Globalisation and consumption risk-sharing in emerging market economies

Manuel Ramos-Francia and Santiago García-Verdú, Bank of Mexico[1]

Abstract

Our aim is to explore how globalisation has affected consumption risk-sharing in emerging market economies. To that end, we implement a consumption risk-sharing test, using the Barro-Ursua Macroeconomic data set. Its span lets us explore historic episodes in which globalisation has markedly changed. We account for risk aversion heterogeneity by using the economies' estimates of their relative risk aversion coefficients, and for subjective discount factor heterogeneity by estimating panel regressions with fixed effects. Specifically, we explore risk-sharing in emerging market and advanced economies as two groups, and by geographic regions. In most cases, we reject full insurance. However, advanced economies seem to have achieved full insurance in more recent periods. At a regional level, Europe and Asia appear to have attained such a result as well.

Keywords: Risk-sharing, consumption risk-sharing, globalisation.

JEL classification: E21, F6.

Introduction

"The inhabitant of London could order by telephone, sipping his morning tea in bed, the various products of the whole earth, in such quantity as he might see fit, and reasonably expect their early delivery upon his doorstep; he could at the same moment and by the same means adventure his wealth in the natural resources and new enterprises of any quarter of the world, and share, without exertion or even trouble, in their prospective fruits and advantages; or he could decide to couple the security of his fortunes with the good faith of the townspeople of any substantial municipality in any continent that fancy or information might recommend." (Keynes (1919))

There are growing research agendas on the relationship between globalisation and selected economic fields such as growth (BIS (2017)), trade (Antràs (2015)), and inequality (Bourguignon (2015)), among others.[2] However, the relationship between globalisation and risk-sharing has received relatively less attention (eg Rangvid et al (2016)).

[1] The opinions in this note are those of the authors and do not necessarily reflect those of Bank of Mexico. We would like to thank Christian Upper and Fernando Pérez Cervantes for their comments, and José Manuel Sánchez Martínez for his excellent research assistance

[2] Globalisation entails social, economic, political and cultural processes. Thus, it is difficult to define it exactly. For our purposes, we understand it as the processes by which economies increase their financial openness, trade and labour migration.

A key feature of an open economy is its expanded budget constraint. In principle, such an expansion entails at least three features: a wider variety of goods and services (Feenstra (2010)), a smoother income across time (Hall (1978)), and a smoother income across states of nature (Cochrane (1991)). In effect, an open economy has more sources of borrowing during unfavourable times and, similarly, more savings options in better ones. Hence, an open economy should then be more capable of sharing its consumption risks.

Against this backdrop, our aim is to explore how consumption risk-sharing has evolved from 1790 to 2009 in a set of economies, paying particular attention to the case of emerging market economies (EMEs). During such a sample period, there have been variations in the level of globalisation. For instance, in 1815, the end of the Napoleonic wars gave part of the world some stability. Since around 1880, the level of globalisation increased markedly. The epigraphic quotation from Keynes captures this.

Nonetheless, the globalisation process came to a halt with the start of World War I. In effect, the period between the beginning of World War I and the end of World War II saw an important impasse in the globalisation process. Post-WWII institutions and accords gave impetus to the globalisation process. As this process has evolved, economies' risk-sharing capabilities have changed. A central issue is how and how far globalisation will evolve in the future.

In this context, we test for consumption risk-sharing. The test we implement assesses the degree to which a given economy's consumption growth depends on its own output growth, conditional on a measure of aggregate output growth. The test uses an equation similar to:

$$\Delta c_{i,t} = \Delta a_t + g\Delta y_{i,t} + \epsilon_{i,t}. \qquad (1)$$

In words, country i's consumption growth ($\Delta c_{i,t}$) depends on aggregate output growth (Δa_t) and on the country's output growth ($\Delta y_{i,t}$) plus an error term $\epsilon_{i,t}$, in period t. As we will explain, if there is full insurance, domestic consumption growth should not depend on domestic output growth. Consequently, full insurance implies that $g = 0$.

Our main objective is to explore how g has behaved through selected historical periods, in particular for EMEs. We do so to assess how far the process of globalisation has affected consumption risk-sharing.

An abridged literature review

One could argue that this strand of the literature started with Diamond (1967) and Wilson (1968). In different settings, both show that a Pareto-efficient consumption allocation depends only on aggregate output. Empirically, for example, Cochrane (1991) tests the extent to which households insure against changes in their individual incomes for the United States.

Similarly, Attanasio and Davis (1996) and Hayashi et al (1996) analyse risk-sharing in the United States. Deaton (1997) examines it in Côte d'Ivoire. Townsend (1994) and Munshi and Rosenzweig (2009) explore this phenomenon in some regions of India.

In addition, Townsend (1995) inspects the case of Thailand. Although their units of analysis vary, in general, they tend to reject full insurance. Canova and Ravn (1996) examine the implications of international consumption risk-sharing for a set of advanced economies (AEs). They argue that aggregate domestic consumption seems insured over short cycles, but not for medium and long ones. Qiao (2010) focuses on identifying long-run consumption risk-sharing.

Closer to this note, Rangvid et al (2016) focus on the relationship between capital market integration and consumption risk-sharing in advanced economies. They show that higher capital market integration predicts consumption risk-sharing, but not the reverse.[3] Hevia and Servén (2016) explore partial consumption insurance at a country level. Finally, Schulhofer-Wohl (2011) argues that accounting for risk aversion heterogeneity is key to obtaining an unbiased estimator of the coefficient assessing full insurance, an issue we explore.

The model and derivation of the test

Consider the following central planner's problem, in which we assume a utility function with a constant relative risk coefficient (CRRA), also known as an isoelastic utility.

$$\max_{\{C_{i,t}(s_t)\}} \mathbb{E}_0 \sum_{i=1}^{I} \sum_{t=0}^{\infty} \alpha_i \beta_i^t (C_{i,t}(s_t)^{1-\gamma_i} - 1)/(1-\gamma_i) \tag{2}$$

subject to

$\sum_{i=1}^{I} C_{i,t}(s_t) \leq Y_t(s_t)$ for all s_t,

where α_i is the central planner's problem weight for agent i, where $i = 1, 2, 3, \ldots, I$, β_i is the subjective discount factor of agent i, $C_{i,t}(s_t)$ is the consumption of agent i in state of nature s_t, γ_i is the coefficient of relative risk aversion of agent i, and $Y_t(s_t)$ is the aggregate output, for periods $t = 1, 2, 3, \ldots$. We assume that there is no storage, which implies a binding budget constraint.

Given an interior solution, the first-order conditions are $\mathrm{P}(s_t)\alpha_i\beta_i^t C_{i,t}(s_t)^{-\gamma_i} = \Lambda(s_t)$, where $\mathrm{P}(s_t)$ is the probability of state of nature s_t and $\Lambda(s_t)$ stands for the multiplier. We note that it only depends on the state of nature s_t, in particular, it does not depend on the agent i. Denoting logarithms of uppercases with lowercases, the first-order condition is:

$$c_{i,t}(s_t) = -\lambda(s_t)/\gamma_i + p(s_t)/\gamma_i + \log(\alpha_i)/\gamma_i - t\ \log(\beta_i)/\gamma_i$$

Under full insurance, domestic output should have no role in the determination of the consumption of economy i. Accordingly, one typically adds domestic output to the equation as follows,

$$c_{i,t}(s_t) = -\lambda(s_t)/\gamma_i + p(s_t)/\gamma_i + \log(\alpha_i)/\gamma_i - t\ \log(\beta_i)/\gamma_i + g y_{i,t}(s_t),$$

and test whether g is statistically equal to zero.

[3] Ambrus et al (2010) explore informal risk-sharing in social networks.

We note that the multiplier $\lambda(s_t)$ is strictly decreasing in the level of aggregate output. To take the test to the data, we approximate $-\lambda(s_t)$ with the level of aggregate output a_t. By adding an error term in which we include $\Delta p(s_t)$ and taking differences, we obtain the following expression:

$$\Delta c_{i,t} = \Delta a_t/\gamma_i + g\Delta y_{i,t} - \log(\beta_i)/\gamma_i + \epsilon_{i,t}$$

This last expression is similar to (1) and to equation (2) in Schulhofer-Wohl (2011).

To gain some intuition, consider that the more risk averse an agent is (ie a greater γ_i), everything else being constant, the less volatile its consumption growth is with respect to aggregate output growth. In this case, the agent is less willing to withstand a volatile consumption growth. Conversely, the less risk averse an agent is (ie a smaller γ_i), the more volatile its consumption growth is with respect to aggregate output growth. In such a case, the agent is more willing to endure a relatively more volatile consumption path.

The test we implement accounts for heterogeneity in risk aversion by using estimated risk aversion coefficients. It also considers heterogeneity in the subjective discount factors by using a fixed effects model. To see this, rewrite the equation as $\Delta c_{i,t} = \Delta a_t/\gamma_i + g\Delta y_{i,t} + u_i + \epsilon_{i,t}$ where $u_i = -\log(\beta_i)/\gamma_i$, which implies that we do not estimate the subjective discount factors. Moreover, as a dependent variable we use the difference between $\Delta c_{i,t}$ and $\Delta a_t/\gamma_i$. In short, we estimate the following panel regression model:

$$(\Delta c_{i,t} - \Delta a_t/\gamma_i) = g\Delta y_{i,t} + u_i + \epsilon_{i,t}$$

Accounting for heterogeneity in risk aversion is important. Otherwise, the estimation of g could be biased, which would lead to a pessimistic assessment of the risk-sharing capabilities of the economies under consideration (Schulhofer-Wohl (2011)). While the cited paper treats the relative risk aversion coefficients as nuisance parameters, we use estimates from Gandelman and Hernández-Murillo (2014), in which individual estimations are available for most economies in our database.[4] If the estimate for a given economy is not available, we use the average of the economy's estimates within our database. On a related issue, we implicitly assume that the relative risk aversion coefficients have kept constant during the whole sample period. In the appendix, we also estimate some of our tests, but assuming homogeneity in risk aversion. These estimations suggest the presence of the referred bias.

Two additional comments are in order. First, the test for risk-sharing is a joint one. This implies, for instance, that a specific economy could have full insurance, but since the test considers a group of economies, it might fail to find evidence on full insurance for the group as a whole. Second, the test is on the presence of full insurance. In particular, one cannot interpret a positive coefficient g that is statistically

[4] We have CRRA estimates for the following countries: Argentina, Brazil, Chile, Colombia, India, Indonesia, Korea, Malaysia, Mexico, Peru, Russia, South Africa, Sri Lanka, Uruguay, Venezuela, Australia, Austria, Belgium, Canada, Chinese Taipei, Finland, France, Germany, Greece, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Switzerland, the United Kingdom and the United States. We do not have CRRA coefficients for the following countries: China, Egypt, the Philippines, Turkey, Denmark, Iceland, Italy, Spain and Sweden. Thus, we are accounting for risk aversion heterogeneity in about 80% of the economies in our sample.

different from zero as partial insurance. Instead, we broadly interpret it as an indicator of how far an economy is from full insurance.[5]

Data

We use the Barro-Ursua Macroeconomic data set on several economies' historic consumption and output per capita. This database covers the following EMEs: Argentina, Brazil, Chile, China, Colombia, Egypt, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Russia, South Africa, Sri Lanka, Turkey, Uruguay and Venezuela. As for AEs, it includes Australia, Austria, Belgium, Canada, Chinese Taipei, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States.

Their series go as far as 1790 for a handful of economies. They all end in 2009. Naturally, more time series become available for years that are more recent. It is worth emphasising that one should take the estimations associated with the initial periods with some caution. In this respect, we have also included the number of data points considered in each regression, denoted by n. Their frequency is yearly. As a caveat, since the database goes far into the past, the EME and AE classifications do not necessarily apply throughout the whole sample. As an example, Argentina was at some point in the past one of the largest economies in the world. Yet, for consistency, we maintain such a classification.

A comment on the consumption time series is in order. Agents derive utility in a given period from services, non-durable goods, and a fraction of the durable goods they consume during such a period. These tests are commonly implemented using consumption of services and non-durable goods. This assumes separable utility functions with respect to durable goods. The Barro-Ursua database has a broad measure of consumption. We note that, given the yearly frequency, such a distinction is not as important, compared to the cases in which data with a higher frequency are used.

Measuring aggregate output growth per capita

The Barro-Ursua Macroeconomic database does not include an aggregate output index. Thus, we construct such a time series based on a weighted average of individual output during the 1960–2009 period. For periods for which some economies' time series are not available, we proportionally reweight their individual contribution. As a robustness check, we compare this global growth estimate with that of the aggregate output index from the Maddison database for the 1960–2009 period. They are very close.

As a second measure of aggregate output growth, we take the average of each economy's output growth per capita. While this is, of course, an approximation, we think it is an important benchmark, and we estimate our main models with this measure in the appendix. As additional aggregate measures, we estimate regional

[5] Note that, under autarky, such a coefficient would be one.

output growth per capita following the same procedure. We use this last time series for the regional consumption risk-sharing tests.

Historical periods

Key historical events have taken place in our sample period. Of course, our periods have some degree of subjectivity and give relatively more emphasis to events in specific regions of the world. We note that some of the subperiods overlap. Having said that, we consider the following periods.

- 1790–1880: The year 1815 marked the beginning of political and economic stability with the end of the Napoleonic Wars. In the case of EMEs, only two economies have data available for this period. In general, only a few economies cover the whole 1790–1880 period. We note that the database starts in 1790.
- 1880–1914: This period saw a rise in trade and investment. Data for most economies become available.
- 1914–44: This period has three major historical events, World War I (1914–1918), the Great Depression (1929–1939), and World War II (1939–1945).[6]
- 1945–76: As part of the postwar efforts, several institutions were founded and agreements were signed, Bretton Woods being one of them.
- 1948–94: The General Agreement on Trade and Tariffs (GATT) was key for the promotion of trade, removing tariffs and quotas. In 1995, the World Trade Organization (WTO) started, replacing the GATT.
- 1976–2009: The Jamaica Accords took place in 1976, marking the official end of Bretton Woods. One could argue that it ended in 1971, when the United States cancelled the international convertibility of the US dollar to gold.
- 1995–2009: In 1995, the WTO began. The database ends in 2009.

With time, risk-sharing between economies has changed in terms of both its capabilities and possibilities. For instance, transportation costs have fallen noticeably (BIS (2017)). Moreover, one should consider that there are limits to such possibilities if, for instance, an economy falls into a crisis.

Estimation results and discussion

We present the results of our estimations in Table 1. As mentioned, the null hypothesis is $g = 0$, implying full insurance. If such a coefficient is different from zero, its magnitude does not have a structural interpretation.

The following comments are in order. First, globalisation seems to have affected risk-sharing in EMEs and AEs. For example, both seem to have improved their risk-sharing in the 1945–1976 period, relative to their historical trends. Second, AEs appear to have benefited more from the globalisation process. In sharp contrast, EMEs' risk-

[6] In this context, it is fitting to quote the historian A J P Taylor: "No matter what political reasons are given for war, the underlying reason is always economic."

sharing has waned at the margin. Third, in general, AEs seem to have better risk-sharing capabilities compared to those of EMEs. In effect, we find evidence of full insurance in the case of AEs for the 1995–2009 period.

Consumption risk-sharing test

Table 1

	Global Output Growth						
	Emerging Market Economies						
	1790-1880	1890-1914	1914-1944	1945-1976	1948-1994	1976-2009	1995-2009
g	1.08	0.54	0.70	0.49	0.71	0.80	0.81
t-stat.	4.36	7.22	10.81	9.08	18.98	24.20	17.64
const.	0.03	0.00	-0.02	-0.02	-0.02	-0.01	-0.01
t-stat.	1.02	-0.92	-4.52	-7.57	-12.38	-7.57	-6.47
R^2	0.73	0.22	0.25	0.14	0.30	0.48	0.54
N	2	10	13	19	19	19	19
n	10	195	370	545	849	646	285
	Advanced Economies						
	1790-1880	1890-1914	1914-1944	1945-1976	1948-1994	1976-2009	1995-2009
g	0.54	0.42	0.30	0.29	0.41	0.30	-0.01
t-stat.	5.59	6.58	5.40	5.79	9.34	5.52	-0.12
const.	-0.02	-0.02	-0.03	-0.02	-0.02	-0.01	-0.01
t-stat.	-5.53	-6.37	-6.49	-3.71	-10.17	-4.94	-2.65
R^2	0.06	0.07	0.04	0.05	0.08	0.04	0.00
N	15	21	22	23	23	23	23
n	530	571	645	725	1078	782	345

Note: Time series are in real and per capita terms. The shadow indicates that the coefficient is not statistically different from zero at the 5% significance level.

Source: Authors' estimates with data from Barro-Ursua and the World Bank.

Regional consumption risk-sharing

There are several reasons why considering regional consumption risk-sharing is relevant. To begin with, geography plays a key role in its feasibility. In effect, the gravity equation in international trade is a robust relationship.

We thus consider five geographic regions: Asia, Africa, Europe, North America, and South America. Our regions have the following economies. In Asia, we have China, Chinese Taipei, India, Indonesia, Japan, South Korea, Malaysia, the Philippines, Singapore and Sri Lanka. In Africa, we have Egypt and South Africa. In Europe, we have Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Italy, the Netherlands, Norway, Russia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. In North America, we have Canada, Mexico and the United States. Finally, in South America, we have Argentina, Brazil, Chile, Colombia, Peru, Uruguay and Venezuela.

We have the following caveats. First, in the database, Africa only has Egypt and South Africa, which limits our results for this region. Second, for the regional estimations, we do not include Australia and New Zealand. Third, as mentioned, as time goes by, more economies are part of the database. Thus, coefficients from previous periods cannot be compared directly with more recent ones. In particular, one should be careful when interpreting the results for regions and periods with a small number of data points. Thus, we do not comment much on the results regarding the 1790–1880 period for that specific reason.

Having said that, we have several remarks. In Asia, we find evidence of full insurance in two periods. In the 1914–1944 period, for which we note that it involves only six economies, and in the 1995–2009 period, we also have found full insurance. We think that the latter period is more representative of the evolution of risk-sharing.

In Africa, although we fail to reject the null hypothesis in the 1945–1976 period, hinting at full insurance. But, given the magnitude of the coefficient, we attribute such a result to a low statistically power. In general, we reject full insurance at the conventional confidence levels for the rest of the periods. It is worth re-emphasising that we only have two countries for this region.

Regarding Europe, interestingly, we fail to reject the null hypothesis in the 1945–1976 and 1995–2009 periods. In the 1945–1976 period, post-war reconstruction efforts probably enabled risk-sharing. For the 1995–2009 period, the signing of the Maastricht Treaty in 1993 possibly gave place to further economic integration in Europe, playing a role in this respect.

Regarding North America, the region sees full insurance in the 1914–44 and the 1995-2009 periods. We are somewhat skeptical on the results for the 1914–44 period for at least two reasons. Mexico was going through its Revolution (1910–20). In addition, Canada participated in World War I. As mentioned, for the 1995–2009 period, we fail to reject full insurance. We think of this as the result of CUSFTA (starting in 1987), and NAFTA (starting in 1994). Still, the magnitude of the associated coefficient is relatively large.

On South America, in the 1890–1914 period, we fail to reject the null hypothesis, indicating full insurance. Prior to World War I, most South American countries had significant economic growth. We note, however, that in this period data are available for only four economies.

Our results are broadly in line with Qiao (2010), who documents that long-run risk-sharing in OECD countries increased more than that of EMEs during the past two decades. They are also in line with results in Hevia and Servén (2016), who show that high-income countries exhibit higher degrees of risk-sharing than developing countries.

Regional risk-sharing tests

Table 2

	Regional Output Growth (weighted average)						
	Asia						
	1790-1880	**1890-1914**	**1914-1944**	**1945-1976**	**1948-1994**	**1976-2009**	**1995-2009**
g	.	0.33	0.04	0.37	0.39	0.33	0.05
t-stat.	.	2.47	0.34	6.29	6.79	4.21	0.48
const.	.	-0.01	0.01	-0.02	-0.02	-0.01	-0.01
t-stat.	.	-0.57	0.47	-4.12	-4.44	-3.15	-2.33
R^2	.	0.08	0.00	0.14	0.11	0.06	0.00
N	1	5	6	9	9	9	9
n	6	79	170	253	402	306	135
	Africa						
	1790-1880	**1890-1914**	**1914-1944**	**1945-1976**	**1948-1994**	**1976-2009**	**1995-2009**
g	.	.	.	0.36	0.44	0.43	0.51
t-stat.	.	.	.	1.75	3.15	3.42	2.81
const.	.	.	.	0.00	0.00	0.00	-0.01
t-stat.	.	.	.	-0.55	-0.16	0.29	-2.38
R^2	.	.	.	0.05	0.10	0.15	0.23
N	0	1	1	2	2	2	2
n	0	20	31	62	94	68	30
	Europe						
	1790-1880	**1890-1914**	**1914-1944**	**1945-1976**	**1948-1994**	**1976-2009**	**1995-2009**
g	-0.32	0.58	0.43	0.01	0.42	0.26	0.03
t-stat.	-1.78	8.69	7.35	0.15	8.07	4.01	0.27
const.	-0.01	-0.02	-0.03	-0.01	-0.03	-0.01	-0.01
t-stat.	-1.17	-6.17	-5.00	-2.02	-11.11	-5.77	-2.81
R^2	0.01	0.15	0.10	0.00	0.07	0.03	0.00
N	12	16	17	18	18	18	18
n	472	455	495	571	846	612	270
	North America						
	1790-1880	**1890-1914**	**1914-1944**	**1945-1976**	**1948-1994**	**1976-2009**	**1995-2009**
g	-0.05	0.32	-0.05	-0.36	0.21	0.25	0.14
t-stat.	-0.30	2.70	-0.47	-3.06	3.06	3.27	1.27
const.	0.00	-0.01	-0.01	0.01	-0.01	0.00	0.00
t-stat.	-0.39	-1.97	-1.00	2.42	-3.39	-1.52	0.21
R^2	0.00	0.08	0.00	0.09	0.06	0.10	0.04
N	2	3	3	3	3	3	3
n	55	84	93	96	141	102	45
	South America						
	1790-1880	**1890-1914**	**1914-1944**	**1945-1976**	**1948-1994**	**1976-2009**	**1995-2009**
g	.	0.05	0.45	0.88	0.77	0.66	0.59
t-stat.	.	0.30	4.03	8.65	12.08	12.40	8.11
const.	.	0.01	0.00	-0.02	-0.01	0.00	-0.01
t-stat.	.	0.80	-0.03	-4.71	-2.74	-1.18	-2.50
R^2	.	0.00	0.09	0.27	0.32	0.40	0.40
N	1	4	6	7	7	7	7
n	5	80	164	208	316	238	105

Note: Time series are in real and per capita terms. The shadow indicates that the coefficient is not statistically different from zero at the 5% significance level. Asia: China, Chinese Taipei, India, Indonesia, Japan, South Korea, Malaysia, the Philippines, Singapore and Sri Lanka. Africa: Egypt and South Africa. Europe: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Italy, the Netherlands, Norway, Russia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. North America: Canada, Mexico and the United States. South America: Argentina, Brazil, Chile, Colombia, Peru, Uruguay and Venezuela.

Source: Authors' estimates with data from Barro-Ursua and World Bank.

In the appendix, we have documented that in terms of global risk-sharing, in general, we tend to reject the null hypothesis, evidence against full insurance. Contrasting such results with the regional tests, we note that this is broadly in line with the findings that the synchronisation of global business cycles seems to have decreased (Kose et al (2012)), but for various regions synchronisation has increased.

Final remarks

Having found little evidence supporting the presence of full insurance, in general, EMEs and AEs have operated in equilibria that are Pareto-inefficient. Thus, historically, there have been important opportunities to improve the risk-sharing mechanisms prevalent in the global economy. Such opportunities have been lost. Yet, at a regional level, economies appear to have seized more of those opportunities. We think there are two central issues in this regard: first, the way in which globalisation will develop in the future; second, the extent to which risk-sharing will materialise.

We have three additional remarks. First, the tests we have implemented are relatively simple. For example, a given economy might not be sharing its risks at a global level, only regionally, something we have only begun to explore.

Second, the model does not include storage, an assumption we made initially. In fact, papers such as Cochrane (1991) and Schulhofer-Wohl (2011) emphasise this point. On a related matter, we have not explicitly considered other factors such as the geographic distance between economies, which might also be relevant to risk-sharing. In principle, financial markets might be complete, but it might be costly to transfer, for example, one unit of consumption from one country to another.

Third, as explained, the aim of these tests is to assess whether there is full insurance. In particular, we have not considered the welfare cost of our results. On this matter, Rangvida et al (2016) calculate the welfare costs of the lack of full insurance and argue that they are, at times, significant.

Overall, there are important reasons to improve the current risk-sharing mechanisms, particularly so in EMEs. An adverse evolution of globalisation going forward could be costly in general, and particularly in terms of risk-sharing. The literature has paid much attention to topics that relate to globalisation, and justifiably so. Nonetheless, we think that consumption risk-sharing deserves an equal amount of attention.

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Appendix

We present three variations to our main estimations. First, these estimations illustrate that not accounting for heterogeneity in the coefficient of risk aversion could introduce a bias in the estimation of *g*, leading to a pessimistic assessment of risk-sharing. In effect, to document the findings of Schulhofer-Wohl (2011) in our context, compare the estimates in Table A1 with those in Table 1. The estimates of *g* in Table A1 are, in general, greater than those in Table A1. In particular, we note that, in the case in which we fail to reject full insurance, such a result does not hold when we do not account for risk aversion heterogeneity. Yet, several of our key results still hold; eg AEs seem to have benefited relatively more from the globalisation process in this respect.

Risk-sharing test with no CRRA correction (homogenous risk aversion) Table A1

Global Output Growth (No CRRA Correction)							
Emerging Market Economies							
	1790-1880	**1890-1914**	**1914-1944**	**1945-1976**	**1948-1994**	**1976-2009**	**1995-2009**
g	1.09	0.53	0.69	0.58	0.70	0.81	0.82
t-stat.	4.30	7.49	11.80	11.96	19.90	26.21	20.21
const.	0.03	0.00	-0.02	-0.02	-0.02	-0.01	-0.01
t-stat.	0.95	-0.96	-4.13	-7.93	-11.19	-7.02	-6.43
R^2	0.73	0.23	0.28	0.21	0.32	0.52	0.61
N	2	10	13	19	19	19	19
n	10	195	370	545	849	646	285
Advanced Economies							
	1790-1880	**1890-1914**	**1914-1944**	**1945-1976**	**1948-1994**	**1976-2009**	**1995-2009**
g	0.63	0.49	0.36	0.28	0.52	0.47	0.22
t-stat.	12.25	11.29	9.36	8.76	19.13	14.17	4.50
const.	-0.01	-0.01	-0.02	0.00	-0.01	0.00	0.00
t-stat.	-5.17	-5.46	-7.19	-0.40	-9.72	-4.78	-2.26
R^2	0.23	0.19	0.12	0.10	0.26	0.21	0.06
N	15	21	22	23	23	23	23
n	530	571	645	725	1078	782	345

Note: Time series are in real and per capita terms. Source: Authors' estimates with data from Barro-Ursua and World Bank.

Second, as explained, we constructed the aggregate output growth for the 1870–1960 period with weights based on the GDP of the 1960–2009 period. While one would expect that such weights change through time slowly, our measure is an approximation, particularly so, for the initial periods. Thus, as a benchmark, we also consider as a global output growth the arithmetic average of the individual output growth rates in the database (Table A2). The model maintains its key results.

Risk-sharing tests with equal weights for all economies

Table A2

	Global Output Growth (equally weighted)						
	Emerging Market Economies						
	1790-1880	1890-1914	1914-1944	1945-1976	1948-1994	1976-2009	1995-2009
g	0.98	0.53	0.68	0.42	0.68	0.77	0.75
t-stat.	4.37	7.47	11.21	8.51	19.59	23.83	15.59
const.	0.03	0.00	-0.01	-0.02	-0.03	-0.02	-0.02
t-stat.	1.37	-0.74	-2.86	-8.72	-15.17	-12.49	-8.38
R^2	0.73	0.23	0.26	0.12	0.32	0.48	0.48
N	2	10	13	19	19	19	19
n	10	195	370	545	849	646	285
	Advanced Economies						
	1790-1880	1890-1914	1914-1944	1945-1976	1948-1994	1976-2009	1995-2009
g	0.24	0.51	0.27	0.19	0.45	0.32	-0.07
t-stat.	2.52	10.23	6.09	4.16	12.59	5.75	-0.66
const.	-0.02	-0.02	-0.02	-0.02	-0.03	-0.02	-0.01
t-stat.	-4.41	-7.82	-5.13	-4.26	-15.83	-11.25	-4.99
R^2	0.01	0.16	0.06	0.02	0.13	0.04	0.00
N	15	21	22	23	23	23	23
n	530	571	645	725	1078	782	345

Note: Time series are in real and per capita terms. The shadow indicates that the coefficient is not statistically different from zero at the 5% significance level.

Source: Authors' estimates with data from Barro-Ursua and World Bank.

Third, we also explore risk-sharing considering as the aggregate measure global growth, and include all economies in the panel regressions. Although, given our previous results, one could have suspected that there would be no full insurance at a global level, we nonetheless still checked. Our results are in line with such a conjecture. In effect, we do not find evidence of full insurance in any period for the global economy.

Global risk-sharing tests

Table A3

	Global Output Growth						
	Global						
	1790-1880	1890-1914	1914-1944	1945-1976	1948-1994	1976-2009	1995-2009
g	0.58	0.48	0.43	0.34	0.59	0.67	0.58
t-stat.	6.33	9.99	10.06	9.17	20.35	23.32	12.60
const.	-0.02	-0.01	-0.03	-0.02	-0.02	-0.01	-0.01
t-stat.	-5.63	-5.99	-7.62	-6.69	-17.14	-11.09	-7.25
R^2	0.07	0.12	0.09	0.06	0.18	0.28	0.21
N	17	31	35	42	42	42	42
n	540	766	1015	1270	1927	1428	630

Note: Time series are in real and per capita terms.

Source: Authors' estimates with data from Barro-Ursua and World Bank