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Abstract

We argue that since there are several impediments to international risk sharing, the welfare gains from full international risk sharing, which have been the object of analysis in the previous literature, are not suggestive. Instead, we study the gains from feasible risk sharing and find that they are considerable (0.5% increase in permanent consumption). Marginal benefits from further risk sharing are low, which indicates that feasible risk sharing can achieve most of the benefits from internationalrisk sharing. Surprisingly, we find that sharing short term consumption risk lowers welfare. On the basis of the results we make suggestions on how to improve existing international risk sharing systems.

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1 Introduction

There is ample evidence that risk sharing across countries is far from optimal. Sørensen and Yosha (1998), for example, find that insurance among OECD countries is basically zero. French and Poterba (1991) report that, for some major countries, the percentage of assets invested in domestic markets is between 80% and 90%, while standard portfolio theory suggests that households should hold internationally diversified portfolios. It is therefore hotly debated whether agents forgo sizeable gains from diversification. Several studies have addressed this issue and have estimated the welfare gains from fully eliminating the lack of risk sharing. Most of them find that the gains are in fact considerable, although estimates vary widely. Not surprisingly, it is a common view that the current degree of international risk sharing is unsatisfactory.

We argue in this paper that the welfare gains from full risk sharing are not a good basis for evaluating the benefits from further risk sharing. This is because there are several impediments to international risk sharing that prevent full risk sharing or can make risk sharing undesirable. For example, a high degree of risk sharing leads to large transfers between countries that are difficult to enforce among sovereign nations. Moreover, risk sharing commonly amounts to insurance of consumption and income, which reduces the incentives for countries to produce and creates moral hazard.

It is therefore appealing to examine whether risk sharing that is feasible in the presence of such imperfections is worthwhile. This is the primary aim of this paper. In order to do so, we compute the welfare gains from international risk sharing that is restricted to have transfers that sum up to zero. Moral hazard and enforceability are then of limited relevance. Moreover, we aim is sidestep some of the assumptions made in the previous literature on the gains from international risk sharing. The motivation is that, in spite of the extensive literature,[1] there is no consensus regarding the likely size of the welfare gains. Recent estimates vary as widely as from less than 0.1% to more than 100%. Van Wincoop (1999) in his survey of the literature finds that variations are caused by different assumptions on the implicit risk-free interest rate, the risk-adjusted growth rate and the

[1] See surveys in Tesar (1995), Lewis (1996) and Van Wincoop (1999). Furthermore, there is the related literature that measures the costs of business cycle fluctuations, starting with Lucas (1987).

endowment uncertainty. We propose a method to compute ex-post welfare gains from historical consumption data, which does not require to specify any of this parameters.[2] Welfare gains are further sensitive to the speci…cation of the preferences.[3] We therefore develop a second approach that employs Euler equations and that is largely independent of assumptions on preferences. It is based on the idea that market interest rates re‡ect intertemporal optimization of households and can be used to value consumption streams over time.[4]

We measure the welfare gains for the G7 countries in the period from 1956 to 1992. For our …rst approach, which uses standard preferences, we …nd average gains of 0:5% (measured as increase in permanent total consumption). In contrast, the welfare gains implied by interest rates are very small (lower than 0:1%). This di¤erence can be attributed to the failure of standard preferences to take account of many aspect that have been found important in explaining asset prices. In particular, non-expected utility does not separate the intertemporal substitutability from risk aversion. For power utility for example, plausible values of risk aversion imply an elasticity of substitution that is much lower than what is needed to reconcile asset price moments. An alternative explanation for the di¤erences in gains is that in the presence of borrowing constraints, interest rates may not fully re‡ect intertemporal optimization and will give a distorting picture of the welfare gains.

The estimates from standard utility suggest that further risk sharing can indeed be worthwhile. It is true that the welfare gains are moderate in contrast to some estimates for full international risk sharing. For a comparable sample and method, Van Wincoop (1999) …nds gains in the range of 1:1% to 3:5% increase in permanent tradeables consumption.[5]

[2] Athanasoulis and Van Wincoop (2000) follow a similar approach, they estimate the endowment uncertainty from growth regressions.

[3] Campbell and Cochrance (1999) match the equity premium with habit persistence and …nd large gains. Aquivalently, matching the parameters of standard preferences to the equity premium also implies high welfare gains (Lewis, 2000). Obstfeld (1994) shows that the use of expected utility can distort the welfare gains by failing to separate the intertemporal subsititutability from risk aversion.

[4] Alvarez and Jermann (2000) also use asset prices to estimate gains from reducing risk. Their approach di¤ers from ours in the sense that they estimate a process for risk premiums which …ts asset data and then use the process to value consumption streams, while we directly extract information about intertemporal marginal rates of substitution from actual asset prices.

[5] Tradeables make up for roughly half of the total consumption spending in Van Wincoop's sample.

Feasible risk sharing, however, is easier to implement and does not create incentive problems. Our analysis also indicates that extending risk sharing beyond feasible risk sharing does not yield substantial welfare gains. This is because the marginal benefits from risk sharing decline considerably and are small for a household with feasible risk sharing. We also find that sharing yearly consumption risks causes welfare losses. We argue that this is a natural result for countries that differ mainly with respect to cyclical risk.

Our results suggest that existing international risk sharing is far from optimal. This is because it leads to redistribution that certainly has its costs by distorting incentives. Its gains, on the other hand, are questionable because they can also be reaped, at least partly, by relying on risk sharing that does not cause redistribution. In the concluding section of the paper, we make some proposals for improving international risk sharing along these lines.

The remainder of the paper is organized as follows. Section 2 outlines the rationale for feasible international risk sharing and the restriction to risk sharing without redistribution. In section 3, we model the measurement of the welfare gains. Section 4 applies the method to the G7 countries. The final section concludes.

2 Feasible Risk Sharing

Why is full international risk sharing unlikely to arise? If countries were fully insured against consumption risk, this would lead to considerable transfers between countries in case countries develop differently. Since countries are sovereign, these payments will be difficult to enforce. Moreover, in the absence of the ability to contract on risk (i.e., by contracting on shocks), risk sharing leads to insurance. A country that is fully insured against fluctuations in its income or consumption has no incentives to use its resources for production and distortions, as for example in the labor-leisure choice, can arise. Further, full risk sharing requires sharing risk in perpetuity, it is difficult to imagine such agreements in practice.[6]

Consequently, if one wants to study gains from risk sharing that is achievable and this without causing additional costs (such as through distortions caused by moral hazard), one

[6] Moreover, the gains of risk sharing in perpetuity may not be defined, see Van Wincoop (1994).

has to restrict risk sharing such that it results in low cross-border transfers (enforceability), yields a low degree of insurance (moral hazard), and has a restricted horizon. In this paper we consider risk sharing that is restricted by the condition that the sum of ex-post transfers are zero.[7] Moral hazard can then not arise because a country cannot influence its net transfers. Enforceability issues are limited because there is no ex-post redistribution.

This definition of risk sharing effectively measures the gains from international smoothing of consumption (but rules out insurance of shocks). Beyond the smoothing of business cycle fluctuations, it would also allows smoothing of permanent shocks. In contrast to full risk sharing, the per period gains are not sensitive to the horizon of risk sharing because widening differences between countries over time cannot be smoothed. For the estimation, we simply set the horizon of risk sharing equal to the sample period (roughly 40 years).

3 Measuring Welfare Gains

Under international risk sharing, the representative consumer in the home country receives every period an amount of $\tilde{C}_t$ (which is a share of world consumption) in exchange for giving up domestic consumption C_t. Feasible risk sharing requires that (ignoring the discount factor) $\sum_{t=1}^{n} \tilde{C}_t = \sum_{t=1}^{n} C_t$, where n is the horizon of risk sharing. The welfare gains under time separable expected utility are:

$$E_0[\sum_{t=1} \delta^t u(\tilde{C}_t) - \sum_{t=1} \delta^t u(C_t)] \tag{1}$$

where δ is an appropriate discount-factor. Following the convention in the literature to measure the gains as increases in permanent consumption, we define the gains implicitly:

$$0 = E_0[\sum_{t=1} \delta^t u(\tilde{C}_t) - \sum_{t=1} \delta^t u(C_t(1 + \text{gain}))] \tag{2}$$

Beside studying feasible risk sharing over the whole sample period (business cycle risk), we also study the gains from sharing yearly consumption innovations (i.e., where fluctuations beyond one period will not be smoothed).

[7] This is of course an arbitrary choice. By imposing relative strong restrictions we think of effectively measuring a lower bound on the gains from feasible risk sharing.

Sharing Yearly Risk The risk sharing contract pays a share of $\frac{C_0(1+g)}{C_0^*(1+g^*)}$ units of world consumption C_1^* for domestic consumption C_1, with g and g^* being the home and world (ex-post) growth rates.[8] The gains from the contract can then be written as:

$$0 = E_0[u(C_1^* \cdot \frac{C_0(1+g)}{C_0^*(1+g^*)}) - u(C_1(1+\text{gain}))] \tag{3}$$

Sharing Business Cycle Risk In contrast to above, the duration of a contract is now $T > 1$ with payments taking place in each period. To define contracts without redistribution, we detrend $\{C_t\}_{t\ge 0}$ and $\{C_t^*\}_{t\ge 0}$ by the ex-post growth rates g and g^* to obtain: $C_t^D := C_t/(1+g)^t$ and $C_t^{*D} := C_t^*/(1+g^*)^t$ and define the exchange ratio between C_t^D and C_t^{*D} such that average transfers are zero. The expression for the welfare gains is then:

$$0 = E_0[\sum_{t=1}^{T} \delta^t u(C_t^{*D} \cdot \overline{C}_t^D/\overline{C}_t^{*D}) - \sum_{t=1}^{T} \delta^t u(C_t^D(1+\text{gain}))] \tag{4}$$

where $\overline{C}_t^D$ and $\overline{C}_t^{*D}$ are the sample means of C_t^D and C_t^{*D}.[9] Note that the essential difference between (3) and (4) is that in the former the terms of exchange are adjusted every period (for the current levels of C and C^*) but are fixed in the latter. We set later $\delta = 1$ in (4) because a data point at the end of the sample should be treated equal to one at the beginning since we detrended the data . To save notation, we will in the following write C_t and C_t^* for $\overline{C}_t^D$ and $C_t^{*D} \cdot \overline{C}_t^D/\overline{C}_t^{*D}$, respectively, when referring to equation (4), and write C_1^* for $C_1^* \cdot C_0(1+g)/C_0^*(1+g^*)$ when referring to equation (3).

Example: The Welfare Gains with Power Utility For a representative consumer with power utility $u(C) = C^{1-\gamma}/(1-\gamma)$, equation (3) and (4) can be manipulated to:

$$\text{gain} = \left(\frac{E_0[C_1^{*1-\gamma}]}{E_0[C_1^{1-\gamma}]}\right)^{1/(1-\gamma)} - 1 \tag{5}$$

where γ is the coefficient of relative risk aversion.

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[8] Using ex-post growth rates ensures that the payments from the contract average out over the whole sample period.

[9] The definitions of contracts do not ensure that in every period the consumption in the countries add up to world consumption. However, the deviations are negligible.

3.1 The General Case

Our aim is to transform the expression for the welfare gains (equation 3 or 4) in an equation of observables without fully specifying preferences nor assuming (or estimating) a process for consumption. To do so, we first approximate $u(C_1 + \Delta x)$ by $u(C_1) + u'(C_1)\Delta x$ in (3). By doing so we measure the gains from international risk sharing at constant marginal benefits (which gives an lower bound for the welfare gains). Solving for gain in (3) yields:

$$gain = \frac{E_0[u'(C_1)C_1^*]}{E_0[u'(C_1)C_1]} - 1 \tag{6}$$

Equation (6) shows that the gains from risk sharing are determined by the expected consumption weighted with marginal utilities. Since there are no differences in ex-post consumption (zero redistribution), gains can only arise from the fact that the 'timing' of world consumption is better, i.e., world consumption is above domestic consumption if marginal utility is high (a bad state) and below domestic consumption if marginal utility is low (a good state).

The Euler equation for the representative consumer is:

$$u'(C_1) = \delta(1 + r_1)E_1[u'(C_2)] \tag{7}$$

where r_1 is the one-year domestic spot rate at $t = 1$.[10] Approximating $u'(C_0 + \Delta x)$ by $u'(C_0) + u''(C_0)\Delta x$ to substitute for $u'(C_2)$ in (7) and plugging the result into (6), one obtains:

$$gain = \frac{E_0[\delta(1 + r_1)E_1[u'(C_0) + u''(C_0)(C_2 - C_0)]C_1^*]}{E_0[\delta(1 + r_1)E_1[u'(C_0) + u''(C_0)(C_2 - C_0)]C_1]} - 1 \tag{8}$$

Since $u'(C_0)$ and $u''(C_0)$ are known at time $t = 0, 1$, this simplifies to:

$$gain = \frac{E_0[(1 + r_1)C_1^*[1 - \gamma(C_0)E_1[\frac{C_2 - C_0}{C_0}]]]}{E_0[(1 + r_1)C_1[1 - \gamma(C_0)E_1[\frac{C_2 - C_0}{C_0}]]]} - 1 \tag{9}$$

where $\gamma(C_0) = -u''(C_0) \cdot C_0 / u'(C_0)$ is the relative risk aversion parameter at time $t = 0$. Equation (9) is now an equation in the observables $(C_0, C_1, C_1^*, C_2, r_1)$ and the (at time t known) relative risk aversion $\gamma(C_0)$.

[10] Note that we do not require an international version of the Euler-equation to hold.

3.2 Deriving Bounds for the Welfare Gains

An estimator for gain could be obtained from (9) by replacing the expected value $E_1[C_2]$ with C_2 ($E[\cdot]$ is with rational expectations unbiased). However, such a procedure is imprecise since it requires replacing expectations of expected values by their realizations. Instead, we analyze $E_1[C_2]$ for two stylized consumption processes and argue that the estimates obtained for these processes provide lower and upper bounds for the true welfare gains.

Temporary Shocks If innovations to consumption are temporary at $t > 0$ (i.e., fully mean reverting in the next period), then $E_t[C_{t+1}] = C_{t-1}$ and (9) simplifies to

$$\text{gain}_T = \frac{E_0[(1+r_1)C_1^*]}{E_0[(1+r_1)C_1]} - 1 \tag{10}$$

Persistent Shocks If shocks are persistent (and detrended consumption follows a random walk) then $E_t[C_{t+1}] = C_t$ and (9) can be written as

$$\text{gain}_P = \frac{E_0[(1+r_1)C_1^*[1-\gamma(C_0)(\frac{C_1-C_0}{C_0})]]}{E_0[(1+r_1)C_1[1-\gamma(C_0)(\frac{C_1-C_0}{C_0})]]} - 1 \tag{11}$$[11]

If the true consumption process follows a more general pattern, i.e., has innovations which are partly temporary and partly persistent, equation (10) tends to understate the welfare gains. The intuitive reason is as follows. If households build their expectations on the basis of a temporary shock, a change in marginal utility is fully reflected in interest rates, while if the shock has also a persistent component, interest rates change less because they are accommodated by changes in expected next period consumption. Measuring the gains by assuming a mean reversion process (temporary shock) will thus dampen the gains since it reduces the variation in marginal utility implied by the interest rates (and therefore reduces the potential for welfare gains from risk sharing). Correspondingly, a random walk overstates the welfare gains because changes in marginal utility fully map into changes

[11] Equation (11) still contains the risk aversion parameter γ. It serves here to identify expected next year's marginal utility (as it becomes clear from the Euler equation and the following approximation) and does not directly translate into welfare gains (the main influence of the risk aversion comes through changes in current marginal utility, which is directly measured by the interest rates). In fact, estimated gains from (11) are relative insensitive to γ.

in expected future utility (persistent shocks). Interest rate changes will then overstate changes in marginal utility. Consequently, estimates on the basis of assuming this two consumption processes will bound the true welfare gains:

$$gain_T \leq gain \leq gain_P \tag{12}$$

The appendix shows that (12) is fulfilled for a consumption process that has temporary and persistent innovations and derives the general conditions for (12) to hold.

4 The Empirical Evidence

We compute the welfare gains for G7 countries (United States, Germany, Canada, France, United Kingdom, Italy and Japan) between 1956-1992 according to equations (5), (10) and (11). The data come from the Penn World Table (real per capita consumption), OECD Macroeconomic Indicators and Datastream (money market interest rates). World consumption C_t^* is computed from the per capita consumption of the countries (where all countries are weighted equally). Interest rates are, when available, the market rates on one-year treasury bills (otherwise we preferred shorter maturities). Real interest rates are obtained by deflating with ex-post inflation.[12]

The gains are computed by replacing the nominator and denominator in equations (5),(10) and (11) by their respective sample means. For the relative risk aversion γ we assume a value of 3. The results for equation (5) are summarized in Table 1. We find average gains for sharing business cycle risk of about 0.5% increase in permanent consumption. This number is at the lower end of estimates from the risk sharing literature but in line with studies assuming stationary processes, i.e., Obstfeld (1994) and Tesar (1995) estimate gains of less than 0.5%. The average gains from sharing yearly risk are negative (-0.4%). The explanation for that is simple: if a country is at the trough of a business cycle (and marginal utility is high) it is expected to growth. Sharing current consumption growth with a country that is at the peak is not beneficiary since this country is expected to have a lower consumption next period.

[12] Alternatively we tried real interest rates computed from current and lagged inflation and obtained similar results.

We also compute the marginal benefits from risk sharing. Setting $u'(C_1) = C_1^{-\gamma}$ in (6) one obtains the marginal benefits evaluated at home consumption:

$$\text{gain} = \frac{E_0[C_1^{-\gamma} C_1^{*}]}{E_0[C_1^{1-\gamma}]} - 1 \tag{13}$$

We find average marginal gains of 0.9% for business-cycle risk sharing and losses of 0.2% for one-year contracts (not reported in Table 1). The marginal benefits evaluated at world consumption can be computed from:

$$\text{gain} = \frac{E_0[(C_1^{*})^{1-\gamma}]}{E_0[(C_1^{*})^{-\gamma} C_1]} - 1 \tag{14}$$

Equation (14) has been derived from (6) by replacing $u'(C_1)$ with $u'(C_1^{*}) = (C_1^{*})^{-\gamma}$. As reported in Table 1, the marginal gains from sharing further business cycle risk are small on average (0.1%) and again negative for the yearly risk (−0.4%). As one would expect, the marginal gains from reducing consumption variability fall with a reduction in consumption variability, we find marginal gains from full risk sharing of business cycle risk to be much smaller than the initial marginal gains from sharing business cycle risk (0.1% < 0.9%). Analogous, since sharing one-year risk seems to increase consumption variability, marginal costs will raise with the degree of risk sharing (−0.2% > −0.4%). The low marginal gains for the business cycle contract suggests that the potential gains from sharing consumption risk beyond the business cycle risk are small (or that much larger transfers are necessary to induce further significant welfare gains).

The welfare gains implied by Euler equations (equations 10 and 11) are negligible (contained in Table 2). They are for both, the business cycle and the one-year contract, lower than 0.1%. The interval for the true gains given by the boundaries ($|\text{gain}_P - \text{gain}_T|$) is surprisingly narrow. It is then quite appealing that out of 14 cases, only in one case the boundary condition (12) is violated.[13]

What can explain the striking difference between the estimates from power utility and interest rates? One explanation is that in the presence of borrowing constraints and heterogeneity, the Euler equation does not hold for all households. Interest rates changes do then not fully reflect underlying aggregate consumption variability (idiosyncratic risk is

[13] For Canada, the mean reversion estimate for the business cycle contract (−0.10%) is larger than for the random walk (−0.13%).

washed out in either measure), which may understate or overstate the welfare gains. On the other hand is known that standard preferences fail to match important moments of asset prices. Remedies to these puzzles have been offered by assuming habit persistence (Constantinides, 1990, Campbell and Cochrane, 1999) and non-expected utility (Weil, 1989, Epstein-Zin, 1991). Habit persistence helps to match the equity premium by increasing the volatility of marginal utilities (the stochastic discount factor). A higher volatility of the discount factor increases, ceteris paribus, the gains from risk sharing (as equation 6 confirms). Non-expected utility allows to distinguish between risk aversion and intertemporal elasticity of substitution, which has been shown to be important for the costs of consumption fluctuations (Obstfeld, 1994).

The advantage of the interest rate approach is that it does not require to take a stance on these preferences, in fact equations (10) and (11) are very similar for the habit formation specified by Constantinides (1990), where per period utility is $u(x_t)$ with $x_t = c_t - h_t$ and $h_t = \alpha c_{t-1}$ denotes habit. The same is true for the non-expected function proposed by Weil (1990), which allows to separate risk aversion and intertemporal substitutability. The intuition is that both alterations of preferences change the welfare gains through changing the response of marginal utilities to changes in consumption. Since changes in marginal utilities are directly measured by interest rates, the interest rate approach can effectively capture habit persistence and non-expected utility even though it is based on standard preferences.

By equation (10) and (11), the welfare gains depend on the covariance of interest rates with (augmented) measures of domestic and world consumption. For a given correlation between both, a reduction in the variance of interest rates will therefore lower the gains from welfare. In our data, the variance of the interest rates is much lower than what would be implied by standard preferences (power utility with $\gamma = 3$). This is known as the 'low volatility of the risk-free rate puzzle' (see Bansal and Yaron, 2000). To our knowledge, habit persistence has not been able to explain this puzzle (habit persistence also drops as a potential explanation for the differences in gains because it tends to increase the welfare gains). On the other hand, there is a direct relation between the intertemporal elasticity and the volatility of the risk-free rate, i.e., an increase in the former reduces the latter (see for example Bansal and Yaron, 2000). Bansal and Yaron match all important asset price moments (including the risk-free rate volatility puzzle) with an intertemporal substitutability ψ of around 2. In contrast, for the case of power utility ψ is forced to be the inverse of the risk aversion. For $\gamma = 3$ this implies $\psi = 1/3$, which is way below the parameter estimated by Bansal and Yaron.[14] The reason why the intertemporal substitutability plays a role for welfare gains is the following. While risk aversion determines the 'per period gains' from a reduction in risk, the welfare gains from smoothing consumption over time are determined by the intertemporal substitutability. A high ψ means that agents are willing to substitute consumption across time, the welfare benefits from smoothing consumption are therefore lower. Understating the elasticity of substitution overstates then the welfare costs of consumption fluctuations.

Since the liquidity constraint-heterogenous agents approach has not been able to match important asset price moments (i.e., it cannot resolve the tension between the equity premium and the low risk-free rate puzzle and does not help to lower the volatility of the risk-free rate), we view the failure of standard preferences to take explicitly account of the intertemporal substitutability as the more convincing candidate for explaining the differences in gains. This would imply that standard preferences (which have been used almost exclusively in the literature) overstate the welfare gains. An exception is Obstfeld (1994) who finds that varying ψ from 0.05 to 0.5 changes the welfare costs of consumption fluctuations for the U.S. by the factor $8 - 10$. However, in his paper an increase in ψ increases the gains from reducing consumption variability for the considered parameter range. While we have no fully convincing explanation for that, it should be noted that measuring marginal utilities by interest rates does not require specifying a value for ψ.

It may surprise that the welfare gains implied by asset data are low since stock market data have been accounted for implying large welfare gains (see for example the analysis in Lewis, 2000). This is because the high observed equity premium has been explained by high risk aversion or by higher risk than implied by the variance of aggregate consumption. However, as noted by van Wincoop (1999), there is not necessarily a relation between the equity premium and the welfare gains from reducing consumption variability. Our analysis

[14] It should be noted that there is a substantial uncertainty with respect to plausible paremeters for ψ, estimates range from less than 0.1 (Hall, 1978) to more than 2 (Attanasio and Webber, 1989, and Hansen and Singleton, 1984).

confirms this: equation (10) and (11) show no apparent relation to the equity premium and imply that the welfare gains are solely determined by covariance between interest rates and consumption.

5 Summary and Conclusions

In this paper we have studied the welfare gains from risk sharing that can emerge in the presence of imperfections, such as moral hazard and sovereign risk. The gains were computed without fully specifying the consumption process and preferences, first, by using an ex-post approach to measure the gains, and, second, by deriving information about intertemporal marginal rates of substitution from market interest rates. We found that the welfare gains implied by interest rates are negligible (less than 0.1%), which is in contrast to estimates obtained from a power utility function (0.5%). The latter estimate suggests that expanding international risk sharing, despite impediments, is worthwhile.

This can be done in accordance with our analysis as follows. Countries could share national income risks by making transfers when the income of a country deviates from some moving average of the country's income. Such an arrangement would be similar to the consumption risk sharing studied in the paper. It allows only for limited redistribution because any permanent divergence in the development of countries will not be insured since the moving average will eventually adjust to the new income level. In contrast to fully sharing national income risks (as proposed by Shiller, 1993), incentive problems for governments are limited. This is because a reduction in national income will also lower average income and reduce payments in the periods to come. Since transfers are quite restricted and cannot persist over periods (this would require an accelerating growth rate), there is limited scope for default in the presence of substantial gains from such risk sharing.

Our results have implications for existing risk sharing systems. Since the marginal gains from risk sharing beyond feasible risk sharing are small, risk sharing that causes redistribution may be undesirable because the benefits can be largely reaped without incurring costs by exploiting the gains from feasible risk sharing. Moreover, since the evidence shows that sharing short term risk can in fact reduce welfare, existing risk sharing systems should be checked on whether they provide such short term insurance.

References

[1] Fernando Alvarez and Urban J. Jermann. Using asset prices to measure the cost of business cycles. working paper, University of Chicago, 2000.

[2] Stefano G. Athanasoulis and Eric Van Wincoop. Growth uncertainty and risksharing. Journal of Monetary Economics, 45:477–505, 2000.

[3] Ravi Bansal and Amir Yaron. Risks for the long run:a potential resolution of asset pricing puzzles. Journal of Political Economy, forthcoming.

[4] John Y. Campbell and John H. Cochrane. By force of habit: A consumption-based explanation of aggregate stock market behavior. Journal of Political Economy, 107:205–251, 1999.

[5] G. M. Constantinides. Habit formation: A resolution of the equity premium puzzle. Journal of Political Economy, 98:519–543, 1990.

[6] L. G. Epstein and S. Zin. Substitution, risk aversion and the temporal behavior of consumption and asset return ii: An empirical analysis. Journal of Political Economy, 99:1263–1286, 1991.

[7] Kenneth R. French and James M. Poterba. Investor diversi…cation and international equity markets. American Economic Review, 81(May):222–226, 1991.

[8] Karen K. Lewis. Why do stocks and consumption imply such di¤erent gains from international risk sharing? Journal of International Economics, 52:1–35, 2000.

[9] Robert E. Lucas. Models of Business Cycles. Basil Blackwell, Oxford, 1987.

[10] Maurice Obstfeld. Evaluating risky consumption paths: The role of intertemporal substitutability. European Economic Review, 38:1471–1486, 1994.

[11] Robert J. Shiller. Macro Markets: Creating Institutions to Manage Society's Largest Economic Risks. Clarendon Press, Oxford, 1993.

[12] Bent E. Soerensen and Oved Yosha. International risk sharing and european monetary unification. Journal of International Economics, 45:211–238, 1998.

[13] Linda L. Tesar. Evaluating the gains from international risk sharing. Carnegie-Rochester Conferences Series on Public Policy, 42:95–143, 1995.

[14] P. Weil. The equity premium puzzle and the risk free rate puzzle. Journal of Monetary Economics, 24:401–421, 1989.

[15] Eric Van Wincoop. The welfare gains from international risksharing. Journal of Monetary Economics, 34:175–200, 1994.

[16] Eric Van Wincoop. How big are the potential welfare gains from international risksharing? Journal of International Economics, 47:109–135, 1999.

6 Appendix: Bounds for the Welfare Gains

Let the foreign consumption process be constant and normalized to zero: $\{C_t^*\}_{t\geq 0} = 0$. Home consumption is hit every year by a shock ε_t which is either permanent or temporary (vanishes in the next period). Home consumption is then:

$$C_t = C_{t-1} + \varepsilon_t - (1 - D_{t-1})\varepsilon_{t-1} \tag{A1}$$

where the stochastic dummy variable D_t assumes the value 0 if the shock ε_t is temporary and 1 if the shock is permanent. Shock ε_t is normally distributed with zero mean. The dummy D_t is independently distributed with $0 < P(D_t = 0) < 1$ and $P(D_t = 0) + P(D_t = 1) = 1$. Home consumption and shock at time 0 are assumed to be zero ($C_0 = 0$, $\varepsilon_0 = 0$), thus expected home consumption equals foreign consumption.

We show that for the given consumption process equation (12) is fulfilled if the gains are expressed in absolute instead of relative terms. The absolute versions of equations (9), (10) and (11) are:

$$\begin{aligned} gain^A &= E_0[(1 + r_1)(C_1^* - C_1)[1 - \gamma(C_0)E_1[\frac{C_2 - C_0}{C_0}]]] && \text{(A2)} \\ gain_T^A &= E_0[(1 + r_1)(C_1^* - C_1)] && \text{(A3)} \\ gain_P^A &= E_0[(1 + r_1)(C_1^* - C_1)[1 - \gamma(C_0)(\frac{C_1 - C_0}{C_0})]] && \text{(A4)} \end{aligned}$$

Then, for (12) in absolute terms to be true, (A5) and (A6) have to hold:

$$\begin{aligned} gain^A - gain_T^A &= E_0[(1 + r_1)(C_1^* - C_1)[-\gamma(C_0)E_1[\frac{C_2 - C_0}{C_0}]]] \geq 0 && \text{(A5)} \\ gain^A - gain_P^A &= E_0[(1 + r_1)(C_1^* - C_1)[-\gamma(C_0)E_1[\frac{C_2 - C_1}{C_0}]]] \leq 0 && \text{(A6)} \end{aligned}$$

Simplifying (A5) and (A6) yields the following general conditions for equation (12) to hold:

$$\begin{aligned} E_0[(1 + r_1)(C_1^* - C_1)(E_1[C_2] - C_0)] &\leq 0 \quad (gain^A - gain_T^A \geq 0) && \text{(A7)} \\ E_0[(1 + r_1)(C_1^* - C_1)(E_1[C_2] - C_1)] &\geq 0 \quad (gain^A - gain_P^A \leq 0) && \text{(A8)} \end{aligned}$$

For the given consumption process, $(1 + r_1)(C_1^* - C_1)(E_1[C_2] - C_0)$ can be simplified to $-(1 + r_1)\varepsilon_1^2 \leq 0$ if $D_1 = 1$. For $D_1 = 0$, the expression vanishes. Hence, condition (A5) is fulfilled. Analogous, $(1 + r_1)(C_1^* - C_1)(E_1[C_2] - C_1)$ is $(1 + r_1)\varepsilon_1^2 \geq 0$ for $D_1 = 0$ and becomes zero for $D_1 = 1$. Thus, also condition (A6) is fulfilled.

Table 1: The Welfare Gains Computed from Power Utility

	Total Gains		Marginal Gains	
	Business Cycle	1-year	Business Cycle	1-year
United States	0.0%	0.2%	-0.1%	0.2%
Germany	0.2%	-0.7%	-0.1%	-0.8%
Canada	0.5%	0.2%	0.1%	0.2%
France	0.3%	-0.3%	0.2%	-0.4%
United Kingdom	-0.1%	0.4%	-0.6%	0.3%
Italy	0.5%	-0.4%	0.3%	-0.5%
Japan	1.8%	-2.1%	0.6%	-2.1%
Average	0.5%	-0.4%	0.1%	-0.4%

Gains are expressed as percentage increase in permanent consumption for the period 1956-1992.

Total gains are estimated from equation (5), while marginal gains are estimated from equation (14)

Table 2: The Welfare Gains as Implied by Interest Rates

	Business Cycle		1-year	
	Lower bound	Upper bound	Lower bound	Upper bound
U.S.	0.01%	0.04%	0.01%	0.04%
Germany	-0.01%	0.08%	0.01%	0.08%
Canada	-0.10%	-0.13%	0.00%	0.15%
France	-0.04%	0.00%	-0.02%	0.00%
U. K.	0.09%	0.15%	0.01%	0.15%
Italy	-0.10%	-0.03%	-0.02%	0.08%
Japan	0.12%	0.35%	-0.03%	0.09%
Average	0.00%	0.07%	-0.01%	0.08%

Gains are expressed as percentage increase in permanent consumption for the period 1956-1992. Lower bounds are estimated from equation (10), while upper bounds are estimated from equation (11)