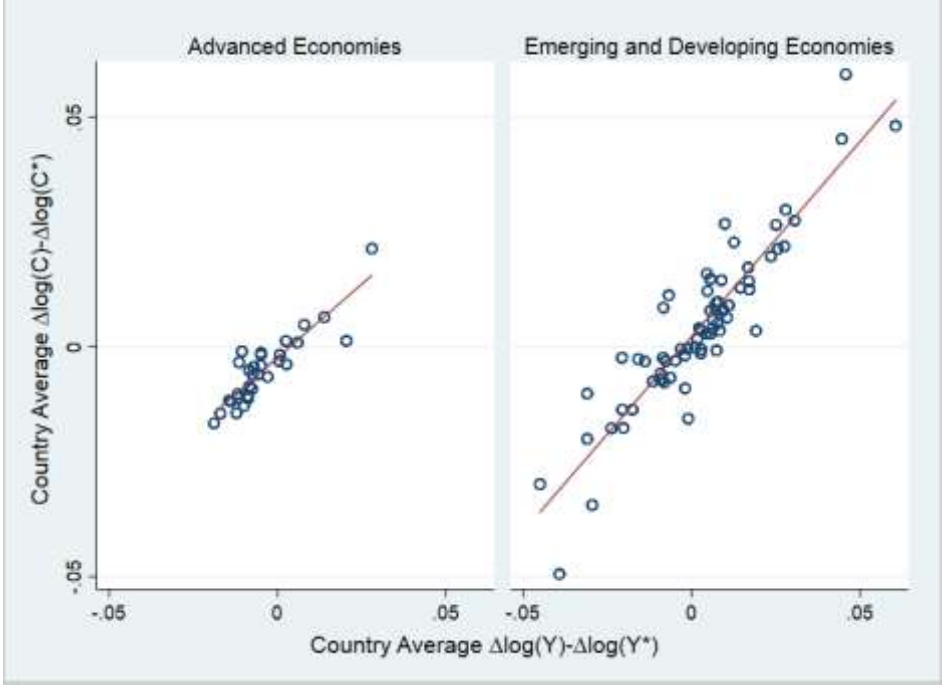
Note: ***p < 0.01; **p < 0.05; *p < 0.1. A complete description of the variables can be found in Appendix A. The dependent variable is Δlog(C)-Δlog(C*). A linear time trend was added to the regression but not reported. The level of IRS for fully open economies is given by performing 1–β_t (the coefficient of Δlog(Y)-Δlog(Y*)).The reported R^2 for Fixed Effects refers to the *Within* estimator.

For the baseline model of consumption risk-sharing, following the methodology employed in Kose, Prasad and Terrones (2009) to assess the level of international risk-sharing (IRS), overall IRS values are found within the larger end of the intervals estimated in the literature. Throughout all estimation methods and development stages, for an economy with full capital account openness, the estimated level of IRS ranges between 0.48 and 0.36. Fixed Effects (FE) estimations generally suggest higher levels of IRS than the Pooled OLS (POLS) and Fixed Country and Time Effects (FCTE) ones – the exception being the Developing Economies group, for which FCTE estimates higher IRS levels than FE. The Chinn & Ito index outperforms the Schindler index when it comes to significance across estimation procedures. The estimations performed with the Schindler index provide no significant evidence in support of a negative impact of capital controls on IRS on three grounds: the results for the full sample under FE and FCTE (the results for the full sample under POLS suggest a negative impact from the capital controls variable, although the results for the interaction variable are not significant) and for developing economies under all estimation methods. The capital controls variable alone is generally insignificant, especially under FE and FCTE.

Focusing on the Chinn & Ito index and the FCTE estimator, for the entire sample of 100 countries, we find an IRS level varying between 0.44 for the completely open economies and just over 0.14, under that same estimation method, for those economies which have completely closed capital accounts. Among advanced economies, these values for IRS range from around 0.42 for the most open under FCTE, to virtually no IRS for the least open economies within this group (we must still bear in mind the fact that for the group of high income economies there are no countries classified as *Wall*). For the group of developing economies, under FCTE, the values of IRS vary between almost 0.48, for those which are completely open, and less than 0.16 for those with a completely closed capital account.

With regard to the Schindler index, taking only the significant results on the full sample level, the highest estimated IRS level is of 0.4 (under both FE and FCTE). For advanced economies alone, an IRS level of 0.42 is found for the most open economies, under FCTE, and of 0.05 for those which enforce the most capital controls. Finally, among fully open developing economies, the average risk-sharing coefficient across specifications is 0.43, under FCTE.

Figure 2: Relationship between Δlog(Y)-Δlog(Y*) and Δlog(C)-Δlog(C*)



For both indices, the level of IRS is very close between open economies, regardless of their income group. Although it is traditionally suggested that there could be institutional quality impediments for developing countries to experience the same IRS as advanced economies, these results suggest no significant impediments to IRS brought about by the development stage a country finds itself in.

These results compare to Kose, Prasad and Torrones (2009) and Gardberg (2019) as they fit the IRS intervals previously found by in the aforementioned literature, while a

significant impact of capital controls on consumption risk-sharing is also suggested, especially when the Chinn & Ito index is used. This is a clearer result than the one reached by Kose, Prasad and Torrones (2009), which are unable to find a significant impact of capital account openness across all income levels given any of the measures which were applied.

Although the apparent differences in explained variation are not large across estimation methods, the adequateness of the FCTE estimator is assessed by performing a test of joint significance for all years and individual countries, which indicates the inclusion of Time Effects is desired to estimate this regression.

4.1.2. Investment risk-sharing

Taking into account the absence of an equally intuitive measure for IRS, when it comes to assessing the impact of capital account openness on investment risk-sharing, we must analyze the results in a comparative manner. As noted in the previous section, we should expect countries with higher levels of capital mobility to depend less upon idiosyncratic shocks – investment should, on average, move in tandem with the world interest rate and the price of capital relative to that of consumption. In this case, we would expect that the higher the level of capital account openness, the smaller the coefficient of the capital controls interaction variable (thus depicting that when controls are in place, domestic output growth is more impactful on investment growth). We would also expect investment to grow faster in countries with less capital controls, all else remaining constant.

Through the entire scope of results, the coefficients of both the output growth variable and the interaction variable are of the expected positive sign, with the former falling into the usual values for the coefficient of output growth in investment-accelerator models (IMF, 2015), and the latter being mostly according to predictions. As was also expected, higher capital controls tend to reduce investment growth.

Regardless of the scope of the estimation, FE estimations always suggest greater dependence of domestic investment from domestic output than the Pooled OLS and FCTE ones, whether it be through the output variables or through the interaction variables. Neither one of the two indices employed produces substantially more significant results than the other. The estimations systematically show support for the existence of a negative impact of capital controls on investment IRS through the interaction variable. The capital controls variable alone is always significant (and negative) under Pooled OLS and insignificant under FE and FCTE for the full sample and the group of developing economies, given any of the two measures of capital controls.

Using the Chinn & Ito index and under FCTE, for the entire sample of 100 countries, for a 1 percent change in domestic output, there is a percentage change in domestic investment of between 1.68%, for those economies which are completely open, and of 3.64% for those which have completely closed capital accounts. Among advanced economies, these values range from around 2.3% for the most open, to around 4.3% for the least open economies within this group, under FCTE (still keeping in mind there are no countries within this group which have a completely closed capital account). For the group of developing economies, the same values vary between just over 1.29%, for those which are completely open, and around 3.66% for those with a completely closed capital account, under FCTE.

With regard to the Schindler index, the estimated coefficient for domestic output for completely open economies obtained under FCTE suggests that a 1% change in domestic output produces a 1.85% change in domestic investment, and of 3.69% for economies with completely closed capital accounts. For the group of advanced economies, the same change is found to be between 2.15%, for completely open economies, and of 4.41% for those which enforce the most capital controls (both under FCTE). Finally, among developing economies, we find a 1% change in domestic output

generates a 1.66% change in domestic investment for completely open economies and of 3.66% for completely closed economies under FCTE.

For both indices, results show a slightly smaller impact of domestic output growth on domestic investment for developing economies than for advanced economies. This contradicts initial suspicions that advanced economies should be less dependent upon their own domestic output gains for investment growth. Even considering differences are not large, we may, at best, consider there are seemingly no differences in the impact of domestic output performance on domestic investment across development stages.

Considering there is no direct comparison available in the literature – at least not of the sort that exists for consumption risk-sharing – we opt to highlight that the results reassert those in IMF (2015), given the finding of a negative impact of capital controls on domestic investment growth, and may indicate a correspondence to the contribution of Caselli and Fryer (2007), given the small differences found for the impact of domestic output growth on domestic investment growth, between economies with similar levels of capital account openness.

Once again, the adequateness of the FCTE estimator is assessed by performing a test of joint significance for all years and individual countries, which indicates the inclusion of Time Effects is desired to estimate this regression.

Table 4.2 – Investment risk-sharing for FE and POLS

	Pooled OLS		*Fixed Effects*		*Fixed Country and Time Effects*	
	CI	SCH	CI	SCH	CI	SCH
Full Sample						
Δlog(Y)	2.0500***	2.1030***	2.1263***	2.2138***	1.6771***	1.8491***
	(.2669)	(.3003)	(.3252)	(.3506)	(.3347)	(.3559)
Kcon	-.0448***	-.0485**	-.0324	-.0126	-.0271	-.0025
	(.0145)	(.0188)	(.0263)	(.0354)	(.0246)	(.0314)
*Kcon*Δlog(Y)*	1.3492***	1.3197**	1.6487***	1.6606**	1.9633***	1.8429***
	(.4922)	(.6219)	(.5970)	(.7142)	(.5800)	(.6933)
Δlog(rpi)	-.1132	-.1208	-.1215	-.1307	-.1490	-.1581
	(.0867)	(.0937)	(.0907)	(.0977)	(.1028)	(.1121)
R^2	0.1820	0.1782	0.1739	0.1726	0.2013	0.1967
Advanced Economies						
Δlog(Y)	2.3869***	2.2229***	2.4778***	2.3067***	2.3073***	2.1497***
	(.1798)	(.1967)	(.1976)	(.2175)	(.2634)	(.2790)
Kcon	-.0796***	-.0799***	-.0727***	-.0798***	-.0871***	-.0909***
	(.0120)	(.0148)	(.0213)	(.0211)	(.0184)	(.0200)
*Kcon*Δlog(Y)*	1.6500**	2.0177***	1.8239**	2.2320***	2.0686***	2.4061***
	(.7479)	(.6860)	(.7803)	(.6515)	(.7180)	(.6367)
Δlog(rpi)	.0772**	.0880**	.0747**	.0860**	.0818	.1104*
	(.0310)	(.0328)	(.0317)	(.0347)	(.0523)	(.0587)
R^2	0.5743	0.5742	0.5774	0.5797	0.6008	0.6015
Emerging Markets & Developing Economies						
Δlog(Y)	1.7395***	1.9203***	1.7833***	2.0657***	1.2920***	1.6635***
	(.3782)	(.4476)	(.4995)	(.5427)	(.4722)	(.5202)
Kcon	-.0581***	-.0612**	-.0252	.0242	-.0108	.0441
	(.0183)	(.0258)	(.0337)	(.04778)	(.0304)	(.0407)
*Kcon*Δlog(Y)*	1.7368***	1.5533*	2.1006***	1.8631*	2.3720***	1.9991**
	(.6163)	(.7980)	(.7928)	(.9438)	(.7275)	(.8773)
Δlog(rpi)	-.1316	-.1381	-.1402	-.1511	-.1735	-.1843
	(.1028)	(.1113)	(.1081)	(.1160)	(.1203)	(.1305)
R^2	0.1566	0.1527	0.1497	0.1489	0.1852	0.1806

Note: ***p < 0.01; **p < 0.05; *p < 0.1. A description of each variable can be found in Appendix A. The dependent variable is Δlog(I). A linear time trend was added to the regression but not reported. The reported R^2 for Fixed Effects refers to the *Within* estimator.

4.2. Robustness Tests

4.2.1. Comparison of capital controls measures

There is a notorious discrepancy between the two measures of capital controls employed, both on the values they attribute to individual countries and on the values which result from estimations. In order to verify the possibility that outliers are interfering with the overall results, we remove countries for which the difference between the two measures of controls is too high – we arbitrarily set as "too high" a difference of 0.4 or more. As a result, 15 countries are removed from the initial sample of 100 countries, for which we provide a brief description which can be found in Appendix B. The three previously employed estimation methods are narrowed down to only two by removing FE, given the similarity of results between FE and FTCE, together with the fact that the test shown in Appendix B suggests the incorporation of time effects in our estimations.

The results for the consumption risk-sharing estimations with the modified indices are presented in Table B.6 in Appendix B. Coefficient values for both estimators become more close for all variables, but no substantial change in IRS levels arises. The noteworthy changes are: for both measures, no variable related to the capital account openness measure (whether on its own or through the interaction variable) is found significant, under FCTE; from the regression with the Schindler index, a higher risk-sharing level for the most open developing economies is suggested (0.47, under FCTE).

A similar case can be found for investment risk-sharing, for which, regarding the estimations based on the Chinn & Ito index, no significant changes occur comparing to previous results. With the Schindler index, once again, the biggest difference is within the group of developing economies, for which a 1% percent change in domestic output now leads to a 1.26% change in domestic investment for the most open countries of the group and a 3.87% change for the completely closed economies (under FE). These

results can be found in Table B.8 in Appendix B, with the updated results for estimations excluding the aforementioned outliers.

4.2.2. Sensitivity to country groupings

In order to assess how sensitive our results are to the currently employed classification of countries as either Advanced Economies or Emerging Markets & Developing Economies, we estimate the results for these groups of countries for the current 2016 classification (which can be found in Table 3.1 in section 3) and for the 1995 IMF World Economic Outlook classification shown in Table 4.3.

Table 4.3 – 1995 World Economic Outlook classification of countries

Advanced Economies (26)	Countries in Transition (14)	Developing Economies (60)	
Australia	Bulgaria	Algeria	Malta
Austria	Czech Republic	Angola	Mauritius
Belgium	Georgia	Argentina	Mexico
Canada	Hungary	Bahrain	Morocco
Denmark	Kazakhstan	Bangladesh	Myanmar
Finland	Kirgizstan	Bolivia	Nicaragua
France	Latvia	Brazil	Nigeria
Germany	Moldova	Brunei	Oman
Greece	Poland	Burkina Faso	Pakistan
Hong Kong	Romania	Chile	Panama
Iceland	Russia	China	Paraguay
Ireland	Slovenia	Colombia	Peru
Israel	Ukraine	Costa Rica	Philippines
Italy	Uzbekistan	Côte D'Ivoire	Qatar
Japan		Cyprus	Saudi Arabia
Korea		Dominican Republic	South Africa
Netherlands		Ecuador	Sri Lanka
New Zealand		Egypt	Swaziland
Norway		El Salvador	Tanzania
Portugal		Ethiopia	Thailand
Singapore		Ghana	Togo
Spain		Guatemala	Tunisia
Sweden		India	Turkey
Switzerland		Iran	Uganda
United Kingdom		Indonesia	United Arab Emirates
United States		Jamaica	Uruguay
		Kenya	Venezuela
		Kuwait	Vietnam
		Lebanon	Yemen
		Malaysia	Zambia

The first notes should regard the drastic difference in the country classification system used by the IMF: even though between 1995 and 2016 only a handful of countries have been promoted to "advanced economy" status, there is a serious methodological difference between those years when it comes to separating emerging markets and developing countries. Indeed, in 1995 the IMF suggested a three-way split of the world, forming the groups Advanced Economies, Developing Economies and Economies in Transition. The latter included all the economies which were in transition from state-controlled economies to market economies following the decline of the USSR in 1991. That group is added to the group of Emerging Markets & Developing Economies, for comparison purposes, when the 1995 country classification is used. From April 2004 onwards, that classification system was substituted by a two-way split into the groups of Advanced Economies and Emerging Markets & Developing Economies, with no defined criterion available to differentiate between an emerging market and a developing economy. That is why only the economies marked in the IMF October 2016 WEO as Low-Income Developing Countries are considered to be developing economies. Any country not classified as either Advanced or Developing is classified as an Emerging Market in the 2016 system. Taking all of this into account, we should keep in mind the fragility of such classification systems, and thus opt to stick to the broad grouping method employed in previous sections. Just as in the previous robustness check, the three previously employed estimation methods are narrowed down to only two (we remove FE) given the similarity of results between FE and FTCE and the fact that the test shown in Appendix B suggests the incorporation of time effects.

Starting with the consumption risk-sharing comparison, the magnitude in which the results vary depending on the classification – even though in terms of individual variable significance the results do not show much of a difference – is noticeable. Among developed economies the coefficients vary substantially, suggesting, for example, a level of IRS of 50% for the most open economies following the 1995 classification (under

POLS and FCTE, with the Schindler index), while the suggested level of IRS following the 2016 classification is of little more than 0.43. For the group of emerging markets and developing economies, the largest level of IRS suggested following the 1995 classification is of over 0.45 (FCTE, Chinn-Ito index) while with the 2016 classification, that same value can be up to over 0.48, both considering countries with fully open capital accounts.

Table 4.4 – Consumption risk-sharing comparison

	1995				*2016*			
	Pooled OLS		Fixed Country and Time Effects		Pooled OLS		Fixed Country and Time Effects	
	CI	SCH	CI	SCH	CI	SCH	CI	SCH
Full Sample								
Δlog(Y)-Δlog(Y)*	.6011***	.6328***	.5630***	.6030***	.6011***	.6328***	.5630***	.6030***
	(.0663)	(.0768)	(.0674)	(.0806)	(.0663)	(.0768)	(.0674)	(.0806)
Kcon	.0072***	.0058***	.0041	-.0025	.0072***	.0058**	.0041	-.0025
	(.0020)	(.0022)	(.0041)	(.0069)	(.0020)	(.0022)	(.0041)	(.0069)
Kcon(Δlog(Y)-Δlog(Y*))*	.2590**	.1923	.2949**	.2050	.2590**	.1923	.2949**	.2050
	(.1181)	(.1515)	(.1400)	(.1861)	(.1181)	(.1515)	(.1400)	(.1861)
R^2	0.2796	0.2738	0.2336	0.2297	0.2796	0.2738	0.2336	0.2297
Advanced Economies								
Δlog(Y)-Δlog(Y)*	.5191***	.5033***	.5067***	.5043***	.5774***	.5697***	.5808***	.5822***
	(.0916)	(.0992)	(.1114)	(.1165)	(.0982)	(.1073)	(.1207)	(.1263)
Kcon	-.0039	-.0010	-.0136**	-.0037	.0023	.0050	.0033	.0065
	(.0030)	(.0044)	(.0061)	(.0051)	(.0048)	(.0049)	(.0080)	(.0064)
Kcon(Δlog(Y)-Δlog(Y*))*	.6120***	.5330**	.6492***	.5573**	.5024***	.3839*	.5349***	.3921*
	(.1948)	(.2289)	(.1896)	(.2202)	(.1775)	(.1953)	(.1793)	(.1945)
R^2	0.5540	0.5396	0.5799	0.5592	0.5762	0.5683	0.5800	0.5703
Emerging Markets & Developing Economies								
Δlog(Y)-Δlog(Y)*	.6164***	.6530***	.5462***	.5933***	.6010***	.6424***	.5205***	.5736***
	(.0813)	(.0925)	(.0834)	(.0980)	(.0862)	(.0981)	(.0856)	(.1013)
Kcon	.0066**	.0045	.0083*	-.0002	.0061**	.0037	.0031	-.0090
	(.0026)	(.0028)	(.0045)	(.0087)	(.0028)	(.0030)	(.0038)	(.0094)
Kcon(Δlog(Y)-Δlog(Y*))*	.2294*	.1569	.2942*	.2006	.2484*	.1729	.3186**	.2206
	(.1349)	(.1714)	(.1568)	(.2086)	(.1391)	(.1775)	(.1580)	(.2132)
R^2	0.2610	0.2562	0.2264	0.2229	0.2523	0.2474	0.2183	0.2155

Note: ***p < 0.01; **p < 0.05; *p < 0.1. A description of each variable can be found in Appendix A. The dependent variable is Δlog(C)- Δlog(C*). A linear time trend was added to the regression but not reported. The level of IRS for fully open economies is given by performing 1–β_t (the coefficient of Δlog(Y)-Δlog(Y*)). The reported R^2 for Fixed Effects refers to the *Within* estimator.

With regard to the investment risk-sharing comparison, the case is rather the same, although with an overall smaller magnitude. Among advanced economies the values of the coefficients, e.g. for the output variable, differ significantly as well – from a minimum of 1.84 following the 1995 classification, to a minimum value of 2.15 following the 2016 country classification (both values obtained under FCTE, using the Schindler index). Similar to the case of consumption risk-sharing, within the group of emerging markets coefficients diverge as well, with the result obtained under FCTE, using the Chinn-Ito index shows a coefficient with the value of 1.56 following the 1995 classification, and 1.29 using the 2016 classification system.

Table 4.5 – Investment risk-sharing comparison

	1995				*2016*			
	Pooled OLS		Fixed Country and Time Effects		Pooled OLS		Fixed Country and Time Effects	
	CI	SCH	CI	SCH	CI	SCH	CI	SCH
Full Sample								
Δlog(Y)	2.0500***	2.1030***	1.6771***	1.8491***	2.0500***	2.1030***	1.6771***	1.8491***
	(.2669)	(.3003)	(.3347)	(.3559)	(.2669)	(.3003)	(.3347)	(.3559)
Kcon	-.0448***	-.0485**	-.0271	-.0025	-.0448***	-.0485**	-.0271	-.0025
	(.0145)	(.0188)	(.0246)	(.0314)	(.0145)	(.0188)	(.0246)	(.0314)
*Kcon*Δlog(Y)*	1.3492***	1.3197**	1.9633***	1.8429***	1.3492***	1.3197**	1.9633***	1.8429***
	(.4922)	(.6219)	(.5800)	(.6933)	(.4922)	(.6219)	(.5800)	(.6933)
Δlog(rpi)	-.1132	-.1208	-.1490	-.1581	-.1132	-.1208	-.1490	-.1581
	(.0867)	(.0937)	(.1028)	(.1121)	(.0867)	(.0937)	(.1028)	(.1121)
R^2	0.1820	0.1782	0.2013	0.1967	0.1820	0.1782	0.2013	0.1967
Advanced Economies								
Δlog(Y)	2.1720***	1.9900***	2.0079***	1.8357***	2.3869***	2.2229***	2.3073***	2.1497***
	(.1827)	(.1847)	(.2179)	(.2133)	(.1798)	(.1967)	(.2634)	(.2790)
Kcon	-.0755***	-.0624***	-.0768**	-.0679**	-.0796***	-.0799***	-.0871***	-.0909***
	(.0196)	(.0221)	(.0290)	(.0263)	(.0120)	(.0148)	(.0184)	(.0200)
*Kcon*Δlog(Y)*	2.0155*	2.5151**	2.5452**	3.0496***	1.6500**	2.0177***	2.0686***	2.4061***
	(.9952)	(.9744)	(.9255)	(.7637)	(.7479)	(.6860)	(.7180)	(.6367)
Δlog(rpi)	.0870**	.1020**	.0995*	.1378**	.0772**	.0880**	.0818	.1104*
	(.0373)	(.0402)	(.0561)	(.0668)	(.0310)	(.0328)	(.0523)	(.0587)
R^2	0.5928	0.5924	0.6399	0.6407	0.5743	0.5742	0.6008	0.6015
Emerging Markets & Developing Economies								
Δlog(Y)	1.9764***	2.0788***	1.5594***	1.8282***	1.7395***	1.9203***	1.2920***	1.6635***
	(.3687)	(.4135)	(.4595)	(.4792)	(.3782)	(.4476)	(.4722)	(.5202)
Kcon	-.0514***	-.0559**	-.0155	.0200	-.0581***	-.0612**	-.0108	.0441
	(.0181)	(.0247)	(.0272)	(.0362)	(.0183)	(.0258)	(.0304)	(.0407)
*Kcon*Δlog(Y)*	1.4329**	1.3451*	2.0246***	1.7623**	1.7368***	1.5533*	2.3720***	1.9991**
	(.5992)	(.7546)	(.7098)	(.8287)	(.6163)	(.7980)	(.7275)	(.8773)
Δlog(rpi)	-.12867	-.1366	-.1687	-.1801	-.1316	-.1381	-.1735	-.1843
	(.0998)	(.1080)	(.1171)	(.1274)	(.1028)	(.1113)	(.1203)	(.1305)
R^2	0.1653	0.1622	0.1910	0.1870	0.1566	0.1527	0.1852	0.1806

Note: ***p < 0.01; **p < 0.05; *p < 0.1. A description of each variable can be found in Appendix A. The dependent variable is Δlog(I). A linear time trend was added to the regression but not reported. The reported R^2 for Fixed Effects refers to the Within estimator.

5. Conclusions

The recent memory of the Great Recession of 2008-09 and of the European financial crises in the years that followed the Great Recession have prompted a re-examination of the role of capital controls as an instrument of macro-financial policy management. This thesis aimed at evaluating the impact of capital account openness (or the other side of the same coin, capital controls) on one of the most important potential benefits of capital mobility as referred in the literature – international risk-sharing. The possibility for agents to insure themselves against country-specific shocks through consumption and investment channels should provide an important balance in situations of crisis, allowing them to not suffer from sudden restrictions on their levels of consumption or desired investment. However, when macro or financial shocks are of global nature, there is an understandable temptation by national policy makers to use capital controls as an instrument to achieve some insulation of their economies – even if only temporary -- from the stormier waters of international capital markets in those circumstances. The question is then whether on balance (i.e. including "good" and "bad" times), there is a benefit that is economically and statistically significant.

In this work, a sample of 100 countries across different economic development stages was analyzed between 1995 and 2016, thereby including global crises periods (as in 2008-09) as well as periods of low global macroeconomic and financial volatility like 1999-2006. Previous literature found relatively low levels of international risk-sharing for consumption in particular and mixed evidence on the impact of capital account openness. Especially for developing countries, *de jure* measures of capital controls were not successful in explaining differences in international risk-sharing caused by the existence of controls on international capital mobility. In contrast, economically and statistically significant results were found in support of a positive impact of openness on international risk-sharing suggested: completely open economies share almost 40% of their consumption risk internationally (over three times the amount shared by closed

economies), and enjoy an at least 1.5 p.p. smaller dependence of domestic output growth on their investment growth than that faced by closed countries within the same income group.

As also shown in this thesis, these results are not uniform across capital control measures, specifications and country groupings. For consumption risk-sharing in advanced countries, the benefits of capital account openness are more homogenously estimated across capital control measures and country grouping (i.e. whether for instance one uses a 1995-based vs. a 2016-based definition of advanced economies). This is an important result particularly in light of the better quality of the data in those countries which should make inference more reliable. As for investment risk-sharing, there is evidence of a significant effect that is less dependent on the capital control measure and country grouping. Importantly, I also find evidence that higher capital account openness is associated with higher investment growth on average,

These results suggest that, when looking at the benefits of economy-wide capital controls to help reduce macroeconomic and financial vulnerability to sudden stops in capital flows, policy makers should be no less equally mindful of the benefits of capital account openness to promote smoother consumption and investment growth, as well as faster investment and economic growth on average.

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Appendices

Appendix A
Data description

Table A.1. Data description

Variable	*Description*	*Unit*
Y	Per capita real domestic gross domestic product at constant 2011 national prices	Mil. 2011 US$
*Y**	Per capita real world gross domestic product at constant 2011 national prices	Mil. 2011 US$
C	Per capita real domestic consumption at constant 2011 national prices	Mil. 2011 US$
*C**	Per capita real world consumption at constant 2011 national prices	Mil. 2011 US$
I	Per capita real domestic investment at constant 2011 national prices	Mil. 2011 US$
rpi	Relative price of investment	Ratio between investment deflator and consumption deflator
Δlog(Y)	First-differenced logarithm of y	–
Δlog(Y)*	First-differenced logarithm of Y	–
Δlog(C)	First-differenced logarithm of c	–
Δlog(C)*	First-differenced logarithm of C	–
Δlog(I)	First-differenced logarithm of inv	–
Kcon	Capital account controls variable; either Chinn & Ito or Schindler measure	Index where 0 indicates open capital account and 1 closed capital account
Δlog(rpi)	First-differenced logarithm of rpi	–

Appendix B
Test and regression outputs

B.1 Preliminary tests

Table B.1.1. Unit Root Tests on consumption dependent variable: Levin-Lin-Chu

Adjusted t	Panels	Periods
-9.3798***	100	21

t statistics in parentheses
***p < 0.01; **p < 0.05; *p < 0.1

Table B.1.2 Unit Root Tests on consumption dependent variable: Im-Pesaran-Shin

Z-t-tilde-bar	Panels	Periods
-14.8076***	100	21

t statistics in parentheses
***p < 0.01; **p < 0.05; *p < 0.1

Both tests strongly reject the hypothesis that all panels contain unit roots.

Table B.2 Unit Root Tests on investment dependent variable: Im-Pesaran-Shin

Z-t-tilde-bar	Panels	Periods
-20.2305***	100	21

t statistics in parentheses
***p < 0.01; **p < 0.05; *p < 0.1

The test strongly rejects the hypothesis that all panels contain unit roots.

Note: the LLC unit root test requires strongly balanced panels, thus, it's not available for the investment dependent variable.

Table B.3.1: Wooldridge Test for Autocorrelation in Panel Data (consumption)

F	Prob > F
2.301	0.1325

Table B.3.2: Wooldridge Test for Autocorrelation in Panel Data (investment)

F	Prob > F
0.509	0.4773

The null hypothesis that there is no first order autocorrelation is not rejected.

B.2 Regression Outputs and Robustness Tests

Table B.4.1 Test for joint-significance of time effects (consumption)

F	Prob > F
3.22	0.0001

Table B.4.2 Test for joint-significance of time effects (investment)

F	Prob > F
3.27	0.0001

The null hypothesis that the coefficients for all years is equal to zero is rejected.

Table B.5 Outliers between Chinn & Ito and Schindler indices

Countries removed from sample	*No. of periods with excessive discrepancy*
Bulgaria	7 periods
Czech Republic	5 periods
Dominican Republic	8 periods
Egypt	5 periods
Georgia	4 periods
Ghana	10 periods
Jamaica	8 periods
Kazakhstan	7 periods
Korea	4 periods
Lebanon	10 periods
Nigeria	20 periods
Paraguay	4 periods
Saudi Arabia	7 periods
Turkey	12 periods
Venezuela	6 periods

Table B.6 – Consumption risk-sharing (removing outliers)

	Pooled OLS		*Fixed Country and Time Effects*	
	CI	SCH	CI	SCH
Full Sample				
Δlog(Y)-Δlog(Y)*	.5930***	.5890***	.5596***	.5742***
	(.0709)	(.0792)	(.0724)	(.0850)
Kcon	.0084***	.0079***	.0028	.0031
	(.0021)	(.0022)	(.0057)	(.0063)
Kcon(Δlog(Y)-Δlog(Y*))*	.2019	.1917	.2296	.1749
	(.1310)	(.1597)	(.1642)	(.2018)
R^2	0.2846	0.2805	0.2343	0.2314
Advanced Economies				
Δlog(Y)-Δlog(Y)*	.5822***	.5689***	.5836***	.5755***
	(.1016)	(.1101)	(.1241)	(.1302)
Kcon	.0046	.0070	.0053	.0099
	(.0054)	(.0052)	(.0088)	(.0065)
Kcon(Δlog(Y)-Δlog(Y*))*	.3939**	.3172*	.4239**	.3204*
	(.1748)	(.1728)	(.1702)	(.1633)
R^2	0.5624	0.5614	0.5660	0.5647
Emerging Markets & Developing Economies				
Δlog(Y)-Δlog(Y)*	.5875***	.5855***	.5149***	.5330***
	(.0937)	(.1042)	(.0942)	(.1096)
Kcon	.0078**	.0066**	.0004	-.0012
	(.0031)	(.0029)	(.0051)	(.0079)
Kcon(Δlog(Y)-Δlog(Y*))*	.1974	.1868	.2628	.2101
	(.1520)	(.1884)	(.1841)	(.2333)
R^2	0.2505	0.2471	0.2157	0.2133

Note: ***p < 0.01; **p < 0.05; *p < 0.1. A description of each variable can be found in Appendix A. The dependent variable is Δlog(C) - Δlog(C*). A linear time trend was added to the regression but not reported. The level of IRS for fully open economies is given by performing 1–β_t (the coefficient of Δlog(Y)-Δlog(Y*)). The reported R^2 for Fixed Effects refers to the *Within* estimator.

Table B.7 – Investment risk-sharing (removing outliers)

	Pooled OLS		*Fixed Country and Time Effects*	
	CI	SCH	CI	SCH
Full Sample				
Δlog(Y)	2.0978***	2.0258***	1.7354***	1.7126***
	(.2957)	(.3164)	(.3809)	(.3819)
Kcon	-.0477***	-.0637***	-.0351	-.0289
	(.0177)	(.0199)	(.0294)	(.0314)
*Kcon*Δlog(Y)*	1.3678**	1.5781**	1.9112**	2.0848***
	(.6002)	(.6628)	(.7409)	(.7629)
Δlog(rpi)	-.1607	-.2013*	-.2692**	-.3180**
	(.1118)	(.1130)	(.1347)	(.1362)
R^2	0.1779	0.1777	0.2015	0.2028
Advanced Economies				
Δlog(Y)	2.3733***	2.1988***	2.3024***	2.1302***
	(.1850)	(.2016)	(.2673)	(.2806)
Kcon	-.0796***	-.0757***	-.0955***	-.0856***
	(.0149)	(.0172)	(.0181)	(.0231)
*Kcon*Δlog(Y)*	2.4008***	2.4755***	2.5544***	2.6663***
	(.7663)	(.7169)	(.6954)	(.7087)
Δlog(rpi)	.0903**	.0962579**	.0944	.1186
	(.0346)	(.0378)	(.0611)	(.0709)
R^2	0.5647	0.5655	0.5868	0.5871
Emerging Markets & Developing Economies				
Δlog(Y)	1.7806***	1.7012***	1.2815**	1.2628**
	(.4490)	(.5122)	(.5580)	(.5842)
Kcon	-.0638***	-.0879***	-.0156	.0073
	(.0218)	(.0283)	(.0375)	(.0442)
*Kcon*Δlog(Y)*	1.7920**	2.0711**	2.3848**	2.6082**
	(.7538)	(.8880)	(.9347)	(1.0201)
Δlog(rpi)	-.2282	-.2772*	-.3659	-.4267**
	(.1409)	(.1400)	(.1631)	(.1633)
R^2	0.1503	0.1529	0.1885	0.1930

Note: ***p < 0.01; **p < 0.05; *p < 0.1. A description of each variable can be found in Appendix A. The dependent variable is Δlog(I). A linear time trend was added to the regression but not reported. The reported R^2 for Fixed Effects refers to the *Within* estimator.