

A Service of

ZBW

Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics

Schumacher, Dieter

Working Paper

The integration of international financial markets: An attempt to quantify contagion in an input-output-type analysis

DIW Discussion Papers, No. 1554

Provided in Cooperation with: German Institute for Economic Research (DIW Berlin)

Suggested Citation: Schumacher, Dieter (2016) : The integration of international financial markets: An attempt to quantify contagion in an input-output-type analysis, DIW Discussion Papers, No. 1554, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin

This Version is available at: https://hdl.handle.net/10419/129205

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



WWW.ECONSTOR.EU



Discussion

Papers



Deutsches Institut für Wirtschaftsforschung

2016

The Integration of International Financial Markets An Attempt to Quantify Contagion in an Input-Output-Type Analysis

Dieter Schumacher

Opinions expressed in this paper are those of the author(s) and do not necessarily reflect views of the institute.

IMPRESSUM

© DIW Berlin, 2016

DIW Berlin German Institute for Economic Research Mohrenstr. 58 10117 Berlin

Tel. +49 (30) 897 89-0 Fax +49 (30) 897 89-200 <u>http://www.diw.de</u>

ISSN electronic edition 1619-4535

Papers can be downloaded free of charge from the DIW Berlin website: <u>http://www.diw.de/discussionpapers</u>

Discussion Papers of DIW Berlin are indexed in RePEc and SSRN: <u>http://ideas.repec.org/s/diw/diwwpp.html</u> http://www.ssrn.com/link/DIW-Berlin-German-Inst-Econ-Res.html

The Integration of International Financial Markets An Attempt to Quantify Contagion in an Input-Output-Type Analysis^{*}

Dieter Schumacher⁺

Europe University Viadrina Frankfurt (Oder) and DIW Berlin

February 2016

Abstract

The increasing integration of international financial markets means that credit defaults in one country have to be covered by creditors in other countries. If the principle of creditor liability were applied systematically, the financial losses incurred by the financial institution that provided the credit and is thus directly affected by the default would be "passed on" through its domestic and foreign shareholders and debt holders, as well as their creditors, to the original savers. In this paper, this contagion effect will be estimated by taking international capital linkages into account. Analogously to an input-output analysis of interindustry linkages, savings used for investments in one country are traced back to the countries from which the funds originated. This also reveals the important role of international financial centers, which essentially serve as distributors of investment risks, while the financial losses are ultimately borne by larger countries with higher levels of savings.

JEL: F65, G01, G15

Keywords: financial crises, international capital linkages, input-output analysis

^{*} English version of DIW Discussion Paper 1478

[†] I am grateful to Dietmar Edler for computing the inverse coefficients, to Mechthild Schrooten as well as Marius Clemens for valuable information on bilateral capital data, and to Hella Steinke for preparing the tables. For helpful comments on an earlier version I am grateful to Jürgen Blazejczak, Axel Jochem, and Reiner Stäglin.

Introduction

In 2008, when the mortgage default crisis hit in the USA, raising the risk of insolvency for numerous major financial institutions, a series of crises were unleashed on international financial markets. In the years that followed, banks in Greece, Ireland, Portugal, Spain, and ultimately Cyprus were driven to the brink of bankruptcy as a result of bad investments. Policy makers responded by providing extensive financial support and largely suspending the principle of creditor liability. This was rooted in fears of financial contagion, where one bank's insolvency leads to the insolvency of further banks because they have to write off a large portion of their outstanding debts to the first bank. It was only later that holders of Greek debt were pressed to cut the value of their holdings, and it was only in the case of Cyprus that their creditors were forced to bear the burden when the two largest credit institutions failed.

This raises the question of whose assets were actually protected by the state support measures. To estimate the financial losses resulting from a systematic application of the principle of creditor liability, one needs figures on national and international credit relations at the level of the individual financial institutions. This information is difficult to obtain and in some cases simply not available at all.¹ Even when the aim is to quantify domestic credit linkages within Germany alone, there are severe limitations, and numerous estimations are required (Upper and Worms 2002).

For these reasons, a number of studies have taken a different approach by examining linkages among international financial markets using aggregated national data on capital exports and imports. One of these, Gourinchas, Rey, and Truempler (2011), estimated a matrix of bilateral external claims and liabilities and used it to estimate changes in asset prices during the global financial crisis of 2008. Milesi-Feretti, Strobbe, and Tamirisa (2010) analyzed bilateral financial linkages between around 70 countries in the context of global imbalances and also illuminates the role of smaller countries as offshore financial centers. Examining a smaller group of countries over a longer period of time, Kubelec and Sa (2010) traced the development and intensity of the international integration of capital markets over more than two decades.

¹ See Schumann's (2013) paper on Irish bank creditors that had to be rescued by the Irish government. The data of the Bank for International Settlements (BIS) on banks' claims and liabilities are only available in aggregated form.

This paper takes the same approach by attempting to estimate the possible domino effect of credit defaults on a national level. Due to the linkages among international financial markets, credit failures in one country have to be paid for not only by domestic but also by foreign lenders. If the principle of creditor liability were applied systematically, the loss of assets by the affected bank would be "passed on" through its domestic and foreign shareholders and debt holders, to the original savers. In this paper, we examine this effect in a methodological framework similar to an input-output analysis of an economy's inter-industry linkages. Just as an input-output analysis traces the value added contained in the final demand for a given product back to the respective economic sectors when taking intermediate goods into account, savings contained in the investment in a given country can be traced back to the countries of origin taking international capital linkages into account.

I. Methods and Data

In every country, funds from domestic savings, supplemented by foreign funds, can be invested either at home or abroad. When international capital flows are separated by countries of origin and destination, these bilateral capital flows, supplemented by domestic investment and saving for n countries in a specific period, can be stated as shown in Table 1.

Table 1

Countries j Countries i	Country 1	Country 2	Country 3	 Country n	Total capital exports	Domestic investment	Total capital allocation
Country 1	0	X ₁₂	X ₁₃	 X_{1n}	Kexp ₁	I_1	X ₁
Country 2	X ₂₁	0	X ₂₃	 X _{2n}	Kexp ₂	I ₂	X ₂
Country 3	X ₃₁	X ₃₂	0	 X _{3n}	Kexp ₃	I ₃	X ₃
							•
Country n	X _{n1}	X _{n2}	X _{n3}	 0	Kexpn	In	X _n
Total capital imports	Kimp ₁	Kimp ₂	Kimp ₃	 Kimp _n	К	I	
Domestic saving	S_1	S ₂	S_3	 S _n	S		
Total capital formation	X ₁	X ₂	X ₃	 X _n			х

The terms above stand for the following:

 X_{ij} capital flows from country i to country j (i,j = 1,...,n)

 $Kimp_i = \Sigma_i X_{ij}$ total capital imports of country j

 $Kexp_i = \Sigma_j X_{ij}$ total capital exports of country i

- Sj saving in country j
- I_i investment in country i

In every country, the capital formation X_j from savings and capital imports has to be equal to capital allocation X_i for domestic investments and capital exports, that is:

(1)
$$Sj + \Sigma_i X_{ij} = X_j$$

and

(2)
$$I_i + \Sigma_j X_{ij} = X_i$$

with $X_j = X_i$ for i = j.

The values in the columns show the financing of assets in a given country. The values in the rows show how these assets are invested. The international mobility of capital makes it possible that investments in a country exceed the level of domestic savings and conversely that savings exceed domestic investments. In the former case, capital imports are larger than capital exports, and there is net capital inflow; in the latter case, the situation is reversed and there is net capital outflow. From equations (1) and (2) it follows that in every country, the difference between savings and investments is equal to the difference between capital exports and capital imports. This results from the fact that, by definition, in the balance of payments the net capital exports correspond to the difference between exports and imports of goods and services, and in the national accounts, the net exports of goods and services are in turn equal to the difference between saving and investment. For all countries together, capital exports must be equal to capital imports in the amount of K, and worldwide, savings S is equal to investments I.

Here, the values on the main diagonal are zero because there are no adequate data available on credit relations between the individual banks, and therefore, capital flows within the countries cannot be calculated. The sources of data that are available provide only information on cross-border capital flows. This leads to the assumption that domestic savings funds go directly into use as domestic investments or capital exports. The total extent of credit relations between original savers and final investors is thus underestimated. The analysis of the domino effect presented here thus takes into account only the risk of contagion that is connected with cross-border chains of creditors.

Table 1 corresponds formally to an input-output table which shows the deliveries between economic sectors in the first quadrant, final demand in the second quadrant, and the components of value added in the third quadrant. In the static model of input-output analysis, under the assumption of constant input coefficients, one can calculate the total production and value added that is necessary for the final demand for a certain good – both directly, in the sector producing the final good, and indirectly, through the demand for intermediate goods in all sectors.² Analogously, when assuming a constant financing structure from domestic savings and capital imports (Table 2), one can determine the total financing contained in an investment, either directly or indirectly through capital imports, and the original savings from all countries.

Table 2 Financing Structure

Countries j Countries i	Country 1	Country 2	Country 3	 Country n
Country 1	0	a ₁₂	a ₁₃	 a _{1n}
Country 2	a ₂₁	0	a ₂₃	 a _{2n}
Country 3	a ₃₁	a ₃₂	0	 a _{3n}
Country n	a _{n1}	a _{n2}	a _{n3}	 0
Total capital imports	k ₁	k ₂	k ₃	 k _n
Domestic saving	S ₁	S ₂	S ₃	 S _n
Total capital formation	1	1	1	 1

The mathematical formulation of the model is given in Appendix 1 and can be interpreted as follows: An investment in a country requires financial resources of equal value to those provided by a bank and refinanced out of domestic savings and capital imports in line with the country's average financing structure. The capital imports are provided by the countries of origin in line with their financing structures. These again include capital imports, which in turn have to be financed by the countries of origin, and so on. In financing the investments in a country, there is thus a chain of creditor relationships that extends across many levels and that can be distributed across all countries through international financial linkages. In this way, the investments in each country not only contain funds from domestic savings directly

² See Appendix 1 for selected examples from the large body of literature on input-output analysis based on the pioneering work of Wassily Leontieff.

but also contain savings from other countries indirectly. If an investment proves to be bad and if the credits cannot be repaid, then – if the principle of creditor liability is applied consistently – the losses are distributed across many countries through the international chain of creditor relationships. And in the end, original savers in all countries are affected.

The data for the model calculations come from international sources and cover the twelveyear period from 1999, the year when the euro was introduced, to 2010, the year of the Greek crisis. The cumulative amounts of financial flows reflect approximately the stock of debts or claims needed for the analysis. The data on saving and investment were taken from the national accounts. The figures on capital exports and imports were calculated from the balance of payments statistics and comprise portfolio, direct and other investment as well as changes in foreign reserves. The distribution of cumulative capital flows by country of origin and destination was done based on data from surveys by the IMF on bilateral portfolio and direct investment at the end of 2010. We were able to distinguish among 68 individual countries, among them important large countries and smaller offshore financial centers, and the group of all other countries. The list of countries is found in Table A.1 in Appendix 3. For the processing of the data, see Appendix 2.

The 69x69 matrix computed as described above only approximately fulfills the conditions for consistency in Table 1 because the balance of payments and the national accounts data are incompatible and there are gaps in the data that had to be filled in through a number of estimations. The net capital exports that result for the individual countries from the row and column totals in the bilateral matrix differ from the difference between domestic saving and investment and from the net capital exports in the balance of payments, but are comparable in size. All in all, the financing coefficients calculated from the matrix should be sufficiently reliable and the model calculations carried out with it should at least provide the basis for estimating the general direction and size of the effects. The fact that data on domestic credit relations are lacking leads to underestimation of the overall volume of credit in question, but the results on the distribution of savings losses by country remain unaffected.

From 1999 to 2010, investments and savings worldwide add up to around 120 trillion USD each, capital exports and imports to around 60 trillion USD. The countries with larger economies also have the largest savings and are thus ultimately the largest lenders. Correspondingly, the USA, China, Japan, Germany, France, Italy, and the United Kingdom are in the lead with savings volumes. International capital flows present a different picture.

Here, not just the size and economic strength of the country play a role but also the importance and international integration of the country's financial sector. The ranking list of capital exporters and thus of international lenders is again led by the USA, followed by the United Kingdom, Germany, and China. The ten largest capital exporters, however, also include Luxembourg, Ireland, and the Netherlands. Smaller offshore financial centers have a very low volume of domestic saving and show not only high capital exports but also high capital imports. The financial center London makes itself apparent in British capital imports, which not only balance out the savings deficit in the United Kingdom but also flow into the country's very high capital exports.

II. Results

Tables 3a-f present the results of the model calculations for the euro-area countries that have slipped into crisis over the last few years. The tables show, for an investment of 1 billion USD, the credit volume that is directly and indirectly dependent on it and the savings contained in it, both in total and for selected creditor countries. These are the 15 largest creditor countries as measured by capital exports and sorted according to the level of their capital exports from 1999 to 2010 (from the USA with well over 9 to Belgium with around 1 trillion USD). If the investment proves to be bad, the credits that have been made use of, both directly and indirectly, are defaulted on, and the savings contained in them is lost. To simplify the interpretation, in the following we use the term "credits" although the funds being referred to also contain other forms of financing. The starting point is always a "bad investment" in the sense that a credit for expenditures in the amount of 1 billion USD is not being repaid. The credits may also have been used to finance consumption spending.

For a bad investment of 1 billion USD, the same amount of credits are defaulted on directly in the same country: "domestic direct". In the case of *Greece* (Table 3a), these credits, in the amount of 550 million USD, are refinanced with capital imports from other countries, in which the same amount of credits again become non-performing: "indirect 1" (corresponding to the coefficients a_{ij}). The further credit defaults, which occur in the second and all following rounds, add up to 410 million USD and are referred to as "indirect 2". The total amount of indirect credit default thus amounts to 960 million USD. The total credit default – direct and indirect – amounts to around 2 billion USD (corresponding to the coefficients c_{ij}). The

indirect credit defaults reflect the domino effect and here apply primarily to foreign lenders.³ In the country-level analysis, these defaults are larger, the higher the share of capital imports in total financing is. In the case of Greece, the effect of the contagion (at 960 million USD) is almost as large as the amount of the 1 billion USD credit that was provided directly for the bad investment and that has been defaulted on. Here, the foreign credit default in the first round (550 million USD) is higher than the credit default in the second and all subsequent rounds (410 million USD).

The lower part of the table gives the volume of domestic savings, which is lost on the various levels of credit default according to the savings coefficients in the individual creditor countries. Across all levels and all countries, it adds up to the amount of the bad investment – here, 1 billion USD. In the case of Greece, almost half of the losses, at 450 million USD, are domestic Greek savings and slightly more than half, at 550 million USD, are savings from other countries (indirect 1+2), 320 million USD thereof in the first round (indirect 1) and 230 million USD in all further rounds of credit defaults (indirect 2). In total, the savings lost in other countries, at 550 million USD, corresponds to the indirect credit default in the first round, which is identical to capital imports contained in the financing of the bad investment of the country of investment. The distribution of savings losses across the individual countries differs, however, from their share in credit defaults.

Looking abroad, it is primarily savings in Germany and France that are affected (at 90 and 70 million USD or 16 and 12%, respectively, of the global effect), followed by China, the USA, and Russia. The largest credit defaults abroad are also borne by Germany (120 million USD or 13%), France, the USA, and China, followed by the United Kingdom, Luxembourg, and the Netherlands – the latter all countries with important international financial centers. Here, Germany, France, and China are already affected in the first round; the USA, United Kingdom, and Luxembourg primarily from the second round on, and the Netherlands on both levels.

³ It may also contain repercussions on the country of the bad investment insofar as other countries import capital from this country. Indirect credit defaults due to domestic bank linkages cannot be taken into consideration here due to the lack of data.

Table 3a

Credit and savings volume contained in a 1 billion USD investment: Greece

	Domestic	ic Foreign							
	direct	Indir	ect 1	Indir	ect 2	Indired	ct 1 + 2		
Creditor country	In billion USD	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	
			Directly	and indirectly affected credit v		volume			
World total thereof:	1.00	0.55	100	0.41	100	0.96	100	1.96	
United States	0.00	0.02	3	0.05	13	0.07	7	0.07	
United Kingdom	0.00	0.02	4	0.04	8	0.06	6	0.06	
Germany	0.00	0.09	17	0.03	8	0.12	13	0.12	
China	0.00	0.04	7	0.02	4	0.06	6	0.06	
Luxembourg	0.00	0.02	4	0.03	7	0.05	5	0.05	
France	0.00	0.09	16	0.03	6	0.11	12	0.11	
Ireland	0.00	0.01	1	0.01	4	0.02	2	0.02	
Japan	0.00	0.01	1	0.02	4	0.02	2	0.02	
Netherlands	0.00	0.03	5	0.03	7	0.05	6	0.05	
Spain	0.00	0.03	5	0.01	2	0.04	4	0.04	
Italy	0.00	0.01	3	0.01	3	0.03	3	0.03	
Hong Kong China	0.00	0.00	0	0.01	2	0.01	1	0.01	
Switzerland	0.00	0.01	2	0.01	3	0.02	2	0.02	
Russian Federation	0.00	0.01	2	0.03	7	0.04	4	0.04	
Belgium	0.00	0.02	3	0.01	2	0.03	3	0.03	
			Directly a	nd indirectly co	ontained saving	s volume			
World total	0.45	0.32	100	0.23	100	0.55	100	1.00	
thereof:									
United States	0.00	0.01	3	0.03	14	0.04	8	0.04	
United Kingdom	0.00	0.01	2	0.01	5	0.02	4	0.02	
Germany	0.00	0.06	20	0.02	10	0.09	16	0.09	
China	0.00	0.04	12	0.01	6	0.05	9	0.05	
Luxembourg	0.00	0.00	0	0.00	1	0.00	1	0.00	
France	0.00	0.05	16	0.02	7	0.07	12	0.07	
Ireland	0.00	0.00	1	0.00	2	0.01	1	0.01	
Japan	0.00	0.01	2	0.01	6	0.02	4	0.02	
Netherlands	0.00	0.01	3	0.01	5	0.02	4	0.02	
Spain	0.00	0.02	5	0.01	3	0.02	4	0.02	
Italy	0.00	0.01	3	0.01	4	0.02	3	0.02	
Hong Kong China	0.00	0.00	0	0.00	1	0.00	1	0.00	
Switzerland	0.00	0.01	2	0.01	3	0.01	2	0.01	
Russian Federation	0.00	0.01	3	0.02	10	0.03	6	0.03	
Belgium	0.00	0.01	3	0.00	2	0.01	3	0.01	

Table 3b

Credit and savings volume contained in a 1 billion USD investment: Ireland

	Domestic	Foreign									
	direct	Indir	ect 1	Indir	ect 2	Indired	ct 1 + 2				
creditor country	In billion USD	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD			
			Directly	and indirectly	affected credit	volume					
World total	1.00	0.74	100	0.69	100	1.43	100	2.43			
thereof:											
United States	0.00	0.12	16	0.11	16	0.23	16	0.23			
United Kingdom	0.00	0.12	16	0.06	9	0.18	12	0.18			
Germany	0.00	0.07	10	0.05	8	0.13	9	0.13			
China	0.00	0.00	1	0.03	4	0.03	2	0.03			
Luxembourg	0.00	0.07	9	0.04	6	0.11	8	0.11			
France	0.00	0.06	8	0.04	7	0.10	7	0.10			
Ireland	1.00	0.00	0	0.03	4	0.03	2	1.03			
Japan	0.00	0.02	3	0.03	4	0.05	4	0.05			
Netherlands	0.00	0.06	8	0.05	7	0.10	7	0.10			
Spain	0.00	0.02	3	0.02	2	0.04	3	0.04			
Italy	0.00	0.03	4	0.02	3	0.05	3	0.05			
Hong Kong China	0.00	0.01	1	0.01	2	0.02	1	0.02			
Switzerland	0.00	0.02	2	0.02	3	0.04	2	0.04			
Russian Federation	0.00	0.01	1	0.01	1	0.01	1	0.01			
Belgium	0.00	0.02	3	0.02	2	0.03	2	0.03			
			Directly a	ind indirectly co	nd indirectly contained savings volume						
World total	0.26	0.36	100	0.37	100	0.74	100	1.00			
thereof:											
United States	0.00	0.07	20	0.06	17	0.14	19	0.14			
United Kingdom	0.00	0.04	11	0.02	6	0.06	9	0.06			
Germany	0.00	0.05	14	0.04	10	0.09	12	0.09			
China	0.00	0.00	1	0.03	7	0.03	4	0.03			
Luxembourg	0.00	0.00	1	0.00	1	0.01	1	0.01			
France	0.00	0.03	10	0.03	7	0.06	8	0.06			
Ireland	0.26	0.00	0	0.01	2	0.01	1	0.27			
Japan	0.00	0.02	5	0.03	7	0.05	6	0.05			
Netherlands	0.00	0.02	6	0.02	5	0.04	6	0.04			
Spain	0.00	0.01	4	0.01	3	0.02	3	0.02			
Italy	0.00	0.02	5	0.01	4	0.03	4	0.03			
Hong Kong China	0.00	0.00	1	0.00	1	0.01	1	0.01			
Switzerland	0.00	0.01	3	0.01	3	0.02	3	0.02			
Russian Federation	0.00	0.00	1	0.01	2	0.01	2	0.01			
Belgium	0.00	0.01	3	0.01	2	0.02	2	0.02			

Table 3c

Credit and savings volume contained in a 1 billion USD investment: Portugal

	Domestic	Foreign							
	direct	Indir	ect 1	Indir	ect 2	Indired	rt 1 + 2		
creditor country	In billion USD	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	
			Directly	and indirectly	affected credit	volume			
World total	1.00	0.56	100	0.48	100	1.04	100	2.04	
thereof:									
United States	0.00	0.01	2	0.07	14	0.08	8	0.08	
United Kingdom	0.00	0.01	2	0.05	10	0.06	6	0.06	
Germany	0.00	0.06	10	0.04	9	0.10	10	0.10	
China	0.00	0.03	5	0.02	4	0.05	4	0.05	
Luxembourg	0.00	0.03	6	0.03	7	0.06	6	0.06	
France	0.00	0.08	14	0.04	7	0.12	11	0.12	
Ireland	0.00	0.08	14	0.02	3	0.10	9	0.10	
Japan	0.00	0.01	1	0.02	4	0.03	3	0.03	
Netherlands	0.00	0.04	8	0.03	7	0.08	7	0.08	
Spain	0.00	0.09	16	0.01	2	0.10	10	0.10	
Italy	0.00	0.02	3	0.02	3	0.03	3	0.03	
Hong Kong China	0.00	0.00	0	0.01	1	0.01	1	0.01	
Switzerland	0.00	0.01	1	0.01	3	0.02	2	0.02	
Russian Federation	0.00	0.01	1	0.01	1	0.01	1	0.01	
Belgium	0.00	0.01	2	0.01	3	0.03	2	0.03	
			Directly a	nd indirectly contained savings volume					
World total	0.44	0.31	100	0.26	100	0.56	100	1.00	
United States	0.00	0.01	2	0.04	16	0.05	٩	0.05	
United Kingdom	0.00	0.01	2	0.07	7	0.03	3	0.03	
Germany	0.00	0.00	13	0.02	, 12	0.02	12	0.02	
China	0.00	0.04	8	0.03	6	0.07	7	0.07	
Luxembourg	0.00	0.00	1	0.02	1	0.00	, 1	0.00	
France	0.00	0.05	16	0.02	8	0.07	12	0.07	
Ireland	0.00	0.03	7	0.02	2	0.03	4	0.03	
lanan	0.00	0.01	, 2	0.02	-	0.02	4	0.02	
Netherlands	0.00	0.02	5	0.01	5	0.03	5	0.03	
Snain	0.00	0.06	18	0.01	3	0.06	11	0.06	
Italy	0.00	0.00	4	0.01	4	0.02	4	0.02	
Hong Kong China	0.00	0.00	0	0.00	1	0.00	1	0.00	
Switzerland	0.00	0.00	1	0.01	- २	0.01	2	0.01	
Russian Federation	0.00	0.01	2	0.01	2	0.01	2	0.01	
Belgium	0.00	0.01	2	0.01	3	0.01	2	0.01	

Table 3d

Credit and savings volume contained in a 1 billion USD investment: Spain

	Domestic	Foreign								
	direct	Indir	ect 1	Indir	ect 2	Indired	tt 1 + 2			
Creditor country	In billion USD	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD		
			Directly	and indirectly	affected credit	volume				
World total thereof:	1.00	0.38	100	0.30	100	0.68	100	1.68		
United States	0.00	0.03	8	0.04	15	0.07	11	0.07		
United Kingdom	0.00	0.02	5	0.03	10	0.05	7	0.05		
Germany	0.00	0.05	14	0.02	8	0.08	12	0.08		
China	0.00	0.02	6	0.01	4	0.03	5	0.03		
Luxembourg	0.00	0.02	6	0.02	7	0.04	6	0.04		
France	0.00	0.06	16	0.02	7	0.08	12	0.08		
Ireland	0.00	0.01	3	0.01	4	0.02	3	0.02		
Japan	0.00	0.01	2	0.01	4	0.02	3	0.02		
Netherlands	0.00	0.04	11	0.02	6	0.06	9	0.06		
Spain	1.00	0.00	0	0.01	3	0.01	1	1.01		
Italy	0.00	0.01	4	0.01	3	0.02	3	0.02		
Hong Kong China	0.00	0.00	0	0.00	2	0.01	1	0.01		
Switzerland	0.00	0.01	2	0.01	3	0.01	2	0.01		
Russian Federation	0.00	0.01	2	0.00	1	0.01	2	0.01		
Belgium	0.00	0.01	3	0.01	3	0.02	3	0.02		
			Directly a	nd indirectly contained savings volume						
World total thereof:	0.62	0.22	100	0.16	100	0.38	100	1.00		
United States	0.00	0.02	8	0.03	16	0.04	12	0.04		
United Kingdom	0.00	0.01	3	0.01	6	0.02	4	0.02		
Germany	0.00	0.04	17	0.02	10	0.05	14	0.05		
, China	0.00	0.02	9	0.01	7	0.03	8	0.03		
Luxembourg	0.00	0.00	1	0.00	1	0.00	1	0.00		
France	0.00	0.04	17	0.01	7	0.05	13	0.05		
Ireland	0.00	0.00	1	0.00	2	0.01	2	0.01		
Japan	0.00	0.01	3	0.01	7	0.02	5	0.02		
Netherlands	0.00	0.02	7	0.01	5	0.02	6	0.02		
Spain	0.62	0.00	0	0.00	3	0.00	1	0.62		
Italy	0.00	0.01	4	0.01	4	0.02	4	0.02		
Hong Kong China	0.00	0.00	0	0.00	1	0.00	1	0.00		
Switzerland	0.00	0.00	2	0.00	3	0.01	2	0.01		
Russian Federation	0.00	0.01	3	0.00	2	0.01	2	0.01		
Belgium	0.00	0.01	3	0.00	3	0.01	3	0.01		

Table 3e

Credit and savings volume contained in a 1 billion USD investment: Italy

	Domestic	Foreign								
	direct	Indir	ect 1	Indir	ect 2	Indired	t 1 + 2			
creditor country	In billion USD	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD		
			Directly	and indirectly	and indirectly affected credit volume					
World total thereof:	1.00	0.30	100	0.25	100	0.55	100	1.55		
United States	0.00	0.01	4	0.04	15	0.05	9	0.05		
United Kingdom	0.00	0.03	10	0.02	9	0.05	10	0.05		
Germany	0.00	0.04	13	0.02	9	0.06	11	0.06		
China	0.00	0.02	7	0.01	4	0.03	5	0.03		
Luxembourg	0.00	0.03	9	0.02	6	0.04	8	0.04		
France	0.00	0.05	15	0.02	7	0.06	11	0.06		
Ireland	0.00	0.02	6	0.01	4	0.03	5	0.03		
Japan	0.00	0.01	3	0.01	4	0.02	4	0.02		
Netherlands	0.00	0.02	6	0.02	7	0.03	6	0.03		
Spain	0.00	0.01	4	0.01	2	0.02	3	0.02		
Italy	1.00	0.00	0	0.01	3	0.01	1	1.01		
Hong Kong China	0.00	0.00	0	0.00	2	0.00	1	0.00		
Switzerland	0.00	0.00	2	0.01	3	0.01	2	0.01		
Russian Federation	0.00	0.01	2	0.00	1	0.01	2	0.01		
Belgium	0.00	0.01	3	0.01	3	0.01	3	0.01		
			Directly a	nd indirectly contained savings volume						
World total thereof:	0.70	0.17	100	0.13	100	0.30	100	1.00		
United States	0.00	0.01	4	0.02	17	0.03	10	0.03		
United Kingdom	0.00	0.01	6	0.01	6	0.02	6	0.02		
Germany	0.00	0.03	16	0.01	11	0.04	14	0.04		
, China	0.00	0.02	11	0.01	6	0.03	9	0.03		
Luxembourg	0.00	0.00	1	0.00	1	0.00	1	0.00		
France	0.00	0.03	16	0.01	7	0.04	12	0.04		
Ireland	0.00	0.00	3	0.00	2	0.01	2	0.01		
Japan	0.00	0.01	5	0.01	7	0.02	6	0.02		
Netherlands	0.00	0.01	4	0.01	5	0.01	4	0.01		
Spain	0.00	0.01	5	0.00	3	0.01	4	0.01		
Italy	0.70	0.00	0	0.01	4	0.01	2	0.70		
Hong Kong China	0.00	0.00	0	0.00	1	0.00	1	0.00		
Switzerland	0.00	0.00	2	0.00	3	0.01	2	0.01		
Russian Federation	0.00	0.00	3	0.00	2	0.01	2	0.01		
Belgium	0.00	0.00	3	0.00	3	0.01	3	0.01		

Table 3f

Credit and savings volume contained in a 1 billion USD investment: Cyprus

-	Domestic	Foreign							
	direct	Indir	ect 1	Indir	ect 2	Indired	rt 1 + 2		
creditor country	In billion USD	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	In % of world total	In billion USD	
			Directly	and indirectly affected credit vo		volume			
World total	1.00	0.87	100	0.46	100	1.33	100	2.33	
thereof:									
United States	0.00	0.01	1	0.07	16	0.08	6	0.08	
United Kingdom	0.00	0.00	0	0.04	8	0.04	3	0.04	
Germany	0.00	0.01	1	0.04	8	0.05	4	0.05	
China	0.00	0.00	0	0.01	3	0.02	1	0.02	
Luxembourg	0.00	0.04	4	0.02	5	0.06	5	0.06	
France	0.00	0.00	0	0.03	6	0.03	2	0.03	
Ireland	0.00	0.00	0	0.01	3	0.01	1	0.01	
Japan	0.00	0.00	0	0.02	4	0.02	1	0.02	
Netherlands	0.00	0.02	3	0.03	7	0.06	4	0.06	
Spain	0.00	0.00	0	0.01	2	0.01	1	0.01	
Italy	0.00	0.00	0	0.01	3	0.01	1	0.01	
Hong Kong China	0.00	0.00	0	0.01	2	0.01	1	0.01	
Switzerland	0.00	0.00	0	0.01	3	0.01	1	0.01	
Russian Federation	0.00	0.57	66	0.01	2	0.58	44	0.58	
Belgium	0.00	0.00	0	0.01	2	0.01	1	0.01	
			Directly a	nd indirectly co	nd indirectly contained savings volume				
World total	0.13	0.63	100	0.24	100	0.87	100	1.00	
thereof:									
United States	0.00	0.00	1	0.04	18	0.05	6	0.05	
United Kingdom	0.00	0.00	0	0.01	6	0.01	2	0.01	
Germany	0.00	0.01	1	0.03	11	0.04	4	0.04	
China	0.00	0.00	0	0.01	5	0.02	2	0.02	
Luxembourg	0.00	0.00	0	0.00	1	0.00	0	0.00	
France	0.00	0.00	0	0.02	7	0.02	2	0.02	
Ireland	0.00	0.00	0	0.00	1	0.00	0	0.00	
Japan	0.00	0.00	0	0.01	6	0.02	2	0.02	
Netherlands	0.00	0.01	2	0.01	5	0.02	3	0.02	
Spain	0.00	0.00	0	0.01	2	0.01	1	0.01	
Italy	0.00	0.00	0	0.01	4	0.01	1	0.01	
Hong Kong China	0.00	0.00	0	0.00	1	0.00	0	0.00	
Switzerland	0.00	0.00	0	0.01	3	0.01	1	0.01	
Russian Federation	0.00	0.50	79	0.01	4	0.51	58	0.51	
Belgium	0.00	0.00	0	0.01	2	0.01	1	0.01	

In the case of *Portugal* (Table 3c) a similar pattern appears for the overall effects and the affected creditor countries. Here, however, following Germany and France (with 70 million USD each, or 12% of the affected savings volume abroad) the neighboring country Spain appears to be affected particularly severely. In addition, credit defaults play a major role for Ireland – but most of these are "passed on" to savers in other countries. A credit default in *Spain* (Table 3d), due to the size of the country, affects domestic savers to a much greater extent. Just over one third of the losses must be borne by foreigners, again primarily in Germany and France (around 50 million USD each, or 14 and 13% of affected savings abroad), followed by the USA and China. The effects of a credit default in *Italy* (Table 3e) show a similar pattern, with domestic savers holding an even higher share of the lost savings.

In contrast, three quarters of those affected by credit default in *Ireland* (Table 3b) are foreign savers, primarily in the USA but also in Germany (90 million USD or 12%), the United Kingdom, and France. The role of London as an international financial center, which passes on most of its losses from credit defaults to savers in other countries, can be seen in the fact that the United Kingdom holds a much larger share of the non-performing credits than it does of the ultimately affected savings: In the case of Ireland, at 16% the United Kingdom (together with the USA) is the country most strongly affected by first-round credit defaults abroad, but it only has a 9% share of affected savings abroad. The case is the opposite with Germany: Here, the share of the affected savings is higher than the share of credit defaults.

In *Cyprus* (Table 3f), the foreign share in total losses is even larger than in Ireland. This applies particularly to Russia, which holds the largest share of the non-performing credits, at 60%, and half of the lost savings. Russia is followed by the USA, Luxembourg, the Netherlands, Germany, and the United Kingdom in the share of non-performing credits, and by the USA and Germany in lost savings (40 million USD or 4%).

The smaller a country is – for example, Cyprus and Ireland – the more its losses are passed on to savers in other countries. The larger a country is – such as Italy – and thus in possession of a more substantial volume of domestic savings, the more its losses are borne by domestic savers and the less savings abroad are affected. On the other hand, the larger the economy of a country in crisis is, the higher the absolute level of bad investments and thus also of losses abroad. If one takes domestic investments as a benchmark and sets Greece equal to 1, then the effects of credit defaults in Portugal and Ireland are similar in size, in the case of Spain and Italy 5 to 6 times the size, and in the case of Cyprus just one-thirteenth of the effect of credit

default in Greece. Taking capital imports as a benchmark, Italy would "only" have three times and Ireland six times while Cyprus would have one quarter the Greek effect.

The results for the selected countries of investment show that the (indirect) effects on savings by foreign creditors are not only significant in the first round but that they do play a substantial role in subsequent rounds, which can only be quantified with the aid of the model calculations. They also show that the shares of the individual creditor countries in the affected savings abroad may diverge significantly from their share in the indirect credit defaults in the first round, i.e., the capital imports of the country of investment. Thus, for example, the share of the USA in savings losses is much larger than the US share in capital imports. For Luxembourg and Ireland, in general the opposite is the case. The significance of the indirect effects on savings is also evident in a comparison of the findings for all of the countries of investment considered in the model calculations.

Table A.1 in the Appendix shows the credit volume depending directly and indirectly on an equally large investment and the savings contained therein for all investment countries, both in total as well as the capital imports and savings from Germany contained in the total. According this table, the total credit default abroad (domino effect) that would be caused by a bad investment of 1 billion USD is just 0.1 to 0.2 billion USD in countries that primarily finance their investments domestically, such as Kuwait, Saudi-Arabia, Venezuela, Argentina, China, India, Indonesia, Japan, and Korea, and as much as 2 billion USD or more in offshore financial centers like Curacao, Isle of Man, Bermuda, the Cayman Islands, Gibraltar, Guernsey, Jersey, and the Dutch Antilles, but also in Luxembourg. The effects abroad starting in the second round (indirect 2) are, in most cases, similarly large to those in the first round (indirect 1).

Also in a broader comparison, the results show that the effects of an equally large credit default on foreign creditors and savers tends to be larger for smaller countries. One reason for this is that foreign economic linkages play a more important role in relative terms in smaller countries than in larger ones. Second, it is primarily small countries with their tax incentives that have developed into centers for international financial transactions. Against this backdrop, the high indirect effects of a credit default in the United Kingdom is particularly noteworthy, which result from London's role as an international financial center and from the high capital imports to finance the British savings deficit.

The German shares of affected savings abroad differ significantly by country of investment. Taking all of the rounds into account, it ranges from 2% in Bahrain and Barbados to between 18 and 20% in Poland, the Czech Republic, and Austria and all the way to 40% in Malta. The German share of losses to countries abroad in the first round varies even more widely, and is driven primarily by bilateral factors. The share of losses starting with the second round varies much less widely, and thus has a balancing effect. On average, it reflects the German share of global savings and capital exports (of 6 to 7%). In many cases, the total affected savings in Germany is larger than what the German share of capital imports by the investment country would suggest (affected credit volume indirect 1).

The same is true of the other countries with the strongest economies and the largest savings. However, the amount of losses and the order of countries affected differs by investment country. Tables A.2 and A.3 in the Appendix show, for each investment country, the ten creditor countries that would be most heavily affected by losses abroad in the case of a credit default. Table A.2 gives the share of capital imports, Table A.3 the total affected savings, taking all the rounds into account.

Among foreign savers, Germany is affected most of all when credits in European countries like Austria, Bulgaria, Greece, Austria, Bulgaria, the Czech Republic, Greece, Italy, Poland, Romania or Slovakia are not repaid (Table A.3) – with a share of savings affected abroad of 13 to 20% (see Table A.1). Turning to other regions of the world, however, savers in the USA are more strongly affected by a credit default than other foreign savers. The same is true of many offshore areas. In the case of a credit default in Cyprus, it is primarily Russians who lose their savings, while with a credit default in Gibraltar, both US and Russian savers are most affected. Japan is near the top of the ranking especially in Asian countries.

Table 4 presents the 15 largest capital export countries and how frequently they appear among the top five and three most affected creditor countries when comparing the rankings in Tables A.2 and A.3. Looking at total affected savings, the USA is among the top five in all other 68 countries and in the top three most affected creditor countries in 61 countries. It is followed by Germany, Japan, United Kingdom, France, and China. The disproportionate effect on the USA results from its large savings funds and high capital exports; for Germany and France, savings and capital exports play a similar role. For the United Kingdom, the high capital exports play the primary role, whereas for Japan and China it is the high savings funds.

Table 4

	Frequency ir	n the top five	Frequency in	the top three	For comparison :		
	Credit default		Credit default	Affected savings volume	Share of global		
Creditor country	abroad indirect 1	abroad indirect 1 + 2	abroad indirect 1	abroad indirect 1 + 2	Capital exports	Savings funds	
	(a _{ij})	(c _{ij} s _j)	(a _{ij})	(c _{ij} s _j)	in %	in %	
United States	54	68	50	61	16	17	
United Kingdom	37	37	28	20	13	3	
Germany	29	57	15	34	7	6	
China	8	30	5	12	6	13	
Luxembourg	35	0	9	0	6	0	
France	24	33	10	15	5	4	
Ireland	6	0	5	0	4	1	
Japan	13	38	6	25	4	11	
Netherlands	40	20	23	7	3	2	
Spain	10	8	7	5	3	2	
Italy	5	6	1	2	2	3	
Hong Kong China	5	5	5	2	2	1	
Switzerland	3	0	0	0	2	1	
Russian Federation	5	5	3	3	2	3	
Belgium	0	0	0	0	2	1	

The creditor countries found most frequently among the most affected countries

Source: own model calculations and information from the IMF and the World Bank.

Examining credit defaults based on capital imports figures (indirect 1), a different picture appears. Here, among the most frequently affected countries, the USA is followed by the Netherlands and Luxembourg, and all three are found even more frequently than Germany among the top five. In the case of Germany (in the top five 57 times for total savings and 29 times for capital imports), Japan (38 versus 13), and China (30 versus 8), the frequency of a high loss of savings is far underestimated if one considers direct capital imports from these countries alone. The case is reversed for countries like Luxembourg (0 versus 35), Ireland (0 versus 6), and the Netherlands (20 versus 40). They are affected primarily by credit defaults, but only a small amount of their domestic savings are affected.

III. Conclusions

The results of the model calculations allow us to answer two questions for each country: First, which foreign countries' credit defaults affect this country the most, and second, which foreign countries would be most affected by a credit default in this country. There are two indicators that show the level to which countries are affected: first, the amount of credits defaults, and second, the original savings contained in that amount. The effects on other

countries (contagion) can be determined easily for the first round with the financing coefficients on the basis of capital imports, but from the second round on, they can only be estimated through the model calculations. In most cases, they are just as high as in the first round. The country structure in subsequent rounds of credit defaults may also differ significantly from credit defaults in the first round.

If the principle of creditor liability is applied consistently across the entire credit chain, the countries that ultimately lose assets are those where the savings originated, which went directly and indirectly through international capital flows into the bad investment. Naturally, the largest countries are affected especially severely, since the largest amount of savings comes from them. Here the USA, Germany, and Japan are in the lead. These countries therefore have a large interest in saving the banks that provide the credits. The analysis clearly shows the role of small countries with large financial sectors such as Luxembourg, Ireland, and Cyprus, but also the United Kingdom with the London financial center. Smaller countries with high capital exports and imports are above all distributors of the losses to other countries and pass on the final losses primarily to the larger countries. But they, too, have an interest in saving banks in order to not to lose their business model and thus their source of income. The former would lose their assets, the latter would lose their business.

Germany is affected in particular by a credit default in other European countries. In view of its large volume of savings, Germany also ranks near the top in the case of a credit default in other parts of the world. Looking solely at the respective capital imports from Germany, the losses of German savings due to credit defaults in other countries are underestimated in many cases. The same is true of the USA and Japan; here, too, the analysis of the total affected savings volume shows the true dimension of losses.

The results of the model calculations are subject to a number of limitations. They apply only to an average pattern of different investment forms, to average financing structures, and to a situation where losses from the original credit default are passed on across all of the links in the creditor chain. The effects are smaller when the affected banks are able to absorb the losses. The results also depend crucially on the availability of reliable data on the international capital linkages. The model calculations do not allow conclusions to be drawn about the effects of a default on specific debts or differentiation by investment forms. Here, the investment losses of a country like China, which invested its capital abroad in relatively secure instruments such as US government bonds, tend to be overestimated. However, the

results are likely to give a general impression of how and to what extent a debt crisis in a given country may affect creditors in other countries and what amount of original savings will ultimately be in danger.

It may be possible to improve the data used as the basis for our estimations by additionally evaluating data on bilateral bank credits from the Bank for International Settlements (BIS). What could also be helpful in this regard is a database currently under development by the EU countries that will be structured analogously to the portfolio statistics of the German Bundesbank and will provide data on bilateral portfolio stocks, broken down by sectors such as state, financial institutions, other companies, and private households. For a more in-depth analysis of specific cases, more precise model calculations can be carried out by modifying the coefficients of bilateral linkages, making risk estimates for the respective creditor positions. Thus the approach used here, carried out on the basis of international capital linkages, can supplement other analyses of possible contagion effects of financial crises, in which determinants like macroeconomic stability or exchange rate regimes are taken into account.

The support measures of the euro countries and the rescue funds of the ECB were aimed at stabilizing the affected banks as a means of preventing financial losses from being passed on to the respective domestic savers. What was ultimately protected, however, were the savings of large economies and the business model of international financial centers. Previous measures for overcoming financial market crises have also had a significant distribution effect because the unequal distribution of wealth means that the richer members of society tend to benefit more while the costs are borne by taxpayers and thus distributed much more broadly. The recently launched "banking union" with its stronger emphasis on creditor liability should reduce this effect.

References

Blazejczak, J., F. G. Braun, D. Edler, and W.-P. Schill (2014), Economic effects of renewable energy expansion: A model-based analysis for Germany. In: Renewable and Sustainable Energy Reviews 2014 http://dx.doi.org/10.1016/j.rser.2014.07.134.

Edler, D. (1990), Impact of Selected Technologies on Employment and its Occupational Composition: An Input-Output Approach, in: Matzner, E. and R. Schettkat (Eds.), The Employment Impact of New Technology: The Case of West Germany, Aldershot, 261-275.

Gourinchas, P.-O., H. Rey und K. Truempler (2011), The Financial Crisis and The Geography of Wealth Transfers, NBER Working Paper No. 17353, August. Published in 2012 in: Global Financial Crisis, Journal of International Economics, Vol. 88 (2), 266-283.

Kubelec, Ch. und F. Sá (2010), The Geographical Composition of National External Balance Sheets: 1980–2005, Bank of England Working Paper 384, April.

Milesi-Ferretti, G. M., F. Strobbe und N. Tamirisa (2010), Bilateral Financial Linkages and Global Imbalances: a View on The Eve of the Financial Crisis, IMF Working Paper 10/247, November.

Miller. R. E. and P. D. Blair (2009), Input-Output Analysis. Foundations and Extensions, Cambridge University Press, Cambridge (Mass.), second edition.

OECD (2013), Interconnected Economies: Benefiting from Global Value Chains, Paris.

Schultz, S. und D. Schumacher (1977), Interindustrial Linkages in Developing Countries, A Comparative Analysis of Backward and Forward Linkages, in: Konjunkturpolitik, No. 6, 363-390.

Schumacher, Dieter (1984), North-South Trade and Shifts in Employment. A Comparative Analysis of Six European Community Countries, in: International Labour Review, Vol. 123, No. 3, 333-348, reprinted in: Greenaway, D. and D. R. Nelson (Eds.), Globalization and Labour Markets, Volume II, 3-18, Cheltenham (UK) and Northampton (Mass.), Edward Elgar Publishing, 2001.

Schumann, H. (2013), Staatsgeheimnis Bankenrettung, Der Tagesspiegel, 24 February 2013.

Stäglin, R. (1972), Direct and Indirect Export Dependency of Production Sectors in the Years 1954 to 1970, in: Economic Bulletin, DIW Berlin, Vol. 9 No. 10/1972.

Stäglin, R. (1974), L'interpénétration du commerce extérieur entre la République fédérale d'Allemagne et les pays de la Communauté Européenne: Dépendance de l'économique de la République fédérale de ses exportations de marchandises vers le pays de la CE, in: DIW Bulletin Economique, Vol. 3, No.6/1974.

Stäglin, R. (1998), Möglichkeiten zur Erfassung länderübergreifender Materialströme mit Hilfe von internationalen Input-Output-Verflechtungen, Band 6 der Schriftenreihe Beiträge zu den Umweltökonomischen Gesamtrechnungen, Herausgeber: Statistisches Bundesamt, Wiesbaden.

Upper, C. und A. Worms (2002), Estimating Bilateral Exposures in the German Interbank Market: Is there a Danger of Contagion?, Economic Research Centre of the Deutsche Bundesbank, Discussion paper 09/02.

Appendix 1: The Model

Estimating the financing structure of capital formation for each country j results in the share a_{ii} of capital imports from country i and s_i for domestic savings (Table 2), such that:

(1) $\Sigma_i a_{ij} + s_j = 1$.

Assuming that the financing structure is independent of the amount of financing and the type of investment, the total capital allocation of country i in Table 1 can be stated as:

(2)
$$\Sigma_j a_{ij} x_j + I_i = x_i$$

with x_i as a variable that represents the level of financing activities and thus the amount of funds in country i. For all countries, this equation can be formulated as:

(3)
$$A x + I = x$$

with the matrix $A = (a_{ij})$ and the column vectors $I = (I_i)$ and $x = (x_i)$ or (x_j) .

For a given vector I of investments, this results in:

(4)
$$x - Ax = I$$
 or $(E - A)x = I$ with E as the identity matrix

and

(5)
$$x = (E - A)^{-1} I$$

The vector x gives the entire amount of funding in the various countries for domestic investments in the amount of I that are needed both directly and indirectly, via capital imports.

If one refers to the inverse matrix $(E - A)^{-1}$ as C, that is,

(6)
$$C = (E - A)^{-1}$$

then the values c_{ij} in column j of this matrix state the total amount of financial resources needed from the various countries i for an investment in country j in the amount of 1. As a gross value, they also include the financial resources contained indirectly through international capital linkages. The savings in the individual countries that is contained in the total required financial resources then results as:

(7)
$$S' = s' C$$

with the row vectors $S' = (S_i)$ of the directly and indirectly contained savings and $s' = (s_i)$ of the country-specific savings coefficients. Thus, for each country i, we can determine the total amount of savings, taking into account the international capital linkages, contained in an investment in a given country j, or conversely: the amount that can be lost in the case of a bad investment.

The equations formulated here correspond to the basic static model used in input-output analysis for the inter-industry linkages in an economy (see Miller and Blair 2009 for a recent and detailed presentation on the foundations and extensions of input-output analysis). For the numerous empirical studies on the subject published by DIW Berlin, see Stäglin (1972 and 1974), Schultz and Schumacher (1977), and Schumacher (1984) applying the static model, Edler (1990) using a dynamic version, Blazejczak et al. (2014) combining input-output relations and an econometric model, and Stäglin (1998) on the analysis of international input-output linkages. Using an international system of input-output tables, the OECD calculated the imports contained both directly and indirectly in bilateral export figures and now provides data for international trade on the basis of domestic value added (OECD 2013).

Appendix 2: The Data

The data for Table 1 were compiled from various international sources for the 12-year period from 1999, the year when the euro was introduced, to 2010, the year of the Greek crisis. The figures on investment and saving in the various countries were obtained from the national accounts data published by the World Bank in its World Development Indicators and add up to a total of around 120 trillion USD for the world during the reporting period.

The data on capital exports and imports were taken from the IMF balance of payments statistics. Looking at direct investment and "other" investment for all countries together, these data result in around the same values for capital exports and capital imports (around 17 trillion USD) each). With portfolio investment, the data on capital exports (around 15 trillion USD) result in a substantially lower value than the data on capital imports (around 25 trillion USD). Capital exports were therefore calculated as the sum of current account and capital account⁴ minus changes in foreign reserves plus capital imports (for direct, portfolio and other investment) because the balance on the current and capital accounts, on the one hand, and the balance on the financial account including foreign currency reserves, on the other hand, have to offset each other. In this calculation, global capital exports come out to be around 4 trillion USD higher than reported capital exports. Significantly larger numbers were found for the USA, United Kingdom, Italy, and Germany. Including foreign currency reserves in the calculation (around 7 trillion USD) results in around 60 trillion USD for the period from 1999 to 2010 for all countries together, which corresponds to the value obtained for capital imports.

Data on the international capital linkages by country of origin and destination can be obtained from the IMF's Coordinated Portfolio Investment Survey (CPIS) and Coordinated Direct Investment Survey (CDIS), which give the stock values of portfolio investment abroad as well as outward and inward direct investment for a large number of reporting countries and separated by partner countries. Some of the countries that are important for the analysis are not reporting for the surveys, however. This is true in particular of China and Saudi Arabia, and in the case of direct investment, of a number of smaller countries that are active in international finance (such as Bermuda, the Cayman Islands, Singapore, the Dutch Antilles). In the case of direct investment, the gap was largely closed by replacing the missing values for outward investment with data on inward investment of the reporting countries from the

⁴ Including the purchase/sale of intangible non-manufactured assets.

non-reporting countries. In this way, a 69x69 matrix was compiled for the portfolio and direct investment of 68 individual countries and the sum of the other countries with stock values from the end of 2010, which add up to around 65 trillion USD worldwide (including around 41 trillion USD in portfolio investment). This corresponds to the value obtained above of 60 trillion USD for the cumulative capital exports from 1999 to 2010 from the balance of payments statistics.

The estimated foreign currency reserves, which play a major role for China in particular, were assigned to the countries of investment and added to the matrix. Here, reference was made to the database of Gourinchas, Rey, and Truempler (2011)⁵, whose data on foreign currency reserves of 11 countries and 6 country groups can be broken down into USD, euros, British pounds, Swiss francs, and Japanese yen. The allocation of the reserves in euros to the individual euro-countries was done based on their share in the capital of the ECB.

In order to obtain a matrix of bilateral capital stocks for the model calculations, the cumulative capital exports from the balance of payments statistics were broken down by countries of destination and the cumulative capital imports from the balance of payments statistics were broken down by countries of origin using the country structures from the bilateral stock matrix with the addition of foreign currency reserves. Using the results of the two operations, the average was obtained such that the row and column totals of the bilateral matrix come as close as possible to the capital exports and imports from the balance of payments. In the case of a few very small and not independent countries for which there are no balance of payments statistics available, the values from the stock statistics were used for capital imports, and it was assumed that capital exports were equally large.⁶ This implies that these countries, due to their small size, are only transit countries for capital flows. Missing national accounts data on these countries were replaced by the assumption that their saving and domestic investment are equal to zero.

For the values of bilateral capital stocks estimated in this way, the consistency conditions in Table 1 are only approximately fulfilled. First, the difference between capital exports and imports from the balance of payments statistics differ from the balance of saving and

⁵ Gourinchs, Rey, and Truempler (2011) compiled a matrix of bilateral gross and net external positions matrices with data from the end of 2007 and 2008 for 11 countries and 3 country groups drawing on the two aforementioned IMF surveys with the addition of data from a number of national sources.

⁶ This is true of the Cayman Islands, Curacao, Gibraltar, Guernsey, the Isle of Man, Jersey, and Bermuda. For the Dutch Antilles, the higher value for capital exports was also assumed for capital imports.

investment from the national accounts data. In the cases of Italy, Ireland, and Bulgaria, for instance, we find net capital imports but a more balanced or even positive savings position. Second, our final step calculating averages results in reductions or increases to the original deviations. Thus in our calculations, the capital balance appears too positive for France and Luxemburg, while it fits the net savings position of Ireland and Canada better and appears too negative for Brazil and Belgium. Overall, the balances of capital exports and imports from our bilateral matrix correspond fairly well with the balances of saving and investment. The countries with the largest surpluses of saving and thus net capital exports are China and Germany, followed by Russia, Saudi Arabia, Japan, the Netherlands, Norway, Singapore, and Switzerland. The countries with the largest saving deficits and thus the largest net capital imports are the USA, followed at a large distance by the United Kingdom, Spain, India, Greece, Portugal, Turkey, Mexico, and France.

Appendix 3: Additional Tables

		Directly an	d indirectly	affected cree	dit volume	Directly and indirectly contained savings				ume	thereof: Debt holders in Germany in % of those affected abroad			
		Domestic	For	reign	total	Domestic		Foreign		total	credit volume		savings volun	ne
	Country of investment	direct	indirect 1	indirect 2		direct	indirect 1	indirect 2	indirect 1+2		indirect 1	indirect 1	indirect 2	indirect 1+2
1	Argentina	1	0.13	0.10	1.23	0.87	0.07	0.05	0.13	1.00	3	3	11	6
2	Australia	1	0.35	0.28	1.63	0.65	0.19	0.16	0.35	1.00	3	4 26	8 10	20
4	Bahamas The	1	0.35	0.20	2 32	0.01	0.24	0.15	0.55	1.00	0	20	7	3
5	Bahrain	1	0.52	0.15	1.67	0.48	0.44	0.08	0.52	1.00	1	1	7	2
6	Barbados	1	0.83	0.46	2.29	0.17	0.57	0.26	0.83	1.00	0	0	5	2
7	Belgium	1	0.49	0.47	1.96	0.51	0.24	0.25	0.49	1.00	7	10	12	11
8	Bermuda	1	1.00	0.86	2.86	0.00	0.52	0.48	1.00	1.00	1	1	7	4
9	Brazil	1	0.27	0.27	1.54	0.73	0.12	0.15	0.27	1.00	2	3	8	6
10	Bulgaria	1	0.49	0.41	1.91	0.51	0.27	0.22	0.49	1.00	10	13	13	13
11	Canada	1	0.28	0.22	1.51	0.72	0.16	0.13	0.28	1.00	2	3	7	5
12	Cayman Islands	1	1.00	0.71	2.71	0.00	0.60	0.40	1.00	1.00	2	2	8	4
13	China mainland	1	0.29	0.28	1.50	0.71	0.13	0.10	0.29	1.00	2	5	6	5
14	Hong Kong SAR China	1	0.09	0.08	2.03	0.91	0.04	0.05	0.09	1.00	5	5	7	3
16	Macao SAR China	1	0.00	0.44	1.60	0.40	0.30	0.24	0.00	1.00	0	0	4	3
17	Colombia	1	0.17	0.13	1.31	0.83	0.10	0.07	0.17	1.00	4	5	9	7
18	Curacao	1	1.00	1.49	3.49	0.00	0.19	0.81	1.00	1.00	3	12	15	15
19	Cyprus	1	0.87	0.46	2.33	0.13	0.63	0.24	0.87	1.00	1	1	11	4
20	Czech Republic	1	0.22	0.19	1.41	0.78	0.12	0.10	0.22	1.00	19	24	12	19
21	Denmark	1	0.35	0.30	1.65	0.65	0.19	0.16	0.35	1.00	10	13	10	12
22	Egypt, Arab Rep	1	0.26	0.23	1.49	0.74	0.14	0.13	0.26	1.00	2	2	10	6
23	Finland	1	0.40	0.31	1.70	0.60	0.23	0.16	0.40	1.00	8	10	10	10
24	France	1	0.41	0.35	1.76	0.59	0.22	0.19	0.41	1.00	11	15	10	13
25	Germany	1	0.30	0.27	1.57	0.70	0.16	0.14	0.30	1.00	0	0	11	5
26	Gibraltar	1	1.00	0.70	2.70	0.00	0.61	0.39	1.00	1.00	1	1	7	3
27	Greece	1	0.55	0.41	1.96	0.45	0.32	0.23	0.55	1.00	17	20	10	16
28	Guernsey	1	1.00	0.94	2.94	0.00	0.49	0.51	1.00	1.00	/	10	9	10
29	Hungary	1	0.50	0.55	2.05	0.50	0.20	0.30	0.50	1.00	13	23	9	15
3U 21	India	1	0.70	0.64	2.34	0.30	0.35	0.35	0.70	1.00	212	1/	10	13
32	Indonesia	1	0.11	0.11	1.22	0.85	0.05	0.00	0.11	1.00	2	2	8	5
33	Ireland	1	0.10	0.69	2 43	0.26	0.05	0.04	0.10	1.00	10	14	10	12
34	Isle of Man	1	1.00	1.08	3.08	0.00	0.42	0.58	1.00	1.00	1	1	9	6
35	Israel	1	0.31	0.32	1.63	0.69	0.13	0.18	0.31	1.00	1	2	6	5
36	Italy	1	0.30	0.25	1.55	0.70	0.17	0.13	0.30	1.00	13	16	11	14
37	Japan	1	0.10	0.08	1.19	0.90	0.06	0.05	0.10	1.00	3	3	8	6
38	Jersey	1	1.00	0.96	2.96	0.00	0.48	0.52	1.00	1.00	7	10	10	10
39	Kazakhstan	1	0.24	0.22	1.45	0.76	0.12	0.12	0.24	1.00	5	7	9	8
40	Korea, Rep	1	0.12	0.11	1.23	0.88	0.06	0.06	0.12	1.00	3	4	9	6
41	Kuwait	1	0.04	0.03	1.08	0.96	0.02	0.02	0.04	1.00	1	1	7	4
42	Luxembourg	1	0.94	0.77	2.71	0.06	0.53	0.41	0.94	1.00	17	21	9	16
43	Malaysia	1	0.13	0.12	1.25	0.87	0.06	0.07	0.13	1.00	3	5	8	6
44	Malta	1	0.81	0.62	2.43	0.19	0.48	0.33	0.81	1.00	61	/2	10	46
45	Movico	1	0.77	0.54	2.31	0.23	0.48	0.29	0.77	1.00	2	2	01	5
40	Netherlands	1	0.10	0.13	2.20	0.34	0.08	0.07	0.10	1.00	8	12	9	10
48	Netherlands Antilles	1	1.00	0.55	2.15	0.00	0.29	0.32	1 00	1.00	2	2	8	4
49	New Zealand	1	0.27	0.20	1.47	0.73	0.16	0.11	0.27	1.00	1	2	7	4
50	Norway	1	0.26	0.21	1.47	0.74	0.15	0.11	0.26	1.00	9	11	9	10
51	Panama	1	0.43	0.31	1.74	0.57	0.25	0.18	0.43	1.00	2	2	7	4
52	Philippines	1	0.19	0.15	1.34	0.81	0.11	0.08	0.19	1.00	2	3	8	5
53	Poland	1	0.29	0.26	1.56	0.71	0.15	0.14	0.29	1.00	18	24	11	18
54	Portugal	1	0.56	0.48	2.04	0.44	0.31	0.26	0.56	1.00	10	13	12	12
55	Romania	1	0.35	0.30	1.65	0.65	0.18	0.16	0.35	1.00	11	14	13	13
56	Russian Federation	1	0.14	0.15	1.28	0.86	0.05	0.08	0.14	1.00	6	11	8	9
57	Saudi Arabia	1	0.08	0.04	1.12	0.92	0.05	0.02	0.08	1.00	1	1	6	3
58	Singapore	1	0.45	0.41	1.87	0.55	0.22	0.23	0.45	1.00	3	4	6	5
59	Slovak Republic	1	0.30	0.19	1.50	0.70	0.20	0.10	0.30	1.00	17	18	11	15
6U 61	South Africa	1	0.28	0.26	1.54	0.72	0.14	0.14	0.28	1.00	5	/	9	8
62	Sweden	1	0.38	0.29	1.08 1.72	0.62	0.22	0.10	0.38	1.00	14	17	10	14
62	Switzerland	1	0.38	0.33	1.72	0.02	0.20	0.10	0.38	1.00	9	2 12	10	11
64	Thailand	1	0.43	0.41	1.04	0.57	0.21	0.22	0.43	1.00	2	ວ ຊ	7	5
65	Turkey	1	0.24	0.22	1.47	0.76	0.12	0.12	0.24	1.00	6	8	, 13	11
66	United Kingdom	1	0.65	0.55	2.19	0.35	0.35	0.30	0.65	1.00	6	8	10	9
67	United States	1	0.40	0.28	1.69	0.60	0.25	0.15	0.40	1.00	3	4	9	6
68	Venezuela, RB	1	0.06	0.05	1.11	0.94	0.03	0.03	0.06	1.00	4	5	10	8
69	Other countries	1	0.28	0.24	1.53	0.72	0.15	0.13	0.28	1.00	2	2	9	5

Table A.1	
Credit and savings volume contained in an investment of 1 billion USD by country of investment ((in billion USD)

Country of investment	Countries affected by	a credit default abroad	d (in order of the amoun	t of the first indirect cr	edit default correspond	ing to the capital import	ts: indirect 1 = a _{ij})			
Argentina	Spain	United States	United Kingdom	Brazil	Netherlands	Italy	Luxembourg	Germany	France	Canada
Australia	United States	United Kingdom	Japan	Singapore	Luxembourg	Netherlands	Germany	France	Canada	Hong Kong SAR, China
Austria	Germany	France	Brazil	Netherlands	Italy	United States	Switzerland	Luxembourg	China mainland	Belgium
Bahamas, The	United States	Brazil	Russian Federation	Netherlands	Italy	Cayman Islands	Switzerland	Japan	Luxembourg	France
Bahrain	Kuwait	Saudi Arabia	United Kingdom	Netherlands	Jersey	other Countries	Cayman Islands	Germany	Luxembourg	Egypt, Arab Rep
Barbados	Canada	United States	other Countries	Chile	Russian Federation	Germany	United Kingdom	Luxembourg	France	Bermuda
Belgium	France	Luxembourg	United Kingdom	Netherlands	Germany	United States	Finland	China mainland	Ireland	Japan
Bermuda	United States	Hong Kong SAR, China	Ireland	Netherlands	Luxembourg	Canada	United Kingdom	Japan	France	Russian Federation
Brazil	United States	Cayman Islands	United Kingdom	Spain	Luxembourg	Netherlands	Japan	France	Germany	Mexico
Bulgaria	Netherlands	Austria	Greece	Germany	Russian Federation	Hungary	Czech Republic	Italy	Spain	France
Canada	United States	United Kingdom	Netherlands	Japan	Switzerland	Luxembourg	France	Germany	Australia	Ireland
Cayman Islands	United States	Japan	Hong Kong SAR, China	United Kingdom	Luxembourg	France	Netherlands	Ireland	Brazil	Canada
Chile	United States	Cayman Islands	Spain	Bermuda	Canada	Bahamas, The	Netherlands	Argentina	other Countries	United Kingdom
China mainland	Hong Kong SAR, China	United States	Singapore	Cayman Islands	Japan	United Kingdom	Korea, Rep	Germany	Luxembourg	France
Hong Kong SAR, China	China mainland	United States	United Kingdom	Bermuda	Netherlands	Cayman Islands	Singapore	Luxembourg	Japan	Australia
Macao SAR, China	Cayman Islands	Hong Kong SAR, China	China mainland	United States	Bermuda	Portugal	United Kingdom	Japan	Italy	Singapore
Colombia	United States	Spain	Netherlands	Mexico	Luxembourg	Germany	United Kingdom	Japan	Switzerland	Canada
Curacao	Luxembourg	Ireland	Czech Republic	France	Germany	Portugal	Belgium	Sweden	Guernsey	Bermuda
Cyprus	Russian Federation	Greece	Luxembourg	Netherlands	other Countries	Austria	Germany	Poland	Cayman Islands	India
Czech Republic	Germany	Austria	Netherlands	France	United States	Luxembourg	Spain	Belgium	Poland	Switzerland
Denmark	United States	Sweden	Germany	Luxembourg	Norway	United Kingdom	Finland	Netherlands	France	Brazil
Egypt, Arab Rep	United States	United Kingdom	Netherlands	France	Kuwait	Luxembourg	Italy	Greece	Switzerland	Spain
Finland	Sweden	United States	Germany	France	Netherlands	United Kingdom	Luxembourg	China mainland	Japan	Denmark
France	United States	Germany	United Kingdom	Luxembourg	Netherlands	Belgium	China mainland	Ireland	Japan	Italy
Germany	Luxembourg	France	United States	United Kingdom	Netherlands	China mainland	Japan	Ireland	Switzerland	other Countries
Gibraltar	United States	Russian Federation	Netherlands	Brazil	United Kingdom	Denmark	Germany	France	Austria	Israel
Greece	Germany	France	China mainland	Cyprus	Spain	Netherlands	United Kingdom	other Countries	Luxembourg	Belgium
Guernsey	United Kingdom	United States	Netherlands	Germany	Switzerland	Japan	France	Luxembourg	Norway	Finland
Hungary	Cayman Islands	Germany	Spain	Luxembourg	Austria	Netherlands	Bermuda	Canada	Ireland	United States
Iceland	United Kingdom	Netherlands	United States	Germany	France	Denmark	Luxembourg	Italy	Norway	Spain
India	United States	Mauritius	United Kingdom	Singapore	Luxembourg	Japan	Germany	France	Hong Kong SAR, China	Netherlands
Indonesia	Singapore	United States	Malaysia	Luxembourg	Japan	Netherlands	United Kingdom	Australia	Canada	China mainland
Ireland	United States	United Kingdom	Germany	Luxembourg	France	Netherlands	Italy	Spain	Portugal	Japan
Isle of Man	United Kingdom	Ireland	United States	Malaysia	South Africa	Luxembourg	Russian Federation	Japan	Singapore	Germany
Israel	United States	Cayman Islands	United Kingdom	Luxembourg	Netherlands	France	Guernsey	Japan	Canada	Germany
Italy	France	Germany	United Kingdom	Luxembourg	China mainland	Ireland	Netherlands	Spain	United States	other Countries
Japan	United States	United Kingdom	France	China mainland	Cayman Islands	Luxembourg	Singapore	other Countries	Ireland	Germany
Jersey	United Kingdom	United States	Germany	Luxembourg	France	Japan	Ireland	Switzerland	Netherlands	Spain
Kazakhstan	Netherlands	United States	United Kingdom	France	Germany	Canada	China mainland	Russian Federation	Korea, Rep	Cayman Islands
Korea, Rep	United States	United Kingdom	Luxembourg	Singapore	Japan	Hong Kong SAR, China	Ireland	France	Germany	Netherlands
Kuwait	Bahrain	Italy	Saudi Arabia	United Kingdom	Luxembourg	Malaysia	Jersey	Hong Kong SAR, China	Guernsey	United States
Luxembourg	Germany	United Kingdom	United States	Netherlands	Italy	Belgium	France	Switzerland	Ireland	Spain
Malaysia	United States	Singapore	United Kingdom	Luxembourg	Cayman Islands	Netherlands	Japan	Hong Kong SAR, China	Kuwait	Germany

Table A.2 Creditor countries with the largest credit default in the first round with a bad investment in the various countries of investment

Country of investment	Countries affected by	a credit default abroad	I (in order of the amour	nt of the first indirect cre	edit default correspond	ing to the capital impor	ts: indirect 1 = a _{ij})			
Malta	Germany	Netherlands	Luxembourg	Turkey	France	Austria	Spain	United States	Italy	Portugal
Mauritius	India	United States	Malaysia	South Africa	Luxembourg	United Kingdom	Netherlands	Singapore	France	Germany
Mexico	United States	Spain	Netherlands	United Kingdom	Luxembourg	Germany	Japan	Cayman Islands	Canada	France
Netherlands	United States	United Kingdom	France	Germany	Luxembourg	Cayman Islands	Belgium	Bermuda	Italy	Netherlands Antilles
Netherlands Antilles	United States	France	Netherlands	Japan	Hungary	Germany	Belgium	Italy	Switzerland	Canada
New Zealand	Australia	United States	United Kingdom	Japan	Netherlands	Singapore	Cayman Islands	Canada	Germany	Guernsey
Norway	United States	Sweden	Japan	Germany	United Kingdom	France	Luxembourg	Denmark	Netherlands	Switzerland
Panama	United States	Netherlands Antilles	Venezuela, RB	Spain	Brazil	Colombia	Netherlands	Luxembourg	other Countries	United Kingdom
Philippines	United States	Japan	Singapore	United Kingdom	Netherlands	Luxembourg	Australia	Hong Kong SAR, China	Norway	Korea, Rep
Poland	Germany	United States	Luxembourg	France	Netherlands	United Kingdom	Italy	Austria	Belgium	Ireland
Portugal	Spain	France	Ireland	Germany	Netherlands	Luxembourg	China mainland	Italy	other Countries	United Kingdom
Romania	Netherlands	Austria	Greece	Germany	France	Italy	Luxembourg	Spain	United States	Switzerland
Russian Federation	United States	Netherlands	Bermuda	Luxembourg	Germany	Cyprus	United Kingdom	Bahamas, The	France	Sweden
Saudi Arabia	Kuwait	Bahrain	China mainland	United States	United Kingdom	other Countries	Japan	France	Netherlands	Egypt, Arab Rep
Singapore	United States	Cayman Islands	Netherlands	Malaysia	Japan	China mainland	United Kingdom	Bermuda	Norway	Germany
Slovak Republic	Germany	Austria	Netherlands	China mainland	other Countries	Czech Republic	Italy	Belgium	Hungary	France
South Africa	United States	United Kingdom	Netherlands	Luxembourg	Germany	Ireland	China mainland	France	Canada	Japan
Spain	France	Germany	Netherlands	United States	Luxembourg	China mainland	United Kingdom	Italy	other Countries	Belgium
Sweden	United States	Finland	Luxembourg	Germany	Denmark	Norway	France	Netherlands	United Kingdom	Japan
Switzerland	United States	Netherlands	Luxembourg	United Kingdom	France	Germany	Hungary	Sweden	Norway	Spain
Thailand	United States	Singapore	Japan	Cayman Islands	Luxembourg	United Kingdom	Hong Kong SAR, China	Malaysia	Netherlands	Germany
Turkey	United States	United Kingdom	Netherlands	Luxembourg	Germany	France	Malta	Bahrain	Greece	Austria
United Kingdom	United States	Netherlands	Ireland	Luxembourg	France	Germany	Japan	China mainland	Spain	Switzerland
United States	China mainland	United Kingdom	Japan	other Countries	Ireland	Canada	Netherlands	Germany	Luxembourg	France
Venezuela, RB	United States	Netherlands	Spain	Luxembourg	France	United Kingdom	Germany	Switzerland	Italy	Jersey
Other Countries	United Kingdom	Hong Kong SAR, China	United States	Italy	Switzerland	Ireland	Netherlands	Russian Federation	France	other Countries

Table A.3		
Creditor countries with the largest savings losses in	the case of a bad investment in the	various countries of investment

Country of investment	Countries affected by	the loss of savings abro	oad (in order of the tota	l amount lost: indirect 1	+ 2 = cij sj)					
Argentina	Spain	United States	Germany	United Kingdom	France	Brazil	Italy	Netherlands	Japan	China mainland
Australia	United States	Japan	United Kingdom	Germany	China mainland	France	Netherlands	Canada	Singapore	Switzerland
Austria	Germany	United States	France	Italy	China mainland	Brazil	Japan	Netherlands	Switzerland	United Kingdom
Bahamas, The	United States	Brazil	Russian Federation	Japan	China mainland	Netherlands	Italy	United Kingdom	Germany	France
Bahrain	Kuwait	Saudi Arabia	United Kingdom	United States	Germany	Netherlands	other Countries	Japan	France	Italy
Barbados	Canada	United States	Japan	China mainland	Germany	United Kingdom	France	other Countries	Netherlands	Russian Federation
Belgium	France	United States	Germany	United Kingdom	Netherlands	Japan	China mainland	Italy	Spain	Switzerland
Bermuda	United States	China mainland	Japan	Hong Kong SAR, China	Netherlands	Germany	United Kingdom	Ireland	France	Canada
Brazil	United States	Japan	United Kingdom	Spain	Germany	France	Netherlands	China mainland	Canada	other Countries
Bulgaria	Austria	Germany	Netherlands	United States	Russian Federation	Greece	France	Italy	Japan	United Kingdom
Canada	United States	Japan	China mainland	United Kingdom	Germany	France	Netherlands	Switzerland	Australia	other Countries
Cayman Islands	Japan	United States	United Kingdom	China mainland	Hong Kong SAR, China	Germany	France	Netherlands	Canada	Switzerland
Chile	United States	Spain	Japan	Canada	Germany	China mainland	United Kingdom	France	other Countries	Netherlands
China mainland	United States	Hong Kong SAR, China	Japan	Singapore	Germany	United Kingdom	Korea, Rep	France	Netherlands	Canada
Hong Kong SAR, China	China mainland	United States	Japan	United Kingdom	Netherlands	Germany	France	Singapore	Canada	Korea, Rep
Macao SAR, China	China mainland	United States	Hong Kong SAR, China	Japan	United Kingdom	Germany	France	Netherlands	Canada	Switzerland
Colombia	United States	Spain	Mexico	Germany	Netherlands	Japan	France	China mainland	United Kingdom	Canada
Curacao	Germany	United States	France	United Kingdom	Italy	Ireland	Netherlands	Czech Republic	Luxembourg	Japan
Cyprus	Russian Federation	United States	Germany	Greece	Netherlands	France	other Countries	China mainland	Japan	United Kingdom
Czech Republic	Germany	United States	Austria	France	Netherlands	Spain	United Kingdom	Belgium	Japan	Italy
Denmark	United States	Germany	Sweden	Norway	Japan	United Kingdom	France	Finland	Netherlands	China mainland
Egypt, Arab Rep	United States	United Kingdom	France	Kuwait	Germany	Italy	Netherlands	Japan	China mainland	Switzerland
Finland	United States	Sweden	Germany	France	Japan	China mainland	United Kingdom	Netherlands	Norway	Denmark
France	United States	Germany	China mainland	Japan	United Kingdom	Netherlands	Italy	Belgium	other Countries	Spain
Germany	United States	France	China mainland	Japan	United Kingdom	Netherlands	Italy	other Countries	Switzerland	Austria
Gibraltar	United States	Russian Federation	Netherlands	China mainland	Brazil	Japan	United Kingdom	Germany	France	other Countries
Greece	Germany	France	China mainland	United States	Russian Federation	Spain	other Countries	Netherlands	United Kingdom	Japan
Guernsey	United States	United Kingdom	Germany	Japan	France	Netherlands	Switzerland	China mainland	Norway	Italy
Hungary	United States	Germany	Japan	Spain	France	Netherlands	Austria	Canada	United Kingdom	China mainland
Iceland	United States	Germany	United Kingdom	Netherlands	France	Japan	Italy	China mainland	Denmark	Norway
India	United States	Japan	United Kingdom	Germany	Singapore	Mauritius	France	China mainland	Netherlands	Malaysia
Indonesia	United States	Singapore	Japan	Malaysia	China mainland	Germany	United Kingdom	Netherlands	France	Canada
Ireland	United States	Germany	United Kingdom	France	Japan	Netherlands	Italy	China mainland	Spain	Switzerland
Isle of Man	United Kingdom	United States	Germany	Japan	France	Ireland	Malaysia	China mainland	Netherlands	Russian Federation
Israel	United States	Japan	United Kingdom	China mainland	Germany	France	Netherlands	Canada	other Countries	Switzerland
Italy	Germany	France	United States	China mainland	United Kingdom	Japan	Netherlands	other Countries	Spain	Belgium
Japan	United States	China mainland	United Kingdom	France	Germany	other Countries	Netherlands	Canada	Saudi Arabia	Singapore
Jersey	United States	United Kingdom	Germany	Japan	France	Netherlands	Switzerland	China mainland	Spain	Italy
Kazakhstan	United States	Netherlands	France	Germany	China mainland	United Kingdom	Japan	Russian Federation	Canada	Korea, Rep
Korea, Rep	United States	United Kingdom	Japan	Germany	China mainland	France	Singapore	Netherlands	Canada	Switzerland
Kuwait	Bahrain	Saudi Arabia	Italy	United States	United Kingdom	Malaysia	Germany	Japan	France	China mainland
Luxembourg	Germany	United States	France	United Kingdom	Italy	Netherlands	Japan	Switzerland	Belgium	China mainland
Malaysia	United States	Japan	Singapore	Germany	United Kingdom	China mainland	Netherlands	Kuwait	France	Hong Kong SAR, China

Country of investment	Countries affected by	y the loss of savings abr	oad (in order of the tota	al amount lost: indirect 1	L + 2 = cij sj)					
Malta	Germany	United States	Netherlands	France	Turkey	Japan	United Kingdom	Austria	China mainland	Spain
Mauritius	United States	India	Malaysia	South Africa	Germany	United Kingdom	Netherlands	France	Japan	China mainland
Mexico	United States	Spain	Japan	Germany	United Kingdom	Netherlands	China mainland	France	Canada	Switzerland
Netherlands	United States	Germany	France	United Kingdom	Japan	China mainland	Italy	Belgium	Spain	Switzerland
Netherlands Antilles	United States	France	Japan	Netherlands	China mainland	Germany	United Kingdom	Italy	other Countries	Switzerland
New Zealand	Australia	United States	Japan	United Kingdom	Germany	China mainland	Netherlands	France	Canada	Singapore
Norway	United States	Japan	Germany	Sweden	France	United Kingdom	China mainland	Netherlands	Denmark	Switzerland
Panama	United States	Japan	Venezuela, RB	China mainland	Germany	other Countries	United Kingdom	Spain	Brazil	France
Philippines	United States	Japan	United Kingdom	Germany	Singapore	Netherlands	China mainland	Australia	France	Norway
Poland	Germany	United States	France	Italy	Netherlands	United Kingdom	Japan	Austria	China mainland	Switzerland
Portugal	Germany	France	Spain	United States	China mainland	Netherlands	Ireland	Japan	United Kingdom	Italy
Romania	Germany	Austria	Netherlands	France	United States	Italy	Greece	Spain	United Kingdom	China mainland
Russian Federation	United States	Germany	Netherlands	France	United Kingdom	Japan	China mainland	Sweden	Italy	Austria
Saudi Arabia	Kuwait	China mainland	United States	Bahrain	other Countries	Japan	United Kingdom	France	Italy	Netherlands
Singapore	United States	Japan	China mainland	Germany	Malaysia	Netherlands	United Kingdom	France	Norway	India
Slovak Republic	Germany	China mainland	Austria	Netherlands	United States	other Countries	France	Czech Republic	Italy	Japan
South Africa	United States	United Kingdom	Germany	China mainland	Japan	Netherlands	France	Canada	Switzerland	other Countries
Spain	Germany	France	United States	China mainland	Netherlands	Japan	United Kingdom	Italy	other Countries	Belgium
Sweden	United States	Germany	Japan	Finland	France	Norway	United Kingdom	Denmark	Netherlands	China mainland
Switzerland	United States	Germany	United Kingdom	Netherlands	France	Japan	China mainland	Italy	Hungary	Spain
Thailand	United States	Japan	Singapore	Germany	United Kingdom	China mainland	France	Malaysia	Netherlands	Hong Kong SAR, China
Turkey	United States	Germany	United Kingdom	France	Netherlands	Japan	other Countries	China mainland	Kuwait	Italy
United Kingdom	United States	Germany	France	Japan	China mainland	Netherlands	Ireland	Spain	Switzerland	Italy
United States	China mainland	Japan	United Kingdom	other Countries	Germany	France	Canada	Netherlands	Switzerland	Russian Federation
Venezuela, RB	United States	Netherlands	Germany	France	Spain	United Kingdom	Japan	Italy	China mainland	Switzerland
Other Countries	United States	United Kingdom	Italy	Hong Kong SAR, China	China mainland	Germany	France	Japan	Russian Federation	Switzerland