Financial Liberalization and Consumption Smoothing: What Have We Learned So Far?

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Abstract

Does financial liberalization increase consumption smoothing? Although standard open macroeconomy models predict that more financial liberalization would unambiguously lead to better international consumption smoothing, the empirical literature is at best inconclusive. This study offers a review of both the theoretical and empirical literatures on international consumption risk sharing and highlights common findings that may help explain one of the major puzzles in international macroeconomics. In particular, the study emphasizes the role of impediments to trading foreign capital, cross-country productivity correlations and the importance of a well-defined framework in answering this question.

1 Introduction and Literature

The past two decades have witnessed a surge in cross-border capital flows and a sharp decline in capital account restrictions in industrial countries as well as emerging markets and less developed economies. Standard open macroeconomic models predict that this would unambiguously lead to better international consumption risk sharing[1]. The intuition would be that as countries open their international financial markets, they would be able to *off-load* some of their income risks to the rest of the world, *de-linking* domestic consumption from country-specific disturbances. In return, domestic consumption will vary with the common component of international income growth. However, the empirical literature studying the effects of financial liberalization on consumption smoothing is at best inconclusive, failing to unambiguously show improvements in international consumption risk sharing, especially for the emerging markets and other developing economies. This study investigates this disconnect and offers plausible answers about the relationship between financial liberalization and consumption smoothing.

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[1] Lewis(1996), Obstfeld and Rogoff (1996)

The results are summarized as follows. First, the actual level of financial impediments matters for consumption smoothing. While liberalization has little effect on consumption smoothing when financial markets are very closed, its impact grows as financial markets become more open. Investment income and capital gains appear to be important channels for consumption smoothing. Second, the analysis shows both theoretically and empirically that increased productivity correlations with the rest of the world are associated with less international risk sharing (using consumption-based measures). Third, the study emphasizes the fact that these relationships are nonlinear and suggest putting some structure through a *well-defined* framework. Finally, recent empirical work emphasizes asset revaluations as an indirect channel of consumption risk sharing[2].

In theory, one of the main benefits of financial globalization is that it provides increased opportunities to protect consumers from the risks associated with idiosyncratic income shocks. This ability to insure against different states of nature should be reflected in: *a*) a lower correlation between own consumption and own output, $corr(c, X)$ (own refers to households for micro studies and country for international studies), *b*) a higher correlation between own consumption and aggregate/rest of the world income or consumption, $corr(c, c^*)$ (aggregate refers to total domestic for micro studies within a country, and is either foreign or global for international studies), and *c*) a lower volatility of consumption, σ_c. Usually, consumption-based measures of risk sharing come from a benchmark model with complete markets. For example, Obstfeld and Rogoff (1996) compare the case of financial autarky with the case when financial markets are modeled as contingency assets. They show that in the later case consumption does not co-move with own output, but with an aggregate measure of income (or consumption). Baxter and Crucini (1995) and Backus, Kehoe and Kydland (1995) also predict that in the absence of trade in financial assets domestic consumption should not be highly correlated with world income (or consumption) provided output is not perfectly (highly) correlated across countries, whereas under complete markets cross-country consumptions should be highly correlated. However, in almost all cases, the goal has not been to provide evidence that all markets are complete, but rather to determine how much mileage can be obtained from a model with complete markets. It is widely agreed that a complete markets model provides a useful benchmark for explaining consumption behavior without requiring researchers to literally accept that there are no market imperfections (Mace 1991). Still, deviations from complete markets framework should be carefully modelled in an empirical framework in order to investigate the effect of financial globalization on consumption smoothing.

Cochrane (1991) was one of the first studies to argue that consumption should not vary across individuals in response to idiosyncratic shocks, just as borrowing and lending opportunities imply that consumption should not vary

[2] This last strand of literature specificaly investigates the role of capital gains and factor income flows in income and consumption risk sharing. Income risk sharing is defined by the correlation of the growth rates of Gross National Income and GDP. See Balli, Kalemli-Ozcan and Sorensen (2012).

over time in response to forecastable shocks. In a complete markets model it can be shown that the growth of consumption is only a function of the growth in shadow price of consumption (Langrange multiplier) and preferences[3]. If any other variable X^j_{t+1} is cross-sectionally independent from preferences and measurement error, then X^j_{t+1} is cross-sectionally independent of consumption growth, $log(\frac{C^j_{t+1}}{C^j_t})$[4]. Cochrane shows that preferences can have an arbitrary form (monotonic and concave), need not be time-separable or have the expected utility property, and arbitrary shocks may be included.

Similarly, Mace (1991) shows that for exponential utility and power utility with multiplicative preference shocks, under complete markets, (growth in) individual consumption is a function of (growth in) aggregate consumption and preferences only[5]. Thus, individual income will be uncorrelated with household consumption[6]. Mace reckons that reported income, which is used in her regressions, includes after-tax wages and salaries, pension income, interest income, and various lump-sum receipts. Hence, some of the risk sharing has already taken place and is included in the reported income measure. However, she argues that at least some risk sharing takes place between receipts of reported income and actual consumption, for example via lending and borrowing.

These two studies have been the genesis of an extensive literature aimed at understanding the effects of financial integration on international consumption smoothing. In this case *own* would refer to country's consumption and output. In a representative agent framework, integrated world asset markets would imply that the *ex-post* difference between the two countries' intertemporal marginal rates of substitution is uncorrelated with any random variable on which contractual payoffs can be conditioned. Any idiosyncratic consumption risk systematically related to some verifiable random event will be traded, leaving *ex-post* differentials in marginal utility functions of nonverifiable events only. Thus, a country's consumption will not co-vary with its production as any fluctuations in output caused by known *ex-ante* randomness in the production process can be *de-linked* from consumption via capital markets.

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[3] $log(Ct+1j/Ctj) = 1/\theta^j log(\mu_{t+1}/\mu t) - log(b^j_{t+1}/b^j_t) - log(\rho^j) + \xi^j_{t+1}$, where $\mu(s^t)$: langrange multiplier, ρ^j : rate of time preferences, θ^j: risk aversion coefficient, b^j_t : preference shock

[4] Regressions of the form: $log(\frac{C^j_{t+1}}{C^j_t}) = \alpha + \beta X^j_{t+1} + \varepsilon^j_{t+1}$ can test whether consumption growth and the RHS variables are independent. If the measurement error and preference shifts are homoskedastic and uncorrelated across agents, OLS estimates can be used to test that $\beta = 0$. If the initial RHS variable was correlated with initial consumption levels, one could use instead the residuals from a projection of X^j_{t+1} on C^j_t.

[5] $log(\frac{C^j_{t+1}}{C^j_t}) = \beta_1 log(\frac{C^a_{t+1}}{C^a_t}) + \beta_2 log(\frac{X^j_{t+1}}{X^j_t}) + \varepsilon^j_{t+1}$

[6] Mace runs panel estimation and aggregate consumption controls for possible correlation over time between individual income and preference shocks.

A very influential study that tests consumption risk sharing in an international context is Lewis (1996). She tries to incorporate capital market restrictions to a similar framework and tests whether in countries with closed capital accounts, domestic consumption growth is more correlated with domestic output growth than in countries that have experienced open capital accounts[7]. As described later, this would suggest a test across group of countries. Crucini (1999) also argues that if a country (or region) could buy contingency assets that pay the world average income in return, domestic consumption will be less correlated to domestic income the more of these assets you buy. Artis and Hoffmann (2007, and 2008) also build on these studies and argue that more financial liberalization should result in a decline in the correlation between domestic consumption and domestic output. Furthermore, they argue, as in Asdrubali, Sorensen and Yosha (1996) and Sorensen and Yosha (1998), that the coefficient of regressing domestic consumption on domestic output may be of interest in itself and should be interpreted as a measure of the deviations from the complete markets outcome. Applying this insight to the US state level data, Asdrubali, Sorensen and Yosha estimate that, even in US, about 25% of output risks remain uninsured.

As discussed, Mace(1991) shows that household consumption should be highly correlated to an aggregate pool of consumption. By the same analogy, in the presence of open financial markets, country's consumption should be highly correlated with the common component of the consumption of the foreign countries they trade assets with. In a very simple and tractable framework Obstfeld (1994) shows that consumption should be highly correlated with aggregate world consumption and less correlated with domestic output. He argues that the equation should be first differenced to account for spurious correlation as the series are not cointegrated, and that controlling for world consumption gives an unbiased OLS estimate[8]. Most two-country, one-good models in open macroeconomics give similar predictions. In the simplest complete markets model, marginal utility growth should be equated across countries so that consumption growth rates should be highly correlated. Dynamic stochastic general equilibrium (DSGE) models, in particular, have been able to generate some quantitative predictions along these lines. These models predict that in the absence of trade in goods and financial assets (autarky), the correlation of domestic consumption with world output (or world consumption) would be less than unity provided that output is not perfectly correlated across countries (Backus, Kehoe and Kydland 1995). In contrast, in a scenario with complete markets that enables perfect risk sharing, it should be possible to decouple fluctuations in consumption from those of output. Cross-country correlations of consumption

[7] Lewis estimates a panel in the form: $log(\frac{C^j_{t+1}}{C^j_t}) = \theta(t) + \beta_1 D(j,t) log(\frac{X^j_{t+1}}{X^j_t}) + \beta_2[1 - D(j,t)] log(\frac{X^j_{t+1}}{X^j_t}) + \varepsilon^j_{t+1}$, where $D(j,t) = 1$ if the country is restricted, and 0 otherwise. $\theta(t)$ is a country specific term. A test for international consumption smoothing in this case would be that $\beta_1 > \beta_2$, i.e., that domestic consumption is more related to domestic output in countries that have more stringent capital controls.

[8] Obstfeld regresses an equation of the form: $log(\frac{C^i_{t+1}}{C^i_t}) = \delta + \beta_1 log(\frac{C^W_{t+1}}{C^W_t}) + \varepsilon^i_{t+1}$.

growth rates would be predicted to be perfect or very high. Moreover, consumption across countries would be more correlated than output. Pakko (1998) also shows that in a two-country endowment economy the correlation between domestic consumption and domestic output should be lower than the correlation between domestic consumption and world output in the presence of integrated financial markets. This is a direct consequence of the fact that under integrated markets marginal utilities of consumption between the two countries would be perfectly correlated.

Researchers have also attempted to build models that sometimes reverse these predictions and can be more in line with some of the results presented below. For example, Baxter and Crucini (1995), Heathcote and Perri (2001, 2004), Lewis (1996), Kehoe and Perri (2001), show theoretically scenarios that might lead to different outcomes than those presented above. As will be discussed further in the paper, some of these studies require very strong conditions. But, mostly, with very few exceptions, these rationalizations have not been incorporated in the empirical studies up to date.

A third focus of the consumption risk sharing literature has been consumption volatility. Theory suggests that financial integration should reduce volatility of consumption (relative to that of output or income). In particular, if output fluctuations are not perfectly correlated across countries, it is possible to show that trade in financial assets can be used to de-link national consumption levels from the country-specific components of output fluctuations, making consumption growth less volatile relative to income growth. From a time series perspective, increasing financial integration should lead to declining volatility of consumption relative to output[9].

Given the discussion above, it is not obvious why, in an international context, a country's consumption (growth) would be completely independent of domestic output (growth), even in a stetting with full insurance. Agreeing that some consumption risk sharing may take place from borrowing and lending on credit markets and other formal and informal insurance arrangements would suggest that in an environment closer to complete markets, domestic consumption would be less correlated with domestic income than in an environment where financial markets do not function properly. Domestic consumption and domestic output need not be completely uncorrelated.

The same argument can be made for the correlation between domestic consumption and foreign (global or foreign countries they trade assets with) consumption. Although these studies rationalize a high correlation between cross-country consumptions (or between domestic consumption and rest of the world income), various imperfections can exist. Domestic consumption does not have to be perfectly correlated to foreign consumption (global consumption/output).

[9] See Obstfeld and Rogoff (1996)

The above discussion implies that a legitimate hypothesis would be to test whether consumption is more closely correlated with aggregate consumption in an environment resembling complete markets than in an environment where insurance markets are imperfect, but not that domestic consumption should be perfectly correlated with world consumption.

The empirical literature literature on the effects of financial integration on consumption smoothing asks two main questions. The first is whether there is *perfect* risk sharing. A null hypothesis of perfect risk sharing would require that either correlation between domestic consumption and domestic output be 1 (one), or that correlation between domestic and foreign (rest of the world) consumption be 0 (zero). Some studies have been looking at these correlations trying to interpret it as a test of highly integrated markets.

Failing to find the predicted patterns in the data, further studies have been more pragmatic and chosen to interpret the *magnitudes* of these measures as deviations from the complete markets outcome, investigating the same measures for different market openness realizations across countries and across time. The literature has explored the hypothesis of whether consumption smoothing has increased as financial restrictions have declined. To answer this question, studies have used two approaches. First they ask if there are differences in consumption risk sharing across different groups of countries, i.e., financially integrated versus financially non-integrated countries. Because consumption smoothing should improve as countries become more liberalized, more financially open economies should have shared consumption risks better. For example, if correlation between domestic consumption and domestic output is our measure of consumption smoothing, we should expect to see a lower correlation for countries with more liberalized financial markets. Measures of financial liberalization are imperfect and most studies simply assume that OECD countries are more open than the others.

Another approach has been to look at the extent of consumption risk sharing across time periods. Again, there are major problems with the existing measures of financial openness and with very few exceptions, most studies in this last category implicitly assumes that countries have tended to become more liberalized. Evidence does show that in the last two decades there has been an increase in cross-border capital flows and a decline in financial restrictions between countries[10].

The next section summarizes some of these studies and their main findings. Next, in Section 3, the paper looks at possible theoretical interpretations that reconcile the data with facts. Section 4 proposes a few directions for future research and Section 5 concludes.

[10] Lane and Milessi-Ferretti (2007) and other *de-jure* financial liberalization indicators (IMF AREAER, Chinn-Ito, Kaminsky-Schmukler, etc).

2 Empirical Studies on International Consumption Smoothing

This section presents a review of the empirical studies in the area. The literature on the effects of financial integration on consumption smoothing asks two main questions. The first is whether there is *perfect* risk sharing. Second, the literature has explored the hypothesis of whether consumption smoothing has increased as financial restrictions have declined.

Within each category, these studies differ in terms of the methods they employ, the data sets they use and how they define financial integration. Tables 1-3 give a detailed description of each study, so we can better understand under what circumstances financial integration actually leads to better consumption smoothing. Some studies may appear in more than one category as they may have been investigating multiple hypotheses.

2.1 Perfect/Imperfect Consumption Risk Sharing

The predictions of this literature come from a complete markets model. A country can be said to have perfectly shared consumption risks if the correlation between its domestic consumption and domestic output is close to 0 (zero), or if the correlation between its consumption and other countries' consumption cross-country correlations is close to 1 (one). Another way to look of evidence of consumption risk sharing is to check whether cross-country consumption correlations are higher than cross-country output correlations.[11].

Table 1 shows studies that have asked this question up to date[12]. Mace (1991) finds evidence of perfect risk sharing among American consumers, but her results are sensitive to the form of utility function. Obstfeld (1994) looks at G-7 countries for the period 1950-1988 and concludes that both cross-country consumption growth correlations and the correlation between domestic consumption growth and the world component of consumption (output) growth suggest that countries are nowhere near perfect risk sharing. Backus, Kehoe and Kydland (1995), Pakko(1998, 2004), Canova and Ravn (1996), Ambler, Cardia and Zimmermann (2004) all look at cross-country consumption correlations and conclude that there is no perfect risk sharing. Pakko (1998) also compares the correlation between domestic consumption growth and output growth with the correlation between domestic consumption growth and world output growth, and concludes that risk sharing is far from perfect.

Lewis (1996) uses Penn World Table data for 73 countries in the interval 1950-1992 and regressing domestic consumption on domestic output rejects the

[11] Even if this last condition is satisfied, it would not immediately prove existence of *perfect* risk sharing, but it would be evidence of risk sharing.

[12] Flood, Marion and Matsumoto (2012) develop a welfare-based measure that captures how far countries are from the ideal of perfect risk sharing and use data for a large set of developed and developing countries to answer the question.

hypothesis of perfect consumption risk sharing. She also uses disaggregated consumption data for tradeables and non-tradeables for 48 countries, and again comes to the same conclusion. Bai and Zhang (2005) use data for 21 developed and 19 developing countries and regress cross-sectionally consumption growth on GDP growth. They use data from various sources (IFS, WDI, and PWT 6.1) for the period 1973-1998 and reject the hypothesis of perfect risk sharing. They also run panel regressions and are careful to control for World consumption growth, as advised by Cochrane (1991), and again conclude that countries have not been able to benefit from risk sharing opportunities.

Asdrubali, Sorensen and Yosha (1996) develop a methodology to measure the extent of risk sharing achieved from different channels. They find that only 40% of risk sharing is smoothed via capital markets between the US states. Also Sorensen and Yosha (1998) do the same exercise for OECD and find that a large chunk of the income risks is not shared. These studies argue that empirical tests need not expect a perfect correlation between individual consumption and aggregate consumption. They also suggest that even among US states not all risks are shared. There is still room for more financial integration to help countries (or states and regions) to offload some of their income risks in the financial markets.

Out of twelve (12) studies that use consumption based measures of risk sharing in Table 1, only two (2) find mixed evidence of consumption risk sharing, and ten (10) others reject the hypothesis of perfect risk sharing at very high levels of statistical significance. All the studies that reject perfect risk sharing in Table 1 are cross-country or cross-states studies. This suggests than on an international level consumption risk sharing is strongly rejected and even among US states there are still unexplored opportunities of consumption risk sharing.

2.2 Does Consumption Smoothing Increase as Restrictions Decline?

This section looks at studies that have asked the question if consumption smoothing improves as financial restrictions decline. These studies find the motivation in the idea that financial restrictions are detrimental to consumption risk sharing. Two approaches have been used in the literature. First, the literature compares consumption risk sharing across groups of countries. The intuition would be that one would expect more financially liberalized countries to have benefited more from consumption smoothing opportunities. The other approach looks at whether consumption smoothing has improved across time, as countries have become more liberalized.

2.2.1 Risk Sharing Across (Different Groups of) Countries

One of the first studies to differentiate between groups of countries when testing for consumption risk sharing has been Lewis (1996). She runs separate

regressions for countries that appear to have had open capital accounts and closed capital accounts according to the IMF capital account restrictions measure in the time frame she is considering. Her conjecture is that the correlation of domestic consumption growth on domestic output growth should be higher in countries with capital account restrictions than in the countries with open capital accounts. When she disaggregates consumption data into tradeables and non-tradeables she finds evidence that the correlation between domestic consumption growth and domestic output growth is lower in more financially open countries. Bekaert, Harvey and Lundblad (2005) also find that countries with open capital accounts experience greater reduction in consumption growth volatility after opening their equity markets.

Crucini (1999) suggests regressing domestic consumption growth on world consumption and domestic income of a region or country. By diversifying *ex-ante*, a country (or region) can buy into a mutual fund that pays world average output as a dividend, so that income growth is a weighted sum of domestic and world average output growth. He finds that Canadian provinces and US states risk share more than G-7 countries. Artis and Hoffmann (2008a) build on Crucini (1999) and regress domestic consumption growth on output growth. They find that US states risk share more than OECD countries, and they again re-enforce the observation that even US states do not perfectly risk share. An innovation in their methodology is that they differentiate between permanent shocks to income and transitory shocks to income. They show that the interaction between transitory and permanent shocks to income can bias correlation between domestic consumption and output, implying that the business cycle structure matters when analyzing the consumption-based measures of risk sharing. Artis and Hoffmann (2007) argue that in order to capture the low-frequency co-movement of output and consumption, the levels of consumption and output should be used in regressions, not their growth rates. Using levels in their panel OLS regressions and data for 1960-1990 they again find that US states share more risks than OECD countries. They also find that countries with higher degrees of integration (as measured by the amount of international assets they trade) risk share more. Using data for the period 1990-2004 and running panel OLS regressions in levels they also find that E(M)U countries risk share more than OECD countries. Baxter (2011) looks at bilateral risk sharing at different time horizons and also finds evidence of risk sharing at low frequencies. Canova and Ravn (1996) also check consumption correlations for nine (9) OECD countries for the period 1970-1990, and conclude that correlations are higher for Europe.

Kose, Prasad and Terrones (2003, 2009) look at different measures of consumption risk sharing for 72 countries for 1960-2004 (1960-1999 in the first paper). They divide the countries in three groups, industrial countries (21), emerging markets (22) and other developing countries (33). They consistently find that industrial countries have been better able to smooth consumption during this period. Also, in Bai and Zhang (2005), the coefficient of regressing

domestic consumption growth on domestic output growth is lower for the industrialized countries, whereas the coefficient of domestic consumption growth on world consumption growth is higher for the same group suggesting that developed countries have risk shared more.

Volosovych (2012) and Bracke and Schmitz (2011) look at consumption (and income) smoothing for a large group of developing and industrial country. Volosovych (2012) finds evidence of more income smoothing for a more financially open countries and better investor's protection increases both income and consumption risk sharing. He looks at a sample of 117 countries for the period 1985-2004 and country coefficients of risk sharing are regressed cross-sectionally on investor's protection rights and other variables. Bracke and Schmitz (2011) use *de-facto* measures of financial openness to look at consumption smoothing via capital gains and factor incomes. They find that capital gains is a more important channel for consumption risk sharing and that capital gains are counter-cyclical for developed countries, making them a good possible hedge against output fluctuations. They cannot find the same evidence for emerging markets and indeed Schmitz (2012) finds evidence of pro-cyclical capital gains in a group of 22 emerging markets for the period 1996-2010.

Table 2 lists studies that have compared consumption risk sharing in different groups of countries. Almost all the studies listed in Table 2 suggest than more financially open economies have been better able to smooth consumption. Lewis (1996) and Beckaert et. al. (2005) divide the groups according to the status of their capital account (although Beckaert et al employ different measures of capital account restrictions). Artis and Hoffmann divide countries using flow measures of financial integration and they find more consumption smoothing for E(M)U countries. But, E(M)U countries have also benefitted from huge decreases in financial restrictions compared to other OECD countries, because of the special status they are offered from the European Union. The other studies operate under the implicit assumption that developed countries are more financially developed than non-industrial countries. This is definitely true for *rule-based* measures of financial liberalization (see Kaminsky and Schmukler (2003), WEO (2000), Kose, Prasad, Rogoff and Wei (2006)). Industrial countries have in general less restricted capital accounts. They also have benefited from a large volume of financial flows. But, at the same time, emerging markets have also benefited from a large volume of financial flows, especially in the last two decades. Unfortunately, the studies of Kose et. al. have not been able to show an improvement in risk sharing in these economies, suggesting that financial flows are not a sufficient condition for improvements in international consumption risk sharing.

2.2.2 Risk Sharing Across Time

Table 3 lists the studies that have asked the question of whether countries have benefitted from better consumption smoothing as countries have gotten more

financially liberalized across time. Some of this studies run panel regressions, others compare different measures of consumption risk sharing in different periods. Obstfeld (1993) compares consumption risk sharing in 1951-1972 vs 1973-1988 for the G-7 countries and finds slight evidence of increased risk sharing[13]. Another paper that makes a clear distinction between open and closed periods is Beckaert et. al. (2005). They look at the volatility of consumption growth to GDP growth five (5) years before and after equity market liberalization. They find that volatility of consumption growth to GDP growth has decreased after equity market liberalization. Their results are weaker for emerging markets, though, but their relative success relies on a clear distinction between open a closed periods through the equity market criteria. Islamaj (2008) identifies relatively open and relatively closed periods of financial liberalization by making use of some of the available financial integrations *rule-based* indicators and finds evidence of consumption smoothing, once the productivity shock correlation with rest of the world is taken into account.

Not all studies have shown an improvement in consumption risk sharing through time. Heathcote and Perri (2004) compare cross-country correlations of consumption growth and output growth for US, Canada, Europe and Japan for the periods 1972:1-1986:2 and 1986:3-2000:4. The second period corresponds with an increase in financial flows in all these countries. They show that consumption and output correlations have decreased between US and the rest of the world, but have increased between US and Canada. They argue that a real regionalization has happened and explain that international correlations of consumption are affected by a change in cross-country productivity shock correlations as well as terms of trade movements.

Kose, Prasad and Terrones (2003, 2009) run panel regressions as well as track the evolution of consumption based measures of risk sharing through time. They report an improvement in consumption smoothing for the industrial countries, but deterioration in consumption smoothing for the emerging markets. Bai and Zhang (2005) report that for the periods 1973-1985 and 1986-1998 the extent of risk sharing has not changed over time.

Artis and Hoffmann (2008a) are able to show more risk sharing for OECD countries for the period 1990-2000 versus 1960-1990. They differentiate between permanent and transitory shock and show that countries use financial market to smooth against permanent shocks. They explain that consumption can react to permanent shocks in output and its adjustment can make it more volatile than output. Their study suggests that business cycle properties matter. Artis and Hoffmann (2007) also find evidence of better risk sharing through time among

[13] The sample split was motivated by independent evidence that the first sub-period was on the whole an era of considerably lower global asset-market integration than the second. These results should be interpreted with care since they are based in a small number of observations. Nonetheless, this paper makes a clear distinctions between time periods in which these countries have been financially more open and financially more closed.

OECD and E(M)U economies when they run their panel regressions in levels. They find limited sharing of risks in the short run, but positive risk sharing in the medium and long term. They argue than level regressions are better suited at capturing long-term and country-fixed effects.

Volosovych (2012) looks at consumption smoothing over time for a group of 117 countries from 1985-2004. He splits the sample in 1995 and finds that an increase in consumption smoothing for the second part of the sample. He attributes this to better investor protection in most of the countries, and at the same time the time period corresponds to intensifying financial flows in most countries. Balli, Kalemli-Ozcan and Sorensen (2012) look at OECD countries for the period 1997-2007. They split the sample in year 2000 and finds better risk sharing for the second time period. Their paper uses *de-facto* measures of financial openness and emphasized the role of factor income flows in consumption smoothing. Becher and Hoffmann (2010) also show using household-level data for Italian regions that equity ownership increases risk sharing.

As seen in Table 3, we find a mixed picture of the effects of financial liberalization through time. Studies that have differentiated between relatively open and relatively close periods have been more successful in showing better consumption smoothing. This suggests that the actual level of financial impediments does matter. Table 3 also shows that more developed countries have been more able to benefit from risk sharing through time, and that factor income and especially equity flows are better apt at improving risk sharing.

3 Reconciling with the Facts

In the survey showed above, 10 (ten) out of 12 (studies) reject the hypothesis of perfect risk sharing in Table 1, and the remaining 2 (two) studies show only mixed evidence. Thus, we can conclude that perfect risk sharing has not been achieved, despite increased financial integration. Nonetheless, Tables 1-3 give some very interesting insights about when one should expect to see improvement in consumption smoothing. Table 2 lists 11 (studies) that have shown better consumption risk sharing for more open countries. Two of these studies differentiate countries based on available openness indicators, whereas the rest differentiate between developed and underdeveloped countries, implicitly assuming that developed countries have been more open. These comparisons across groups suggest that consumption smoothing is associated with more liberalization. Table 3 reinforces these results. Out of 13 (eleven) studies looking at the extent of consumption smoothing across time, 9 (seven) find that there has been improvements in consumption smoothing as countries have become more liberalized. Only 2 (two) studies show no improvements in consumption smoothing as financial liberalization has increased and the remaining 2 (two) give mixed results. If transaction costs associated with international trade of goods and assets are large, it is possible that domestic residents may not find it

beneficial to diversify risks. When studies make a clear distinction between relatively open and relatively closed countries, or when they differentiate between relatively open and relatively closed periods in terms of financial restrictions, they have been more successful in showing evidence of risk sharing. This suggests that the actual level of financial restrictions does matter for consumption smoothing. At the same time, these studies show that factor income flows and the accompanying capital gains may play a crucial role for risk sharing.

International financial markets are incomplete as it is not possible to buy insurance against all future contingencies. Models with incomplete asset markets have been more successful in generating the rankings of cross-country consumption and output correlations observed in the data (Baxter and Crucini (1995), Heathcote and Perri (2001)). However, these models require some very strong assumptions. For example, in Baxter and Crucini countries can only trade a risk free bond internationally and in order for the model to generate consumption and output correlations close to the ones observed in the data, their output should be subject to persistent (unit root) shocks. In Heathcote and Perri (2001), countries trade in intermediate goods and use these as inputs to produce final production goods in order for the above-mentioned correlations to be close to the ones we see in the data.

As discussed in the empirical summary, some studies have been able to show better risk sharing, once they have accounted for business cycle properties. Two of the studies in Table 2 also suggest that business cycle properties affect consumption risk sharing. Three of the studies showing more risk sharing over time in Table 3 suggest as well that business cycle properties matter.
For example, Artis and Hoffmann (2008) differentiate against permanent and transitory shocks, and argue that consumers will only insure against permanent shocks ex-ante, and they can insure against transitory shocks ex-post through lending and borrowing. They argue that the correlation between the permanent and transitory shock to income may have biased the coefficient in a regression of consumption on income, and indeed show that OECD countries have been able to smooth permanent income risk across time once they differentiate between permanent and transitory shocks. Becker and Hoffmann (2007) and Baxter (2011) also emphasize the idea that consumption smoothing may be more prevalent in longer term horizons.

Heathcote and Perri (2004) introduce a simple model and Islamaj (2008, 2012) shows suggestive evidence that increased productivity correlations with the rest of the world may have deteriorated consumption based measures of risk sharing and as a result some empirical studies have been unable to detect an improvement in risk sharing as countries have become more financially liberalized.

Business cycle properties have been studied extensively recently. Stock and Watson (2003) document a G-7 business cycle synchronization. They identify common international shocks, domestic effects from spillovers from foreign idiosyncratic shocks and domestic idiosyncratic shocks by using structural VAR. They document that (output) correlations have decreased between US-EU, btw

UK-EU, but have increased between US-UK and within EU. They also show that common international shocks have been smaller in the 80's and 90's, keeping international cyclical correlations low. Another study is Kose, Otrok and Whiteman (2003). They use a Bayesian latent factor model to study co-movement of macroeconomic aggregates across the world, across regions and within countries for 60 countries for the period 1960-1990. They find evidence of a world cycle, which drives output growth fluctuations and is persistent across time. They also find that consumption dynamics are mostly driven by country and idiosyncratic factors.

Other studies have investigated the effects of Terms of Trade (ToT) volatility on measures of consumption risk sharing. It has been argued that terms of trade may change as countries experience financial integration, and consumers may change their optimal portfolio to insure against terms of trade shocks. Cole and Obstfeld (1991) show that insuring against ToT volatility consumers can end up with portfolio choices the same as under a planner's solution for complete markets. Heathcote and Perri (2009) show the same result for a two-country model with intermediate goods. Terms of trade can play quite a role indeed in portfolio choice, which also matters for consumption correlations. Thus, it is important that any well articulated model of consumption smoothing be in a general equilibrium framework, to account for any terms of trade movements.

Other explanations of this puzzle have been put forward as well. Non-tradeable goods may constitute a significant fraction of total consumption. Lewis (1996) has looked at the risk sharing hypothesis by decomposing consumption into tradeable, non-tradeable and durable goods, and has established that this decomposition alone cannot account for the apparent lack of consumption smoothing. She finds evidence that using this decomposition and accounting for capital markets restrictions suggests that more open countries risk share more.

Backus and Smith (1993) and Stockman and Tesar (1995) show that models with non-traded goods, when augmented with large preference shocks, are able to produce lower predicted cross-country consumption correlations, even in a complete markets framework. However, evidence of large preference shock in business cycles is weak. Park (1998) analyses a model with tradeable and non-tradeable investment and consumption goods. His model generates positive cross-country correlations of aggregate output and a cross-country correlation of consumption which is lower than that of output. These and other studies show that although non-tradeables may play a role, it is hard to explain the lack of consumption risk sharing by accounting for non-tradeables only.

3.1 The Need for a Well-Defined Framework

Although vast, for most part the empirical literature on the effects of financial liberalization on international consumption smoothing has been elusive of the-

ory, without having an explicit equilibrium framework in mind[14]. Even when market incompleteness has been considered, like for example, controlling for financial impediments, in most cases the analyses have been *ad-hoc*, probably not testing the implications of an incomplete markets framework. Next, we are going to show that a well-defined framework, like the endowment economy in Heathcote and Perri (2004), that incorporates some of the features mentioned above and can test more directly the effects of financial impediments on measures of international consumption risk sharing. The simple model accounts for impediments to purchasing foreign capital and cross-country productivity correlations. It has some testable implications for conumption smoothing and, a well-defined framework can be derived. The framework shows that the relationship between financial liberalization and consumption smoothing is nonlinear and financial integration interacts with other variables, like business cycle correlations, to affect measure of consumption risk sharing.

3.1.1 A Simple Model

A simple general equilibrium model that contains some of the features mentioned above, market incompleteness and cross-country productivity shock correlations, can give some good insights about what happens to consumption based measures of international consumption risk sharing as countries get more financially integrated.

Consider a two-country exchange (Lucas tree) economy as in Heathcote and Perri (2004). Capital (the tree) in each country is used to produce a perishable output, the quantity of which depends on the realization of the state of nature s. Domestic output is denoted X(s) and foreign output is Y(s). Prior to any trade, the representative domestic agent owns all of domestic capital stock, while the foreign agent owns foreign capital. At the start of each period, the domestic household buys claims to a fraction θ_f of the foreign capital stock, given the budget constraint. Then, the state of nature is revealed, contracts are honored, and agents consume output to which they have claims.

To formalize:
At the start of the period, the domestic household buys a fraction θ_f of the foreign tree subject to the budget constraint:

$$\theta_f P^* = (1-\tau)[P - \theta P]$$

where τ is and iceberg cost.

One can find the foreign share as,

$$\theta P + \theta_f \frac{P^*}{1-\tau} = P \Longrightarrow \theta_f = (1-\tau)\frac{P}{P^*}(1-\theta)$$

where P and P^* are the prices of the domestic and foreign stocks respectively,

[14] a notable exception would be Lewis(1996)

and $(1-\theta)$ is the proportion of the domestic stock sold.

An important assumption is that foreign capital is subject to a proportional tax, τ. This will represent transaction costs in purchasing foreign capital and later will allow us to define financial liberalization. Given a choice for θ, consumption in state s is given by:

$$c(s) = \theta X(s) + \theta_f Y(s) = \theta X(s) + \frac{P}{P^*}(1-\theta)(1-\tau)Y(s) \tag{1}$$

where θ represents fraction of domestic output held, X(s) and Y(s) represent domestic and foreign outputs, respectively, and τ represents impediments to trade in foreign capital[15].

The domestic household solves:

$$\max_{\theta}\{E[u(c_t(s))]\}$$

such that (1) and $\theta \leq 1$.

Consider the case in which the utility is exponential

$$u(c) = -\frac{1}{A}exp\{-Ac\}$$

where A is the coefficient of risk aversion.
Assume that X and Y are jointly normally distributed with means μ_x and μ_y, respectively, equal variance σ^2 and correlation coefficient ρ[16].

It can be shown that, θ, the amount of domestic endowment that a consumer chooses to keep, can be determined endogenously, and is a function of τ, ρ, μ_x and μ_y. This is an interesting observation since it relates the actual amount of financial flows to the financial restrictions imposed on the international markets. In that case, we can derive θ, the holdings of the domestic tree as[17]:

$$\theta = min\{1, \frac{(1-\rho-\tau) + \tau\frac{\mu}{A\sigma^2}}{(2-\tau)(1-\rho)}\}$$

Given an expression for θ, we can derive expressions for all the measures of consumption smoothing used in the literature that depend only on τ, ρ and μ. ρ is the cross-country correlation of productivity shocks and μ can be interpreted as the mean of output in each country. τ represents financial impediments in

[15] Market clearing for stocks implies: $\theta + \lambda_f = 1$ and $\theta_f + \lambda = 1$, where λ and λ_f represent the holdings of domestic and foreign capital share of the foreign consumer. Market clearing for consumption good requires: $c(s) + c^* + (\theta_f Y(s) + \lambda_f X(s))\tau = X(s) + Y(s)$.

[16] Initially assume $\mu_x = \mu_y = \mu$. In that case, the joint distribution over foreign and domestic endowments is perfectly symmetric and as a result $P = P^*$.

[17] Note that if $\tau \to 0 \Longrightarrow \theta \to \frac{1}{2}$, and if $\tau \to 1 \Longrightarrow \theta \to 1$

capital markets and can be thought as exogenously determined by a government authority. Thus, we have expressions for measures of consumption smoothing that depend on exogenous variables only. In contrast to earlier studies, this framework suggests that: first, consumption smoothing depends on financial liberalization in a non-linear fashion, and second, that consumption smoothing depends not only on the degree of financial openness, but also on the nature of the underlying shocks[18].

Testable Implications The exact relationship between these variables can be seen best in graphs. Figures 1 and 2 show these measures of consumption smoothing (vertical axis) and the level of financial impediments (horizontal axis), for different levels of cross-country productivity shock correlations. Low impediments means more liberalized markets. In Figures 1 and 2 $\mu = 2$, $\sigma = 0.1$ and $A = 1$. At a consumption level μ, these values translate to a coefficient of relative risk aversion (corresponding to $A\mu$) of 2[19].

Figure 1 shows what happens to the correlation between domestic consumption and domestic output as impediments to trading foreign capital, τ, decrease. A low correlation between consumption and output means that countries are better able to share consumption risks. For a given ρ, as the country becomes more liberalized the correlation between consumption and output in the domestic country decreases, albeit in a nonlinear fashion (note that for high values of τ there is little or no change in consumption smoothing when τ decreases). Figure 1 also highlights that for fixed values of τ, as ρ increases (this is shown by an upward shift in the curve in Figure 1 consumption smoothing deteriorates (the correlation between consumption and output increases). The intuition would be that as ρ increases, productivity processes between the domestic country and the rest of the world become more similar, making the gains from diversifying consumption risk smaller. Even if the country liberalizes, the net result may be deterioration in consumption smoothing if ρ has increased. This might be shown by moving from point A to point B in Figure 1.

Thus, lower financial restrictions will improve, whereas more similar productivity processes will deteriorate consumption smoothing. For these parameter values, even small impediments to trading foreign capital will shut down international financial markets, as the gains of sharing risks for this parameterization are small. This is in line with the findings of the literature for developed countries (Cole and Obstfeld (1991)). Theoretically, τ would correspond to an array of policy and institutional arrangements, which would be hard to measure. In practice, financial openness measures are imperfect, and may represent only a subset of τ in the model.

Figure 2 shows the relationship between financial restrictions and cross-country consumption correlations for different ρ. In this case, a higher correlation means better risk sharing. Again, everything else equal, fewer impediments

[18] See Heathcote and Perri (2004) for more details.

[19] and a percentage deviation of output (corresponding to $100 \times \frac{\sigma}{\mu}$) of 5 percent.

to trade in foreign capital, correspond to better consumption smoothing. For very high frictions, as τ decreases, there is no change in cross-country correlations of consumption. Only for low enough impediments to foreign capital would fewer restrictions correspond to better consumption smoothing.

Again, for a fixed τ, consumption smoothing may change if productivity correlations with the rest of the world change. For high (restrictive) costs to trading foreign capital, cross-country consumption correlations are determined by productivity correlations, ρ, by definition. For low levels of financial restrictions, a higher ρ corresponds to deterioration in consumption smoothing. This might seem a little counter-intutitive as an increase in ρ will increase output correlations by definition, and in return will increase consumption correlations. But, on the other hand, an increase in ρ has a huge negative effect on the portfolio share of foreign assets, which in turn decreases cross-country correlations for plausible parameter values. The second effect dominates and a higher ρ corresponds to a deterioration in consumption smoothing. See Heathcote and Perri (2004) for more details.

To summarize, everything else equal, there exists a nonlinear relationship between financial liberalization and consumption smoothing. These nonlinearities are not mereley a mathematical fact, but have important implications for the effect of financial liberalization and cross-country productivity correlations on consumption smoothing. A well-defined framework is necessary to capture the true effects of financial liberalization on consumption smoothing.

Empirical Framework One can estimate:

$$c_t = \beta_{1t} X_t + \beta_{2t} Y_t \tag{2}$$

where X_t is the domestic output, Y_t is the foreign output. Note that the coefficients in front of domestic output and world output are changing over time, and not fixed as assumed by some of the previous literature.

It can be shown that one can estimate[20]:

$$\beta_{1t} = \gamma_1 \tau'_t + \gamma_2 \rho'_t + \gamma_3 \rho'_t \tau'_t \tag{3}$$

$$\beta_{2t} = \delta_0 + \delta_1 \tau'_t + \delta_2 \rho'_t + \delta_3 \rho'_t \tau'_t \tag{4}$$

where[21]

[20] See the Appendix (2.8) for more detail. Note that β_{1t} is positively related to τ.

[21] $\gamma_1 = 1$, $\gamma_2 = 1 - \frac{\mu}{A\sigma^2}$, $\gamma_3 = 2(\frac{\mu}{A\sigma^2} - 1)$, $\delta_0 = 1, \delta_1 = 1, \delta_2 = \frac{\mu}{A\sigma^2} - 1, \delta_3 = 2(1 - \frac{\mu}{A\sigma^2})$ Note that τ is positively related to τ'_t. See Islamaj(2012) for more details.

$$\tau_t' = \frac{1}{(2-\tau_t)}$$

and

$$\rho_t' = \frac{1}{(1-\rho_t)}$$

According to our model, one should expect τ to be positively related to β_{1t} and negatively related to β_{2t}. Based on the discussion in the previous subsection, the relationship between financial liberalization and consumption smoothing is nonlinear and also dependent on ρ. Note that ρ is not merely a control but enters interactively in the regression. A more thorough discussion on different estimation techniques is presented in Islamaj (2012).

The framework and the analysis above suggest that the literature on consumption smoothing is suggestive of certain features that future studies should incorporate. First, depart from complete market outcomes, and second, incorporate various business cycle features. It is important that the studies are done using a well-defined framework (possibly in a general equilibrium framework) that can capture nonlinearities and interactions that affect consumption based measures of international consumption risk sharing.

Conclusions and Suggestions for Future Work

Two-country, one-good open macroeconomic models predict that under financially open markets consumers would be able to benefit from increased risk sharing opportunities. The empirical evidence shows only mixed evidence. This study carefully investigates the literature on the effects of financial liberalization on international consumption risk sharing and identifies features that have shown some degree of success in explaining the puzzle, as well as identifies promising directions for future research. The paper provides and extensive survey of the current literature and discusses in detail the strength and weaknesses of each study. Studies are classified according to the question they ask. Some studies have been looking at the hypothesis of perfect risk sharing. Others have been looking at risk sharing across groups of countries, and another group of studies has been looking at consumption risk sharing through time. Whereas most studies reject the hypothesis of perfect risk sharing, there is some evidence that more open countries have risk shared more or some countries have benefited more from risk sharing benefits during more financially open periods. This suggests that the actual level of financial impediments to trade in foreign capital matters for consumption smoothing.

Some studies have also found that business cycle properties can affect consumption based measured of risk sharing. This is also supported from some theoretical literature. This paper identifies one study that incorporates cross-country productivity correlations, as well as impediments to trade in foreign capital. The general framework, which corresponds to the endowment economy in Heathcote and Perri (2004) suggest string linearities and interactions in

the relationship between financial liberalization and measures of consumption smoothing. These nonlinearities and other factors that may affect consumption smoothing measures, like terms of trade movements, can only be capture using a general equilibrium framework and potentially have important implications about the relationship between financial openess and consumption smoothing.

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Table 1: Studies Investigating Perfect Consumption Risk Sharing

Study	Data	Methodology	Risk Sharing	Comments
Cochrane (1991)	PSDI 1980-1983	• Cross-Sectional • Regress consumption growth on independent variables.	Yes	• For short unemployment and involuntary move. • Income not a good variable
Mace (1991)	CES 1980-1983	• Panel • Consumption Growth on aggregate consumption growth and income growth	Mixed	• True for exponential utility, not true for power utility
Obstfeld (1993)	PWT 5, G-7 1950-1988	• Check correlations btw consumption growth rates, and world consumption (output) growth. • Regress consumption growth on world consumption growth.	No	• Using world consumption produces less bias • Low degree of freedom • Cross-country consumption correlations lower than cross-country output correlations
Backus, Kehoe and Kydland (1995)	OECD 1970:1-1990:2	• Hodrick-Prescott filtered cross-correlation of consumption and output btw US and other OECD	No	• Cross-country correlations of consumption lower than output counterparts
Asdrubali, Sorensen and Yosha (1996)	US states, 1963-1990	• Decompose the cross-sectional variance of gross state product data into various components representing different channels of risk sharing	No	• 39% of shocks to gross state product are insured by capital markets, 13 by government and 23 by credit markets
Sorensen and Yosha (1998)	OECD, 1966-1990	• Decompose GDP for each country into various components	No	• Only 40% of the income risk is smoothed mainly through domestic savings and budget deficits
Pakko (1998)	OECD and PWT 5 all years	• Cross-country consumption and output correlations • Correlation of consumption with own and world output • Both Hodrick-Prescot and First-Differenced	No	• Cross-country correlation low • Not robustly lower than output correlations • Correlation of consumption with own output robustly higher than with world output
Lewis (1996)	PWT 5, 73 countries 1950-	• Regress tradeables' consumption growth on	No	• Hypothesis of perfect risk sharing rejected.

	1992 Disaggregated consumption 48 countries 5-year periods 1950-1985	output, non-tradeables and leisure • Use capital market restrictions • panel			
Canova and Ravn (1996)	9 OECD countries, 1970-1990	• Regress proxies for real, fiscal, monetary and demographic factors on errors from regression of domestic to foreign consumption • GMM	Yes for short-term, no in long-run	• Full insurance against high frequency fluctuations in real, fiscal, monetary and demographic variables • Aggregate consumption co-varies with lagged demographic and labor market variable in medium-long run • Cross-country consumption correlations are different from 1	
Bai and Zhang (2005)	21 developed 19 developing 1973-1998 IFS, WDI, PWT 6.1	• Regress cross sectionally consumption growth on GDP growth • Regress in a panel and use World consumption as control	No	• Respective coefficients very different from 1 and zero	
Amler, Cardia and Zimmermann (2004)	OECD 1960:1-2000:4	• Use GMM to estimate and test hypothesis concerning pair wise cross-country correlations of macroeconomic variables	No	• Cross-country correlations of consumption are low and not higher than output correlations	
Pakko (2004)	OECD 1973:1–2002:4	• Correlations with rest of the world (consumption and output) • Spectral decomposition	No	• Non-uniform ranking of consumption and output co-movements across different frequency bands • Cross-country output and consumption correlations may not be a robust measure of international risk sharing	
Kose, Otrok and Whiteman (2003)	1960-1990 PWT, 60 countries	• Bayesian dynamic latent factor model to study co-movement of macroeconomic aggregates across the world, across regions and within countries	No	• Evidence of world cycle, which drives output growth fluctuations and is persistent across time • Consumption dynamics driven by country and idiosyncratic factors	

Table 2: Studies Investigating Consumption Risk Sharing Across (Groups of) Countries

Study	Data	Methodology	Risk Sharing	Comments
Lewis (1996)	PWT 5, 73 countries 1950-1992 Disaggregated consumption 48 countries 5-year intervals 1950-1985	• Regress tradeables' consumption growth on output, non-tradeables, leisure and capital market restrictions • panel	Yes	• Restricted countries' consumptions are more correlated to domestic output • AREAER measure used for restrictions
Canova and Ravn (1996)	9 OECD 1970-1990	• See Table 1	Yes	• Consumption correlations are higher for Europe
Crucini (1999)	Canadian Provinces, US states and G-7 Various years	• Adapt a permanent income model to allow for various degrees of income pooling • Consumption equation consistent with range from complete markets to autarky • 2-stage estimation	Yes	• Canadian Provinces and US states risk share more than G-7 countries
Kose, Prasad and Terrones (2003)	76 countries -21 industrial and 55 developing MFIE (22) and LFIE (33) WDI, IFS 1960-1999	• Volatility of consumption and output -10 years and whole sample • Volatility of consumption over income Q (adjusted by TOT) • Regress volatility of consumption/income on financial flows (+square term) current and capital account restrictions, trade openness, income, ToT, M2, inflation • Panel	yes	• C, Y, Q less volatile in industrialized countries
Bai and Zhang (2005)	See Table 1	See Table 1	Yes	• Coefficient of domestic C on output is lower for industrialized countries and the one on world C is higher
Artis and Hoffmann (2007)	See table 3	See table 3	Yes	• US states risk share more than OECD countries • US states do not perfectly risk share
Artis and Hoffmann (2008a)	OECD vs US states 1960-1990	• Regress level C on level world C and level output • Argues that level regressions are better suited at capturing country-fixed effects • Panel OLS	Yes	• US states risk share more • They still share only 50% of risks • Countries with higher degrees of integration (measured by the

		• Panel dynamic OLS			amount of international assets they trade) risk share more
Artis and Hoffmann (2008b)	OECD, E(M)U 1990-2004	• Panel OLS • Levels	Yes	•	E(M)U countries risk share more than OECD
Bekaert, Harvey and Lundblad (2005)	See table 3	• See table 3	Yes	•	Countries with open capital accounts experience greater reduction in consumption growth volatility after opening equity markets
Kose, Prasad and Terrones (2007)	PWT+WDI 1960-2004 72 countries	• Co-movement with national output • w/ world output/consumption • regressions	Yes	•	industrial countries have been better able to smooth consumption
Volosovych, V. (2012)	WDI 1985-2004 117 countries	• Income smoothing and consumption smoothing • Regress country coefficients cross-sectionally	Yes	•	More income smoothing for more open countries • Investor's protection enhances risk sharing
Bracke and Schmitz(2011)	35 countries 1970-2005 IFS	• Consumption smoothing via capital gains and investment incomes • De-facto measures	Mixed	•	Capital gains more important • Countercyclical for industrial countries • Hard to detect for emerging markets

Table 3: Studies Investigating Consumption Risk Sharing Across Time

Study	Data	Methodology	Risk Sharing	Comments
Obstfeld (1993)	PWT 5, G-7 1951-72 vs 1973-88	• Cross-country consumption correlations • Volatility of consumption • Correlation btw domestic and world consumption • Regress domestic consumption growth on world consumption growth for each sub-period	Yes	• Slight evidence of risk sharing • Small number of observations in each regression • Identifies two periods with different financial integration
Heathcote and Perri (2004)	US, Canada, Europe and Japan 1972:1-1986:2 1986:3-2000:4	• Cross-country correlations • H-P filtered, alternative de-trending methods	No	• Consumption and output correlations btw US and Rest of World have decreased • Btw US and Canada has increased • Volatility of output and consumption for US and RoW has decreased
Kose, Prasad and Terrones (2003)	76 countries - 21 industrial and 55 developing MFIE (22) and LFIE (33) WDI, IFS 1960-1999	• Volatility of consumption and output -10 years and whole sample • Volatility of consumption over income Q (adjusted by TOT) • Regress volatility of consumption/income on financial flows (+square term) current and capital account restrictions, trade openness, income, ToT, M2, inflation • Panel	Yes/ No	• Volatility of C (growth), Q (growth) has increased for MFIE, but has decrease for industrialized countries • Crises do not explain increase in C volatility for MFIE • C/Q volatility increases up to a certain threshold of financial flows, than decreases
Bai and Zhang (2005)	1973-1985, 1986-1998 See Table 1	See Table 1	No	• Extent of risk sharing has not changed over time
Artis and Hoffmann (2008b)	OECD, E(M)U 1980-1990 1990-2004	• Panel OLS • Levels	Yes	• Both groups risk share more • Significant effect of EMU and equity holdings for 1999-2004
Artis and Hoffmann (2007)	OECD 1960-1990 1980-2000 1990-2000 US states 1960-2000	• Differentiate btw permanent and transitory shocks • Only permanent shocks require countries to insure *ex-ante* • Regress consumption on permanent income • 2-stage LS	Yes	• Countries are smoothing permanent shocks • Consumption can react to permanent shocks in output and its adjustment can make it more volatile than output • Business cycle properties matter • Consumption correlations have fallen due to a decrease in trend output volatility,

				which is a common component is domestic and rest of the world C
Artis and Hoffmann (2008a)	OECD 1960-1990 1990-2004	See table 2	Yes	• level regressions capture long term-effects • limited risk sharing in the short-term • evidence of risk sharing in the medium and long run
Islamaj (2008)	WDI Periods based on relatively open vs closed periods	• using available *rule-based* financial integration indicators identify open and closed periods for each country • check correlations of domestic consumption growth and domestic output growth for each sub-period • control for productivity shock correlations with rest of the world	Yes	• preliminary evidence suggest that after controlling for productivity shock correlations with rest of the world, we can explain the lack of consumption smoothing as countries have become more integrated
Sorensen, Wu, Yosha and Zhu (2007)	24 OECD 1993-2003	• Panel OLS • growth	Yes	• Risk sharing increased • Home bias decreased • FDI is better than debt for consumption risk sharing
Bekaert, Harvey and Lundblad (2005)	95 countries 40 emerging markets 1980-2000 5-year	• Volatility 5 years before and after equity market liberalization • Panel • Various indicators of financial liberalization	Yes	• Less volatility of consumption growth to GDP growth • Results are weaker for emerging markets
Kose, Prasad and Terrones (2007)	PWT+WDI 1960-1984 1985-2004 72 countries	• Co-movement with national output • w/ world output/consumption • 9-year rolling window • Regressions for each sub-period • Effects of financial flows on risk sharing	Mixed	• industrial countries have been better able to smooth consumption over time • no evidence for emerging markets and other developing countries • financial flows have improved risk sharing in industrial countries • composition can't explain
Volosovych, V. (2012)	WDI 1985-2004 117 countries	• Income smoothing and consumption smoothing • Sample split in 1995 • role of investor's protection	Yes	• More consumption and income smoothing over time • Investor's protection enhances risk sharing
Balli, F., Kalemli-Ozcan, S. and Sørensen, B. E. (2012)	OECD 1992-2007	• Income and consumption smoothing • Sample split in 2000 • Analyzes factor income and capital gain channels	Yes	• Risk sharing has improved for OECD over time • De-facto integration (factor income) improves risk sharing

Figure 1: Financial Liberalization and Correlation between Own Consumption and Income:

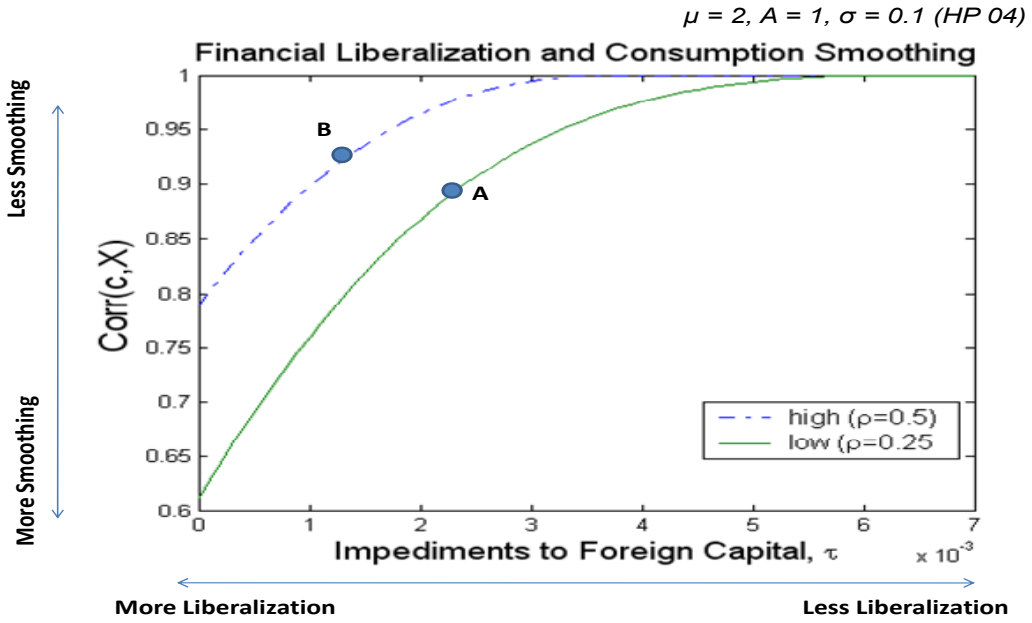
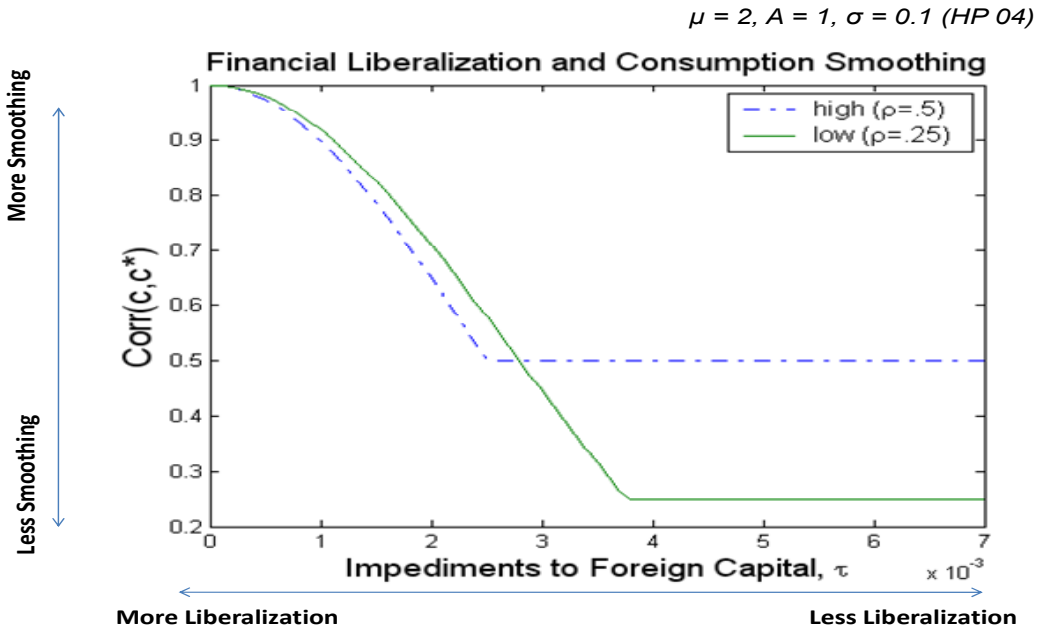


Figure 2: Financial Liberalization Correlation between Own and ROW Consumption



Notes: Figure 1-2 shows a mapping of impediments to trade in purchasing foreign capital and different measures of consumption smoothing as described in the model above for the symmetric case. The parameters used are μ=2, A=1 and σ=0.1. The scale of τ (horizontal axis) is consistent with the story that even small impediments may shut down financial markets (Cole and Obstfeld (1991)).